July 29, 2014

Ryan Wulff
National Marine Fisheries Service
650 Capital Mall, Suite 5-100
Sacramento, CA 95814

Sent via U.S. Mail and via email to BDCP.Comments@noaa.gov

RE: Comments on the Draft Bay Delta Conservation Plan and DEIS/DEIR

Dear Mr. Wulff:

On behalf of Defenders of Wildlife, the Natural Resources Defense Council, and the Bay Institute, and our combined membership and activists, we are writing to submit comments on the draft Bay Delta Conservation Plan ("Draft Plan") and associated Draft Environmental Impact Report and Draft Environmental Impact Statement ("DEIS/DEIR").

As you know, our organizations have dedicated countless hours over the past 8 years working on the Bay Delta Conservation Plan ("BDCP"). Our organizations supported the 2009 Delta Reform Act, which we continue to believe establishes a road map for a successful plan for achieving the co-equal goals of a more reliable water supply and protecting and restoring the health of the Delta ecosystem in a manner that protects and enhances the Delta's unique cultural, agricultural, and other values as an evolving place. And in early 2013, our organizations proposed and requested that the DEIS/DEIR analyze a Portfolio Alternative that included new conveyance in the Delta and new storage south of the Delta, in combination with significant investments in local and regional water supplies.

Unfortunately, as we discuss on the pages that follow, we find that the Draft Plan and DEIS/DEIR fail to meet the standards established in the Delta Reform Act and other applicable state and federal laws. In particular, our review finds that:

- The DEIS/DEIR and Draft Plan both fail to use the best available science, as numerous agency comments demonstrate and independent scientific reviews have concluded;

- The Draft Plan fails to conserve the health of the Bay-Delta estuary and its wildlife and fisheries, and instead the Draft Plan is likely to cause significant environmental impacts to the estuary, its wildlife and fisheries, and the people and communities that depend on its health, including significant water quality impacts to farmers and cities, reduced survival of salmon migrating through the Delta, and declining populations of salmon and other native fisheries;
- The DEIS/DEIR fails to accurately inform the public and decisionmakers of the likely environmental impacts, fails to consider a reasonable range of alternatives, and fails to adequately analyze cumulative impacts; and,
- The Draft Plan fails to reduce reliance on the Delta, fails to ensure that biological objectives are likely to be achieved, fails to ensure funding for plan implementation, provides unlawful water supply assurances, and otherwise violates the Delta Reform Act of 2009 and other state and federal laws.

Our organizations remain committed to working to achieve the co-equal goals and other requirements of the Delta Reform Act. A successful plan for the Delta must be based on the best available science, must reduce reliance on water supply from the Delta and invest in conservation and regional water supply solutions, and must achieve the requirements of state and federal law. We respectfully request that state and federal agencies to substantially revise the Draft Plan and DEIS/DEIR consistent with these comments.

Thank you for consideration of our views. Please feel free to contact us at your convenience if you have any questions regarding these comments.

Sincerely,

Doug Obegi
Natural Resources Defense Council

Kim Delfino
Defenders of Wildlife

Jon Rosenfield, Ph.D.
The Bay Institute

John McManus
Golden Gate Salmon Association

Table of Contents

I. THE DEIS/DEIR AND DRAFT PLAN FAIL TO MEET MINIMUM LEGAL STANDARDS UNDER THE NCCPA, ESA, CEQA, NEPA, AND RELATED ENVIRONMENTAL LAWS

The Draft Plan and supporting analyses do not meet the stated intent to (1) minimize and mitigate for the effects of the activities proposed in this Plan, (2) provide for the conservation of covered species, or (3) meet the standards of the Delta Reform Act of 2009. Draft Plan at 1-1 to 1-2. Nor do the Draft Plan and DEIS/DEIR use the best available scientific data or otherwise comply with the minimum legal standards of several state and federal laws that it is required to meet, including CEQA and NEPA. The Draft Plan and DEIS/DEIR must be substantially revised and recirculated to meet these minimum requirements.

A. The Draft Plan Violates the Natural Community Conservation Planning Act

As NRDC, Defenders, and TBI explained in a letter to DFW Director Bonham on July 10, 2013 (and incorporated here by reference),[1] the Natural Community Conservation Planning Act ("NCCPA") provides the foundational elements for a successful BDCP. As Director Bonham explained in an op-ed, the NCCPA (Cal. Fish & Game Code § 2800 *et seq.*) is a "cutting edge" law that sets a high bar for species protection, and that requires the BDCP to "provid[e] for the conservation and management of . . . 57 species." Charlton H. Bonham, Op-Ed., Plan could help fisheries, water supply, *S.F. Chron.*, June 6, 2013. Unfortunately, the Draft Plan does not meet this laudable standard.

Fundamentally, the Draft Plan fails to comply with the NCCPA by: (1) failing to include conservation measures that are likely to be adequate to conserve covered species in the Plan Area; (2) failing to establish biological objectives that are consistent with the NCCPA standard;[2] (3) providing regulatory assurances that are not "commensurate with long term conservation assurances," preclude effective adaptive management, and are otherwise inconsistent with the NCCPA;[3] and, (4) failing to ensure adequate funding needed to implement the Draft Plan.

[1] A copy of this letter as well as many of our organizations' prior comment letters and memorandums, as well as the scientific studies, modeling analyses, independent scientific peer reviews, and other documents relied on and incorporated by reference in these comments are included on a CD submitted with the hardcopy of these comments.
[2] *See infra* for the discussion of the adequacy of biological objections in sections III and IV of these comments.
[3] *See infra* for the discussion of regulatory assurances in section I(C) of these comments.

1. The Draft Plan Fails to Provide Measures Necessary to Achieve Conservation (Recovery) in the Plan Area, as Required by the NCCPA

To comply with the NCCPA, a natural community conservation plan must provide for measures necessary to recover covered species within the Plan Area. This is evident from the definition of "natural community conservation plan" in the statute, which requires that a plan "shall identify and provide for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible and appropriate economic development, growth, and other human uses." Cal. Fish & Game Code § 2805(h). The NCCPA defines the terms "conserve," "conserving," and "conservation" as "the use of, methods and procedures within the plan area that are necessary *to bring any covered species to the point at which the measures provided pursuant to [the California Endangered Species Act ("CESA")] are not necessary*, and for covered species that are not listed pursuant to [CESA], to maintain or enhance the condition of a species so that listing pursuant to [CESA] will not become necessary." *Id.* at § 2805(d) (emphasis added).[4] Thus, for species listed as endangered or threatened under the CESA, an NCCP must, within the Plan Area, identify and provide for those measures necessary to recover the species to the point where it is no longer considered endangered or threatened and no longer needs to be on the endangered species list. For unlisted species, the Draft Plan must provide measures, within the Plan Area, that keep the species from declining to the point at which it would need to be listed under CESA.

The Draft Plan fails to "provide for those measures necessary to conserve" listed species within the Plan Area. First, for a species that exists exclusively within the BDCP plan area, the BDCP must provide for all of the measures necessary for the species' recovery within the Plan Area. Such species include endangered delta smelt and longfin smelt. Merely contributing to these species' recovery is inadequate when the species occurs entirely within the Plan Area. This requirement is clear from several statutory provisions that require the Department to make specific findings regarding whether the Plan contains specific measures to "conserve" the

[4] In addition to the arguments raised in our 2013 letter, this conclusion regarding the recovery standard is further supported by the text and legislative history of the 2009 Delta Reform Act. First, provisions of the Delta Reform Act require BDCP to include "operational requirements and flows **necessary for recovering the Delta ecosystem and restoring fisheries** under a reasonable range of hydrologic conditions." Cal. Water Code § 85320(b)(2)(A) (emphasis added). Second, the November 4, 2009 Assembly Floor analysis of the Delta Reform Act 2009, which states that with respect to the NCCPA standard, "While some agencies have asserted that BDCP would be an NCCP, the December 2006 planning agreement specifically provided that the signatories were not committed to achieving **the higher ecosystem recovery standard for an NCCP. This bill sets the higher NCCP standard ("the gold standard")** as the threshold for state funding of the public benefits of BDCP activities, while relying on existing law." Nov. 4, 2009 Assembly Floor Analysis of SB 1 X7 (Simitian and Steinberg), available online at: http://leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx7_1_cfa_20091104_035148_asm_floor.html (emphasis added).

covered species within the Plan Area. *See* Cal. Fish & Game Code § 2805(h) (Plan "shall identify and provide for those measures necessary to conserve . . . within the plan area); *id*. at § 2805(d) (defining conservation as recovery); *id*. at § 2820(a)(4) (requiring Plan to contain "measures in the plan areas . . . as needed for the conservation of species"); *id*. at § 2820(a)(6) (requiring plan to contain "specific conservation measures that meet the biological needs of covered species"); *id*. at § 2835 (authorizing the Department to issue a take permit for a covered species if they find that the covered species' "conservation and management is provided for in a [Plan]"). As discussed below, the Draft Plan fails to provide for those measures necessary to conserve delta smelt and longfin smelt, and instead predicts significant declines in the abundance of these species as a result of BDCP, CVP/SWP operations, and other cumulative impacts (including climate change) in the Plan Area.

Second, the Draft Plan unlawfully limits the magnitude of the Plan's required contribution to a species' recovery by the extent of the Plan's impacts on that species. The NCCPA does not permit this artificially truncated contribution to recovery. Rather, the NCCPA takes a far more expansive view of conservation measures, which includes, but is not limited to, taking into account the impacts of covered activities on the covered species. *See* Fish and Game Code § 2820(a)(6) ("The plan contains specific conservation measures that meet the biological needs of covered species **and** are based on the best available information regarding the status of the species and the impacts of permitted activities on those species.") (emphasis added). But the Draft Plan indicates that the BDCP will not provide for sufficient measures to achieve recovery in the Plan Area if a species is imperiled by non-Plan impacts. BDCP Draft at 3.A-19 (explaining that BDCP did not strive to meet species' recovery plan goals, and noting that BDCP's goal-setting "process did not assume that BDCP would be solely responsible for recovery of [covered] species"). For species that exist solely in the Plan Area, this approach is not legally defensible because it ignores the NCCPA's focus on what is necessary to recover a species as opposed to simply addressing the impacts of covered activities. This approach also attempts to excuse the proponents from responsibility for multiple indirect effects of the Draft Plan. If plan developers ignore threats within a plan area that undermine the achievement of recovery of a covered species, the NCCPA's goal of delisting species would be impossible to achieve in most cases. As explained below, the Draft Plan fails to require measures necessary for the conservation of covered species within the Plan Area, in part, because it fails to address impacts beyond those directly caused by the proposed permitted activities. That approach is unlawful.

Third, the manner in which the BDCP's proposed "contribution to recovery" standard is linked to species' geographic range is also inconsistent with the NCCPA. The Draft Plan limits the magnitude of the Plan's contribution to recovery for species with a range that extends beyond the BDCP's plan area. Draft Plan at 3.A-18 ("For species that have a substantial portion of their range outside the Plan Area, the BDCP's potential contribution to recovery is necessarily limited."); BDCP Planning Agreement at 8 (magnitude of contribution to recovery determined, in part, by "the scope of the BDCP Planning Area in relation to the geographic range of the Covered Species."). While it is clear that the NCCPA does not intend for a plan's conservation measures to occur in a species' range *outside* of the Plan Area,[5] the conservation measures within the Plan Area must be adequate to support recovery within that area. The Draft Plan fails to meet this requirement.

The latter flaw is especially relevant to covered salmonids, which spend a portion of their life-cycle within the Plan Area and a portion in other areas. There are a variety of approaches possible when developing a conservation plan for salmonids:

> (1) Providing for measures within the Plan Area sufficient to recover the population;
> (2) Providing for all of the measures within the Plan Area necessary for and consistent with a recovery plan or strategy that encompasses the entirety of the species or range;
> (3) Providing for measures within the Plan Area that contribute to the recovery of population that spends part of its life cycle within the Plan Area in a manner proportional to the portion of the population's life cycle that is spent within the Plan Area.

Of these approaches, only the second application of the NCCPA's conservation standard is legally defensible. The first approach, which requires the Plan to provide for all of the measures necessary for the recovery of any covered species that enters the Plan Area, is unrealistic. If animals are subject to take outside of the Plan Area, there may be little that plan participants could agree to do within the Plan Area to recover the species. In contrast, the third option is inadequate to meet the statutory standard because the amount of time spent in a geographic area is not reflective of the importance of the area. To the extent the Draft Plan limits its contribution to recovery so that the contribution is proportional to the *time* an anadromous fish spends in the Plan Area versus outside of the Plan Area, or to the *size* of the Plan Area compared to the other areas the fish spends its life, the BDCP is adopting the third standard, which fails because it is insufficiently protective.

Finally, as we discuss below, the proposed upstream operations of the CVP and SWP, which are integrally linked to and driven in large part by proposed operations in the Plan Area under the Draft Plan, in combination with climate change, are likely to result in potential extirpation and extinction of several salmon runs. *See, e.g.,* National Marine Fisheries Service 2013, NMFS

---

[5] It is important to note that other legal requirements apply to the draft BDCP's impact on species outside of the Plan Area. For example, CVP/SWP operations proposed under the Draft Plan will have a significant impact on the operation of upstream reservoirs of the CVP and SWP. Those reservoir operations, in turn, may have a significant and adverse impact on the survival and recovery and listed fisheries below the reservoirs, including salmonids. Those impacts must be addressed, avoided and mitigated under a myriad of requirements, including section 7 of the Endangered Species Act, CEQA, NEPA, the Central Valley Project Improvement Act, and other state and federal laws.

Progress Assessment and Remaining Issues Regarding the Administrative Draft BDCP Document, 4/4/13 ("NMFS 2013 Progress Assessment") at 12-13. This outcome is the opposite of the NCCPA's goal of recovery, and appears likely to result in a jeopardy opinion under section 7 of the Endangered Species Act. Ultimately, the operations and CVP and SWP must adapt to climate change, not only for ecosystem protection, but also to manage water supply. The water projects cannot take the approach that there is no duty to adjust operations to account for climate change. It is difficult to imagine how the agencies could even consider approving a conservation plan under either the NCCPA or the ESA that predicts the likely extinction of several listed salmon runs.

2. The Draft Plan Fails to Ensure Adequate Funding for Implementation of the Plan, as Required by the NCCPA

Like the federal ESA, the NCCPA requires that the plan "ensure" adequate funding. *See* Cal. Water Code §§ 2820(a)(10), (b)(8). The Draft Plan and associated documents fail to meet this requirement. *See* discussion *infra* regarding the similar standard to ensure funding under the ESA.

In discussing the ESA and NCCPA standards, the Delta Stewardship Council, which has review authority over DFW's review of BDCP's compliance with the NCCPA, recently noted that,

> Although there are no cases interpreting the 'ensured funding' requirement under the NCCPA, there are a number of federal cases, and one state case, interpreting the very similar 'ensured funding' requirements for issuance of incidental take permits under the federal Endangered Species Act and the California Endangered Species Act. In general, these cases conclude that meeting this requirement cannot rely on speculative future actions by other parties, but requires the applicant's guarantee of adequate funds to carry out the plan.

Delta Stewardship Council, October 24, 2013 staff report, Agenda Item 9, page 2, available online at http://deltacouncil.ca.gov/sites/default/files/documents/files/Item_9_8.pdf. The Draft Plan proposes to rely on speculative future funding actions, and fails to provide such guaranteed funding.

B. The Draft Plan Violates the Endangered Species Act

The federal Endangered Species Act ("ESA," 16 U.S.C. § 1531 *et seq.*) provides another foundational set of requirements on the adequacy of the Draft Plan, which is intended to act as a Habitat Conservation Plan ("HCP") under section 10 of the ESA. As described in the Draft Plan, the BDCP must satisfy at least the following criteria to qualify as an HCP:

- The applicant will ensure that adequate funding for the Plan will be provided;
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of any taking that is incidental to an otherwise lawful activity;
- The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

Draft Plan at 1-8; 16 U.S.C. § 1539(a)(2)(B). As we discuss below, the Draft Plan and accompanying documents fail to meet these requirements. Equally important, as we discuss extensively in sections III and IV of these comments, the Draft Plan fails to use the best available science as required by the ESA. *See* 16 U.S.C. § 1536(a)(2). In addition, as we discuss in section I(C) of these comments, the Draft Plan and Draft Implementation Agreement propose to provide regulatory assurances that violate the requirements of the ESA, including the 5 Point Policy.

1. <u>The Draft Plan and Draft IA Fail to Ensure Adequate Funding for Plan Implementation</u>

As currently drafted, the Draft Plan and draft Implementation Agreement fail to comply with the funding provisions of the NCCPA and ESA. The Endangered Species Act is clear that the plan must "ensure" funding over the lifetime of the permit. 16 USC § 1539(a)(2)(B)(iii); HCP Handbook at 3-33 to 3-34; *National Wildlife Federation v. Babbitt*, 128 F.Supp.2d 1274, 1294-95 (E.D. Cal., 2000); *Southwest Center for Biological Diversity v. Bartel*, 470 F.Supp.2d 1118, 1155 (S.D. Cal., 2006). Of particular note, the HCP Handbook is explicit that a HCP cannot rely on unappropriated federal funding to "ensure" funding of the plan in light of the "Anti-Deficiency Act and the availability of appropriated funds." HCP Handbook at 3-33 to 3-34. In addition, a HCP must provide "remedies for failure to meet funding obligations by signatory measures." *National Wildlife Federation*, 128 F.Supp.2d at 1294-95. And it is black letter law that a HCP "cannot rely on speculative future actions of others" for funding, and that the HCP effectively must be backed by a guarantee by the applicant to ensure funding for all plan elements. *Bartel*, 470 F.Supp.2d at 1155. The *Bartel* case is directly on point regarding the possibility of relying on funding from a future bond requiring voter approval, and in that case the Court noted that "the uncertainty of these ideas is readily apparent," that such funding is speculative in light of future voter approval requirements, and that relying on future bonds does not meet the requirement to ensure funding of an HCP under the ESA. *Id*. The HCP Handbook also emphasizes that,

> <u>Whatever the proposed funding mechanism is, failure to demonstrate the requisite level of funding prior to permit approval or to meet funding obligations after the</u>

> <u>permit is issued are grounds for denying a permit application or revoking or suspending an existing permit, respectively.</u>

HCP Handbook at 3-35 (emphasis in original).

In contrast to these requirements, Chapter 8 of the Draft Plan explicitly states that it does not provide a financing plan and instead only provides estimates of potential funding sources:

> It is important to note that this chapter is not a financing plan for the state or federal water contractors or any other party. Separate financing plans, funding agreements, legislative authority, and other documents will be needed to enable the use of certain funding sources. This chapter provides an overview of potential funding sources to support the implementation of the BDCP as well as the level of past financial support at the state and federal level for similar Delta activities.

Draft Plan at 8-64. Despite this language, Chapter 8 also claims that these "potential funding sources" demonstrate that "adequate funding to implement BDCP has been assured." Draft Plan at 8-120. This conclusion is unlawful and unsupported by the text of Chapter 8.

First, the text of chapter 8 assumes that funding from future water bonds would be used for BDCP. *See* Draft Plan at 8-64 to 8-65, 8-84 to 8-85. Although it is true that one or more future water bonds could fund BDCP, it is unlawful to assume that future water bonds provide assured funding for BDCP. *Bartel*, 470 F.Supp.2d at 1155.

Second, the text of Chapter 8 assumes that billions of dollars in future federal funding could be dedicated to BDCP. *See* Draft Plan at 8-99 to 8-118. However, none of these federal funding sources are dedicated to BDCP, and all are subject to future appropriations by Congress. As such, these funds cannot be relied upon to ensure funding for BDCP. HCP Handbook at 3-33 to 3-34.

Third, Chapter 8 fails to provide adequate remedies to ensure funding if there is a shortfall of initial funding sources for plan implementation. The only remedy identified in the document appears to be reduction in habitat restoration or other conservation measures required under the Draft Plan. Draft Plan at 8-122. This is unlawful; as the court concluded in *National Wildlife Federation v. Babbitt*,

> It is not clear that a funding mechanism that is not backed by the applicant's guarantee could ever satisfy the requirement of § 1539(a)(2)(B)(iii) that the applicant "ensure" funding for the Plan. Assuming, however, that a cost shifting mechanism "ensures" funding within the meaning of § 1539(a)(2)(B)(iii), in these

> circumstances, where the adequacy of funding depends on whether third parties decide to participate in the Plan, the statute requires the applicant's guarantee…
>
> In the face of the City's refusal to "ensure" funding, the Secretary's (B)(iii) finding with respect to the City's ITP is either at odds with the evidence in the record or is based on the City's untenable reading of the statute. In either case, while the Service's (B)(iii) finding is not arbitrary with respect to the Plan as a whole, it is arbitrary and capricious with respect to the City's Permit

128 F.Supp.2d at 1294-95. That court specifically rejected the argument that permit revocation was an adequate remedy to ensure funding. *Id*. The same is true here; BDCP must have some financial backstop or guarantee to ensure that the plan is fully implemented.

The draft Implementation Agreement ("Draft IA") includes similarly unlawful statements and conclusions regarding the assurance of funding under the Draft Plan. *See* Draft IA at 11, 16, 45-48. For instance, the Draft IA states that, "The Parties acknowledge that such assurances do not require that all necessary funds be secured at the time of permit issuance, but rather establish that such funding is reasonably certain to occur during the course of Plan implementation." Draft IA at 45. This is wholly inconsistent with the requirement to "ensure" funding for the plan. *See Bartell*, 470 F.Supp.2d at 1155; *Babbitt*, 128 F.Supp.2d at 1294-95. In addition, the document states that, "Furthermore, as described in Chapter 8 of the Plan, the State and federal governments have committed to provide additional funding to implement the plan." Draft IA at 45. This is contradicted both by the text of Chapter 8 of the Draft Plan, which disclaims any firm commitment of funding by state or federal sources, and by the text on page 46. *See* Draft IA at 46 ("While the United States has been engaged in the development of this draft Agreement, there is no federal position as of this time regarding potential funding obligations of the United States.").

Finally, we note that the Draft Plan improperly proposes that the public pay for restoration of the Yolo Bypass (CM2), despite the fact that restoration of the Yolo Bypass is required under existing permits as a mitigation measure. *See* Draft Plan at 8-74 (excluding CM2 from list of measures for which the contractors will pay any portion of costs). It is unclear how the allocation of costs was made in Chapter 8 between the public (state and federal taxpayers) and USBR/DWR (and their ratepayers), but in light of the fact that the draft plan fails to achieve the standards of the NCCPA, the conclusion that these measures are in excess of mitigation requirements of the project proponents and should be borne by the public appears unsupportable.

2. The Draft Plan Fails to Minimize and Mitigate Takings to the Maximum Extent Practicable

The ESA requires that an HCP minimize the take of covered species to the "maximum extent practicable." 16 U.S.C. § 1539(a)(2)(B)(ii). State law provides even more protection to species listed under CESA. Under CESA, the take must be "minimized and fully mitigated," and under both CESA and the NCCPA, the measures required to minimize take must be roughly proportional to the amount of take. Fish & Game Code §§ 2081(b)(2), 2820(b)(3)(b), (b)(9); 14 Cal. Code Regs. § 783.4. There is no question that the CVP and SWP are significant sources of harm (which is encompassed within the definition of take) and mortality for most of the fish species covered by the Draft Plan. *See, e.g.*, *NRDC v. Kempthorne*, 506 F.Supp.2d 322 (E.D. Cal., 2007). Project-related take occurs not just through entrainment and salvage at export pumps, but throughout the integrated operation of the Projects as a whole, including, for example, by failing to provide adequate coldwater habitat for fish below terminus dams, failing to provide sufficient attraction flows to prevent straying into dead-end sloughs and channels, and by creating channel blockages or altering flows in a manner that increases covered species' exposure to predation, invasive species, and toxics. *See, e.g., San Luis & Delta-Mendota Water Authority v. Jewell,* 747 F.3d 581, 627 (9th Cir. 2014) ("CVP/SWP operations 'have … played an indirect role in the delta smelt's decline by creating an altered environment in the Delta that has fostered the establishment of nonindigenous species and exacerbates these and other stressors that are adversely impacting delta smelt.'"); *id.* at 628-29 (discussing Projects' indirect effects on limiting food supply); *id.* at 629-30 (discussing Projects' role in exacerbating water pollution); *id.* at 630-34 (noting Projects' role in promoting the exposure of native species to harmful predators and the expansion of exotic species in the Delta). The extent of take associated with these activities is directly related to Project operations, including those proposed as part of the Draft Plan.

The Draft Plan fails to minimize and mitigate takings anticipated under the Plan to the maximum extent practicable, as required by the ESA. First, the Plan fails to minimize and mitigate takings associated with the Draft Plan's proposed operations that occur upstream of the Delta, instead claiming that the Projects do not have to modify their upstream operations to adjust to projected temperature increases because the Projects do not control water temperatures. This is incorrect. Those foreseeable effects must be addressed and minimized and mitigated. Second, where the Plan proposes mitigation, it is so uncertain as to be unreliable, and fails to meet the requirements of the ESA.

As we discuss in sections III and IV of these comments, the Draft Plan anticipates that the populations of several covered species – particularly, salmon, sturgeon, and steelhead stocks – will *decline* over the life of the Draft Plan, potentially to the point of extirpation, because of proposed operations and water temperatures below Project-operated dams will be too warm to sustain spawning and rearing. These adverse effects have been confirmed in numerous independent reviews. *See, e.g.,* NMFS 4/4/13 comments at 1.17 ("the cumulative effects of the project when combined with effects of climate change and other baseline conditions is showing the potential extirpation of mainstem Sacramento River populations of winter-run and spring-run chinook salmon over the term of the permit"); *id.* at 2.8 ("Keswick release strategies between the ESO and EBC will result in increased egg mortality upstream. Lower flows in key summer and fall months increase egg mortality for winter-run and spring-run Chinook salmon and potentially other runs. SacEFT habitat results show significant impacts on spawning and rearing habitat for winter-run that are above and beyond effects of climate change…. The analysis shows that ESO criteria could result in riskier operations relating to stranding risk for juveniles (over two times more low risk years under EBC."); *id.* at 2.9 ("While the high spring-time Feather River flows modeled in HOS could attract sturgeon into the Feather River from the Sacramento River, summertime releases are decreased compared to EBC2 to provide for end-of-September storage requirements. The decreased summertime river flows increase water temperatures in the high-flow channel; the resulting temperatures reported in the effects analysis would be lethal to sturgeon eggs and embryos.") The Plan declines to mitigate for this take, even though the Projects could be re-operated to improve the extent and duration of cold-water habitat for these species. But the Draft Plan declines to address this take or propose measures to mitigate it, claiming that the increasing water temperature is not an effect of the Plan, but primarily a result of externally-induced climate change. That is incorrect; operations of these dams and reservoirs strongly affect downstream water temperatures and are driven by water delivery demands, including operations in the Delta.

The Projects have the ability to expand the cold-water pools in Project-controlled reservoirs; adjust reservoir releases to match the temperature and timing needs of cold-water species; construct, repair or maintain lower outlets to better access cold water behind dams (particularly relevant to Oroville Dam); and install other measures such as temperature control curtains to control downstream temperatures to protect cold water habitat in response to these changes. *See, e.g.,* DWR, "Reconnaissance Study of Potential Future Facilities Modifications," Oroville Facilities Settlement Agreement Implementation FERC Project No. 2100 (Dec. 2006) (acknowledging improved ability to meet cold-water species temperature requirements with improvements to the Oroville Dam River Valve) (incorporated herein by reference). Moreover, the Projects have the obligation to do so – there is nothing in the law that excuses the agencies from their obligations to avoid jeopardy and to protect and restore salmon and other cold-water fish simply because external factors contributed to the problem, particularly in a plan that purports to conserve and recover covered species.

Here, the Draft Plan essentially ducks the problem by attempting to claim the Projects are powerless to mitigate for increasing water temperatures. That is simply false. "Normally, an agency rule would be arbitrary and capricious if the agency has ... entirely failed to consider an important aspect of the problem." *Motor Vehicle Manufs. Ass'n v. State Farm Automobile Ins. Co.,* 463 U.S. 29, 43 (1983). Here, the Draft Plan fails to consider the many feasible ways in which it could mitigate for the increased upstream take resulting from proposed Project operations in light of increasing water temperatures. As stated in the Service's HCP Handbook:

> [P]articularly where adequacy of mitigation is a close call, the record must contain some basis to conclude that the proposed program is the maximum that can be reasonably required by that applicant. This may require weighing the benefits and costs of implementing additional mitigation, the amount of mitigation provided by other applicants in similar situations, and the abilities of that particular applicant.

The Draft Plan's approach also violates the requirement that proponents must address the impacts of the *whole of the action* in analyzing impacts and associated mitigation. *See, e.g., Connor v. Burford,* 848 F.2d 1441, 1457–58 (9th Cir.1988).[6] As explained by the Ninth Circuit in *Southwest Ctr. for Biological Diversity v. Bartel:*

> The ESA "does not permit the incremental-step approach" of consultation because "biological opinions must be coextensive with the agency action." *Conner*, 848 F.2d at 1457–58; accord *Center for Biological Diversity v. Rumsfeld*, 198 F.Supp.2d 1139, 1155 (D.Ariz.2002); *Greenpeace v. National Marine Fisheries Serv*., 80 F.Supp.2d 1137, 1143–45 (W.D.Wash.2000). "[T]he ESA requires that all impacts of agency action—both

[6] It is no excuse to claim that Project operations upstream of the Delta are driven by considerations beyond those contemplated in the Draft Plan. Even if it were possible to segregate Project operations in this manner (which it is not), the Draft Plan must be accompanied by a system-wide ESA consultation to obtain necessary take permits. For example, the Draft Plan explains that it is intended "to support the issuance of a joint BiOp under Section 7 by USFWS and NMFS authorizing the incidental take associated with BDCP actions undertaken by Reclamation and CVP contractors within the Plan Area. That joint BiOp will also address the decision by USFWS and NMFS to issue Section 10 permits to the Authorized Entities." Draft Plan at 1-8. In addition, the coordinated operations of the CVP and SWP and its infrastructure (including any modifications proposed by BDCP) must undergo a section 7 consultation under the ESA. *See* 74 Fed. Reg. 7257, 7258 ("in a parallel yet separate process, Reclamation will be required to reinitiate Section 7 consultation on the long-term operation of the CVP, as coordinated with the SWP, to the extent that such coordinated operations may be modified to effectively be integrated with any operational or facility improvements that may occur from implementation of the BDCP."). That consultation must consider the coordinated operations of the projects as a whole, not merely any changes proposed by BDCP, and the consultation must consider all federal, state, private and other actions that may affect listed species, including nondiscretionary actions, to ensure that the proposed project will not cause jeopardy to the survival and recovery of the species or adversely modify its critical habitat. *NWF v. NMFS*, 524 F.3d 917, 928-931 (9th Cir. 2008).

> present and future effects on species—be addressed in the consultation's jeopardy analysis." *American Rivers v. United States ACOE*, 271 F.Supp.2d 230, 255 (D.D.C.2003). This rule ensures that the ESA is enforced in an effective manner because "impermissible segmentation would allow agencies to engage in a series of limited consultations without ever undertaking a comprehensive assessment of the impacts of their overall activity on protected species." *Id*. (emphasis added).
>
> The lesson of *Conner* applies to this case because the ESA's policy of "institutionalized caution," *Tennessee Valley*, 437 U.S. at 194, 98 S.Ct. 2279, "can only be exercised if the agency takes a look at all the possible ramifications of the agency action." *Conner*, 848 F.2d at 1453 (quotation and citation omitted). Though FWS chose not to evaluate the cumulative impact of the implementation of the MSCP and Subarea Plan on the vernal pool species, it fixed the ameliorative measures for the fifty-year life of the ITP to those contemplated in 1997. Ironically, this structure diminishes the value of one of the primary strengths of regional conservation planning—enabling jurisdictions to plan and implement protections for an entire ecosystem. E.g., AR 6780–82, 23189–90, 28100–01, 39463. By the time FWS undertakes its incremental site-specific consultations it may have lost the opportunity to protect the vernal pool species from extinction. Conner, 848 F.2d at 1454–58 (requiring comprehensive information and review "to avoid piecemeal chipping away of habitat"). The flaw is fatal in the context of this case because all vernal pool habitat outside of the San Diego region has been destroyed. E.g., AR 26236 ("The loss of vernal pool habitat is nearly total in Los Angeles, Riverside, and Orange counties"); 63 Fed.Reg. at 54983–84; 58 Fed.Reg. at 41387 (otay mesa mint). The vernal pool species have narrow and strict habitat requirements. E.g., 58 Fed.Reg. at 41388 (Riverside fairy shrimp); 62 Fed.Reg. at 4929 (San Diego fairy shrimp). The remaining habitat is found within the area covered by the MSCP (and lands controlled by the military). Because the MSCP controls the fate of the remaining vernal pool habitat throughout all of its range, it is particularly important to comply with the purpose and spirit of the ESA to seek to prevent the extinction of these species.

470 F. Supp. 2d 1118, 1142-43 (S.D. Cal. 2006). Here, the Draft Plan puts on blinders and pretends that Project operations proposed under the 50-year Plan have no effect on water temperatures or habitat or species viability below Project dams, when it undeniably does. The fact that climate change is an exacerbating factor is not an excuse for the proponents to avoid grappling with this aspect of Project operations. As explained by CDFW in the attached Memorandum dated October 15, 2009 insisting that Caltrans mitigate for impacts related to sea level rise and climate change:

> Based upon … climate change and SLR [sea level rise] data and the project's size, location, design life, and reasonable foreseeable adaptation strategy, there is a fair

> argument this project could have [significant] …impacts on the Humboldt Bay ecosystem.
> …
> [T]he project's … facilities should provide adequate channel or flow capacity based upon calculations using current SLR and climate change projections.
> …
> DFG recommends this project's Final EIR evaluate how this project will adapt to SLR. While adaption options are reasonably foreseeable, they need not be undertaken in the current project. However, given that potentially significant indirect environmental impacts from such adaptations are reasonably foreseeable, they should be evaluated during the current environmental review for this project.

Comments of CDFG to CA Dept. of Transp. re: Eureka-Arcata Corridor Improvement Project, Draft EIR/EIS SCH #200192035, October 15, 2009, at 8, 11-12. The Draft Plan must be revised to evaluate impacts from reasonably foreseeable adaptation changes to Project operations and facilities during the life of the Project required to maintain adequate cold water temperatures for species viability, address this critical aspect of the "whole of the action," and identify mitigation measures to minimize and avoid, where possible, associated take.

Under the ESA, mitigation measures must be "reasonably specific, certain to occur, and capable of implementation; they must be subject to deadlines or otherwise-enforceable obligations; and most important, they must address the threats to the species in a way that satisfies the jeopardy and adverse modification standards." *Ctr. for Biological Diversity v. Rumsfeld,* 198 F.Supp.2d 1139, 1152 (D.Ariz.2002) (citing *Sierra Club v. Marsh,* 816 F.2d 1376 (9th Cir.1987)); *see also NWF v. NMFS,* 481 F.3d 1224 at *12 & n. 16 ("Although the record does reflect a general desire to install structural improvements [to benefit fish] where feasible, it does not show a clear, definite commitment of resources for future improvements."). While adaptive management tied to clearly enforceable biological objectives and actions may fit within this paradigm, "overly flexible adaptive management may be incompatible with the requirements of the ESA." *NRDC v. Kempthorne*, 506 F. Supp. 2d at 352. "[A]t a minimum, a mitigation strategy must have some form of measurable goals, action measures, and a certain implementation schedule; i.e., that mitigation measures must incorporate *some* definite and certain requirements that ensure needed mitigation measures will be implemented." *Id.* at 355 (citing *Rumsfield*, 198 F.Supp.2d 1139 (D. Az. 2002)). Many of the Draft Plan's proposed conservation and mitigation measures fall into the latter category, requiring only process rather than a slate of specific, certain and feasible measures to protect species and their habitat.

Several critical aspects of the Draft Plan are not reasonably certain to occur and cannot be relied on under the ESA. First, as we discuss in section II of these comments, the flows required under the High Outflow Scenario are not likely to occur in a significant percentage of years because of arbitrary operational limitations. Second, as we discuss in section II of these comments, modeled operations that are more protective than the operational rules are not reasonably likely to occur. Third, reliance on adaptive management generally and on the biological objectives specifically is not reasonably likely to occur, because: (a) the Draft Plan proposes that implementation of the conservation measures, not achievement of the biological objectives, is the measure of the plan; and, (b) the adaptive management structure, including the regulatory assurances, eliminate effective adaptive management that would require additional water. Fourth, the Draft Plan cannot lawfully rely on purchases of water to meet minimum instream flows, *see, e.g.*, Draft Plan at 3.4-356, but must ensure that in the absence of adequate funding or lack of available water transfers the minimum flows will be implemented.[7]

3. The Draft Plan Fails to Demonstrate that Taking will not Appreciably Reduce the Likelihood of Survival in the Wild

Finally, as explained above and more extensively in sections III and IV of these comments, the Project operations proposed by the Draft Plan will lead to increased take of covered species. The Draft Plan and DEIS/DEIR demonstrate that this increased take will appreciably reduce the likelihood of survival of listed species in the wild and in combination with other reasonably foreseeable factors, will jeopardize the continued existence and recovery of several listed species, anticipating the potential extirpation and substantial decline in abundance of longfin smelt and several stocks of salmon and steelhead. This result is prohibited under section 10 of the ESA, and prevents the Plan from satisfying the minimum requirements of an HCP or NCCPA.

C. The Regulatory Assurances Proposed in the Draft Plan and Draft Implementation Agreement Violate the NCCPA and ESA

In the following key respects, the regulatory assurances identified in the Draft Plan and Draft Implementation Agreement (Draft IA) violate the ESA, NCCPA, Delta Reform Act, and other state and federal laws:

1) The Draft Plan and Draft IA provide assurances that are inconsistent with the best available science and effective adaptive management, particularly in light of the State's

[7] Although the Draft Plan briefly mentions this concept, it is not a covered activity under the Draft Plan, the effects of such a program are not analyzed in the Draft Plan or the DEIS/DEIR, and there is no funding provided to implement such a program. Prior effects to acquire environmental flows, such as the EWA, have been abject failures, and it is not clear how such a program would ensure that public funds were not being used to pay for private mitigation obligations (such as meeting minimum flow requirements), which would likely constitute an unlawful gift of public funds.

admission of scientific uncertainty and the evidence showing that the Draft Plan is unlikely to achieve key biological goals and objectives;
2) The Draft Plan and Draft IA provide assurances that are not commensurate with conservation assurances as required by the NCCPA, and otherwise violate state law;
3) The Draft Plan's provisions regarding changed circumstances are unlawful;
4) The Draft Plan and Draft IA provide assurances that are inconsistent with the requirements of the ESA, including the Services' 5 point policy;
5) The Draft Plan and Draft IA cannot provide assurances any regarding upstream operations of the CVP and SWP; and,
6) The Draft Plan and Draft IA provide assurances to CVP contractors and to USBR in violation of the No Surprises Rule, which prohibits providing No Surprises assurances to federal agencies.
7) CVP and SWP Contractors are Not Qualified as Permittees, and Thus Cannot Obtain Regulatory Assurances

Each of these points is discussed in turn.

1. <u>Proposed Assurances are Inconsistent with the Best Available Scientific Information and Effective Adaptive Management</u>

The scope of regulatory assurances and how they impact effective adaptive management has been a key issue throughout the development of BDCP. In our 2008 scoping comments, we stated that,

> As both the ESA and NCCPA recognize, adaptive management is a necessary element of an ecologically sustainable HCP/NCCP. Fish & Game Code § 2820(a)(2), (8), (b)(5), (f)(1)(G); HCP Handbook at 3-24; *see* 50 C.F.R. § 17.22(b)(2)(C), (b)(5).… The NCCPA requires that the level of assurances provided by a NCCP be "commensurate with long-term conservation assurances and associated implementation measures pursuant to the approved plan." Fish & Game Code § 2820(f). A critical component in determining the level of assurances is "[t]he degree to which a thorough range of foreseeable circumstances are considered and provided for under the adaptive management program." *Id*. § 2820(f)(1)(8); *see also* 50 C.F.R. §§ 17.22(b)(5), 222.307(g) (regulatory assurances with respect to changed and unforeseen circumstances under the ESA). In addition, we note that California law requires suspension or revocation of the NCCP if take of the species under the plan will jeopardize the continued existence of the species. *See* Fish & Game Code § 2823. Thus all parties have an incentive in ensuring that the HCP/NCCP achieves its goals and avoids jeopardy to any listed species…. As such, the flexibility required for the

> BDCP to succeed precludes any inflexible guarantees or complete regulatory assurances regarding water supplies and exports…. Instead, the BDCP must retain sufficient flexibility to respond to changed conditions and continue to conserve and restore listed species and the health of the Delta ecosystem.

See Scoping comments at 4-5. Unfortunately, the proposed assurances (including the provisions of "water supply neutral" adaptive management) eliminate the necessary flexibility for the Draft Plan to be likely to achieve the Plan's biological goals and objectives, are inconsistent with the NCCPA's statutory criteria for assurances, and fail to adequately address changed circumstances.

First, the Draft IA makes clear that the BDCP biological objectives are not enforceable, and that implementation of the conservation measures – not achievement of the biological objectives – is the only obligation of the plan proponents and permittees:

> Through the implementation of the Plan, including adjustments made through the adaptive management process, Permittees will satisfy their obligation to achieve the biological goals and objectives. Unless otherwise specified in the Plan or this Agreement, failure to achieve a biological goal(s) and/or objective(s) shall not be a basis for a determination by the Fish and Wildlife Agencies of non-compliance with the Plan or for suspension or revocation of the Permits, provided the Permittees are properly implementing BDCP and are in compliance with this Agreement and the terms and conditions of the Permit.

Draft IA at 24 (Section 10.1) The Draft IA also makes clear, consistent with language in the Draft Plan, that adaptive management must be 'water supply neutral,' stating that, "The Parties agree that any potential adaptive management change to the Conservation Measures, either individually or cumulatively, shall not require the commitment of resources, including land, water or money, in excess of those specifically provided for under these strategies, including the Supplemental Adaptive Management Fund, or alter the financial commitments of Plan Participants, as set out in Chapter 8." Draft IA at 36; *see* Draft Plan at 3.4-354 to -357.

However, contrary to statements in the Draft IA, the Draft Plan fails to demonstrate that it is likely to achieve many of the biological objectives, many of the objectives are not consistent with the requirements of the NCCPA, ESA, and other laws, and the Draft Plan is unlikely to achieve many of these critical biological objectives. The Draft IA asserts that, "The Conservation Measures are expected to be sufficient to achieve the biological goals and objectives of the Plan during the 50-year timeframe for Plan implementation." Draft IA at 24 (section 10.2). This statement is not supported by the Draft Plan or the independent scientific and agency reviews. As discussed in sections III and IV of our comments, although the Draft Plan and DEIS/DEIR fail to analyze consistency with most of the biological objectives, the best available scientific evidence shows that the Draft Plan is unlikely to achieve the Plan's biological objectives and that the objectives are not legally adequate, including:

- Salmon survival objective: The Draft Plan is likely to reduce survival of salmon migrating through the Delta and there is no scientific evidence that the survival objectives are likely to be achieved. NMFS has admitted that, "A rough examination of this issue in the current draft indicates that it may be difficult to meet the through-delta survival objectives for salmonids under the proposed operational criteria." NMFS 2013 Progress Assessment at 22. The salmon survival objectives also fail to meet the requirements of the NCCPA and other laws.
- Delta Smelt entrainment objective: The Draft Plan and DEIS/DEIR demonstrates that entrainment under the Draft Plan is likely to exceed this objective, and the objective is not consistent with the existing incidental take statement required under the ESA.
- Longfin Smelt abundance and productivity objectives: The Draft Plan and DEIS/DEIR demonstrate that longfin smelt abundance is predicted to significantly decline under the Draft Plan, that the objectives are not likely to be achieved, and that the objectives are not consistent with ESA and NCCPA requirements.
- Upstream water temperature objectives: the Draft Plan and DEIS/DEIR demonstrate that operations will not be consistent with this objective, nor will operations comply with existing temperature requirements under the ESA. Modeling in the DEIS/DEIR and Draft Plan indicate that abundance of numerous salmon and steelhead runs will decline, and several may go extinct.

As we discuss extensively in our comments, numerous independent scientific reviews and agency reviews have identified failures to use the best available science in the Draft Plan, and they have emphasized the need for an effective adaptive management program in BDCP because of scientific uncertainty.

However, providing assurances that restrict adaptive management to being "water supply neutral" is not consistent with the best available science regarding the effectiveness of the proposed conservation measures in achieving these biological objectives. [8] Such assurances make it substantially less likely that the Draft Plan will achieve the biological objectives, as they

[8] In addition, the Draft IA and Draft Plan establish additional measures that reduce the effectiveness of adaptive management. For instance, the Draft IA appears to allow the implementation Office to change conservation measures through adaptive management without the approval and concurrence of the fishery agencies, even if such measures reduce protections for covered fish and wildlife species. Draft IA at 32. The Draft IA also impedes adoption of adaptive management measures that affect water supply, *id*. at 35, and create procedural roadblocks to effective adaptive management through the dispute resolution process, *id*. at 36.

prevent BDCP from requiring measures to improve flow conditions and address some of the most important stressors on these populations.

2. <u>The Proposed Assurances are not Commensurate with Conservation Assurances as Required by the NCCPA, and Otherwise Violate State Law</u>

Under the NCCPA, regulatory assurances are required to be "commensurate with long-term conservation assurances and associated implementation measures." Cal. Fish and Game Code § 2820(f). The NCCPA requires the Department to consider certain criteria in determining the "level of assurances" to be provided, including: the level of knowledge of the status of species; the adequacy of the analysis of the impact of take on covered species; the use of the best available science and the reliability of mitigation strategies; the range of foreseeable circumstances provided for under the adaptive management program; and the duration of the plan. *Id*.

Unfortunately, the assurances proposed in the Draft Plan and Draft IA are not commensurate with long-term conservation assurances, nor are they adequate in light of the existing scientific information regarding the likelihood that the proposed conservation measures will not achieve the biological objectives, the failure to use the best available science, the lack of meaningful adaptive management responses to changed circumstances, and the 50 year duration of the Draft Plan. For instance, there effectively are no "long-term conservation assurances," as the Draft Plan and Draft IA make clear that the biological objectives are not enforceable and that a failure to achieve these objectives will not result in additional restrictions on water supply, despite the available scientific evidence about the likelihood that proposed conservation measures will not achieve the Draft Plan's biological objectives. Similarly, numerous independent and agency scientific reviews have concluded that the Draft Plan and DEIS/DEIR fail to use the best available science, contrary to the requirements of section 2820(f). The available scientific information demonstrates that the Draft Plan is unlikely to achieve many of the biological objectives as currently designed, and that several salmon runs and other covered species may in fact go extinct during the duration of the Draft Plan. The extensive length of the draft permits (proposed for 50 years, with the possibility of extension) strongly indicates that assurances should be more limited. And as discussed below, the Draft Plan's provisions regarding foreseeable circumstances, particularly climate change, are significantly flawed and inconsistent with legal requirements. As a result, the proposed assurances are not consistent with the NCCPA.

In addition, the proposed assurances, particularly to the extent that they prevent adaptive management and real time operations from achieving biological objectives, also violate the Delta Reform Act. *See* Water Code § 85321 ("The BDCP shall include a transparent, real-time operational decisionmaking process in which fishery agencies ensure that applicable biological performance measures are achieved in a timely manner with respect to water system operations.").

3. The Draft Plan's Provisions Regarding Changed Circumstances, Particularly Foreseeable Circumstances such as Climate Change, are Unlawful

Both the NCCPA and ESA generally require the Draft Plan to address changed circumstances, including foreseeable circumstances. *See* Cal. Fish and Game Code §§ 2805(c), 2820(g); 50 C.F.R. §§ 17.22(b)(5), 222.307(g); HCP Handbook at 3-28. The Draft Plan identifies a number of clearly foreseeable circumstances, such as levee failures, climate change, drought,[9] and nonnative species. Draft Plan at 6-32. However, the Draft Plan generally proposes no additional measures to address these foreseeable circumstances, and precludes any measures to adapt to these changed circumstances that would require additional commitments of water or funding from the water contractors. *See* Draft Plan at 6-30.

These proposed provisions are not compatible with the requirements of state and federal law, particularly regarding the effects of climate change. Climate change is a foreseeable circumstance, and is likely to result in substantial adverse effects on aquatic and terrestrial ecosystems and species in combination with CVP/SWP operations (including BDCP) absent additional changes beyond those proposed in BDCP, including reductions in Delta inflows and outflows, increased air and water temperatures.[10] Yet the Draft Plan proposes that "no additional actions will be required to remediate climate change effects on covered species and natural communities in the reserve system." Draft Plan at 6-43. This is legally inadequate.

Despite acknowledging significant effects of climate change in the Draft Plan and DEIS/DEIR, the Draft Plan repeatedly disclaims any responsibility to address the adverse effects of climate change, repeatedly distinguishing adverse effects as the result of climate change (rather than the effect of the Draft Plan). *See, e.g.*, Draft Plan at 5.5-3, 5.5-11, 5.3-20, 5.5.3-45 to -47. The Draft

[9] The Draft Plan states, however, that drought is only a foreseeable circumstance with respect to the terrestrial reserve system, and that "the expected effects of droughts on the aquatic natural communities are not considered a changed circumstance." Draft Plan at 6-37. This is inappropriate; the scope of a future drought could certainly exceed that modeled in the Draft Plan, and in such circumstances, additional measures will be needed to protect fish and wildlife. If drought conditions truly are addressed in the Draft Plan and no additional measures will be required,, then the Draft Plan must also prohibit any regulatory changes to respond to drought that weaken operational protections for fish and wildlife, such as Temporary Urgency Changes that reduce Delta outflow requirements under D-1641 or relaxation of ESA protections.

[10] BDCP modeling projects little change in inflows on the Sacramento River, *see* Draft Plan at 5.A.2-101, increased Delta salinity, *id*. at 5.A.2-107, and increased extinction risks and reduced habitat for numerous covered species, *id*. at 5.A.2-101-107.

Plan and DEIS project substantial population declines, and possible extinction, as a result of BDCP and climate change. Yet the Draft Plan makes no provisions to mitigate the impacts of CVP/SWP operations in light of climate change, particularly in terms of upstream operations. As we discuss above, the Draft Plan must be revised to evaluate impacts from reasonably foreseeable adaptation changes to Project operations and facilities during the life of the Project required to maintain adequate cold water temperatures for species viability, address this critical aspect of the "whole of the action," and identify mitigation measures to minimize and avoid, where possible, associated take.

Federal agencies have previously concluded that "the range of adaptive responses available to address those changed circumstances is far too narrow and limiting." NMFS 2013 Progress Assessment at 22; USFWS 2013, U.S. Fish and Wildlife Service Staff BDCP Progress Assessment, April 3, 2013 ("USFWS 2013 Progress Assessment") at 29. We strongly concur. The Draft Plan must be revised to incorporate additional measures to address the impacts of CVP/SWP operations in light changed circumstances, particularly climate change, including operations upstream.

4. <u>The Proposed Assurances are Inconsistent with the ESA, Including the Services' Five Point Policy</u>

NMFS and USFWS adopted an addendum to the HCP Handbook in 2000, which is referred to as the Five Point Policy. *See* 65 Fed. Reg. 35242 (June 1, 2000). In 2010, the Federal agencies issued a white paper on application of the Five Point Policy to BDCP. It states in pertinent part that,

> The BDCP is a complex, landscape scale, long-term HCP with a high degree of uncertainty as to how close the initial conservation measures will come to achieving the plan's biological goals and objectives. It falls into the category of plans that will be a mixture of the two strategies, with initial prescriptions associated with adaptive management, and specific biological outcomes defining the ultimate success of the plan. This type of plan will allow management flexibility so the permittee may institute actions necessary to achieve the plan's goals while providing boundaries for future expectations and commitments. In addition, a results-based plan will address uncertainty in the ecosystem and provide the conservation assurances required by the Act. The Services will be challenged to make the findings required for permit issuance if the plan does not include clearly defined and scientifically supported biological goals and objectives, an adaptive management plan that tests alternative strategies for meeting those biological goals and objectives, and a framework for adjusting future conservation actions, if necessary, based on what is learned.

Federal Agencies White Paper on Application of the 5-point Policy to the Bay Delta Conservation Plan, April 29, 2010 at 1 ("BDCP 5-Point Policy Memo"), available online at: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library_-_Archived/5_20_10_BDCP_SC_HO_5_pt_policy_BDCP_white_paper.sflb.ashx. This memo also states that, "An agreement to simply implement specific actions is not sufficient to support the finding unless the analysis demonstrates at the outset a reasonable likelihood that the actions will be successful." *Id*. at 1.

Both NMFS and USFWS have reaffirmed these principles more recently. For instance, NMFS' April 4, 2013 Progress Assessment concludes that,

> Implementation of the conservation measures as initially described in the plan does not constitute the extent of the responsibilities of the Authorized Entities. Achieving the outcomes described in the objectives is the primary responsibility of those implementing the plan.

NMFS 2013 Progress Assessment at 20. That document also states that, "Continuing to achieve objectives is necessary for progress toward recovery of covered species and in many cases will be required for compliance with the terms of the BDCP permit." *Id*. at 19. The U.S. Fish and Wildlife Service provided similar comments in its 2013 Progress Assessment, reaffirming the 2010 memo and stating that,

> In an outcome-based plan, biological objectives provide targets that conservation measures are expected to reach, thereby contributing to the conservation outcomes required by the permit. If the objectives have been appropriately crafted, their achievement assures that a project is doing what it can to contribute to the accomplishment of the ultimate biological goals of the plan. If the CMs fail to achieve the biological objectives around which they are designed, then the plan must provide the means (adaptive management) to change the conservation measures to achieve the outcomes.
>
> We are concerned about the ability of the draft BDCP to successfully facilitate adaptive management.

USFWS 2013 Progress Assessment at 25-26. In addition, the document states that, "the plan needs to clearly articulate that achieving biological objectives is the whole basis of the conservation plan. Achieving and continuing to achieve objectives will be necessary for progress toward the biological goals and recovery of covered species, and may be required for compliance with the HCP permit." *Id*. at 25.

In virtually every respect, the proposed assurances violate the 5 Point Policy and these conclusions of the federal fishery agencies. The Draft IA proposes that the implementation of conservation measures – rather than achievement of biological objectives – shall be the only obligation of the plan proponents and Permittees. *Compare* Draft IA at 24 *with* BDCP 5-Point Policy Memo at 1; *see* NMFS 2013 Progress Assessment at 19, 20. As discussed extensively in sections III and IV of these comments, while BDCP has developed draft biological goals and objectives, the Draft Plan and Draft IA are unlikely to achieve these biological objectives. By establishing a wholly action based HCP, despite the fishery agencies' conclusions regarding scientific uncertainty of conservation measures and the likelihood that the Draft Plan fails to achieve key biological objectives, the proposed assurances violate the ESA.

5. <u>The Draft Plan and Draft IA Cannot Provide any Assurances Regarding Upstream Operations of the CVP and SWP</u>

Even though the CVP/SWP are operated as an integrated unit from upstream reservoirs to operations in the Delta, BDCP proposes to limit the geographic scope of the Draft Plan largely to the legal Delta, excluding upstream operations from covered activities. In our initial scoping comments, we strongly recommended that BDCP revise the geographic scope to include upstream operations, to no avail. Given the adverse impacts of climate change and CVP/SWP operations, particularly upstream reservoir operations, upstream operations of CVP/SWP facilities will have to be substantially changed from that modeled in BDCP in order to avoid causing jeopardy to listed species (either in the near term, or in the future). Because BDCP does not include upstream operations in the proposed project as a covered activity, the Draft Plan and Draft IA cannot legally provide any assurances regarding upstream reservoir operations, even if changes to upstream operations substantially reduce Delta exports in the future. The Draft Plan and Draft IA must be revised to specifically recognize that there are no assurances under the ESA or NCCPA provided regarding upstream operations of the CVP and SWP, and that changes to upstream CVP/SWP operations may result in substantial reductions in water supply under BDCP as compared to that modeled in the Draft Plan.

6. <u>The Draft Plan and Draft IA Provide Assurances to CVP Contractors and to USBR in Violation of the No Surprises Rule, which Prohibits Providing No Surprises Assurances to Federal Agencies</u>

As we previously discussed in our March 2011 memorandum to the state and federal agencies, the ESA prohibits providing "No Surprises" assurances to the Bureau of Reclamation:

> Critically, 50 CFR Sec. 17.22(b)(5), which codifies HCP regulation, states expressly that No Surprises assurances "**cannot be provided to Federal**

> **agencies**." (Emphasis added.) When promulgated, the federal government stated that it was issuing the revised rules in part to clarify that No Surprises assurances "do not apply to Federal agencies who have a continuing obligation to contribute to the conservation of threatened and endangered species under section 7(a)(1) of the ESA." 63 Fed. Reg. 8867 (Feb. 23, 1998). In addition, the notion that the FWS and/or NMFS would be precluded from imposing on a federal agency additional terms and conditions designed to minimize or mitigate excessive take conflicts with the obligation to reinitiate consultation under Section 7(a). Thus, the law expressly prohibits Reclamation and federal water contractors from obtaining Section 10 "No Surprises" assurances and prohibits the FWS/NMFS from approving permits that are structured to undermine the agencies' Section 7 obligations.

Memorandum from EDF, Defenders of Wildlife, and NRDC to the Resources Agency and U.S. Department of the Interior regarding Permittee Status for Water Contractors in BDCP, March 23, 2011 ("2011 Permittee Memo"), at 3; 50 C.F.R. § 17.22(b)(5). However, despite this explicit prohibition under the "No Surprises" rule, the Draft IA attempts to provide regulatory assurances to Reclamation:

> In light of Reclamation's integral role in the BDCP, it is appropriate to provide to Reclamation a degree of certainty regarding its obligation to fund Conservation Measures, and to provide durability and reliability regarding BDCP implementation. In that regard, USFWS and NMFS agree that once the Integrated Biological Opinion has been issued: (1) to the maximum extent allowed by law, Reclamation's ongoing responsibilities for Associated Federal Actions under Section 7(a)(2) of the ESA will be fulfilled through Reclamation's participation in the BDCP, including through the obligations it has assumed under the adaptive management and the Changed Circumstances provisions of the Plan; and (2) USFWS and NMFS agree that Reclamation will not be required to provide additional commitments or measures for Associated Federal Actions beyond those set forth in the BDCP without first attempting to resolve issues through the review process in Section 15.8, if invoked by an Authorized Entity, and exhausting processes set forth in Section 22.5 of this Agreement.

Draft IA at 50-51. This is wholly inconsistent with section 7(a)(1) of the ESA and the "No Surprises" rule, and is unlawful. In order to fulfill its continuing obligations under the ESA, Reclamation must have the ability to provide additional water or money to meet the conservation needs of covered species.

Equally important, the Draft Plan and Draft IA unlawfully propose to extend No Surprises assurances to Federal water contractors, in violation of the No Surprises Rule. Such assurances would not only limit the resources Federal water contractors will be required to contribute to the Draft Plan, but such assurances would effectively limit the water and other resources the Bureau of Reclamation could contribute to the Draft Plan. That is inconsistent with section 7(a)(1) of the ESA and the No Surprises rule, as we made clear in our November 2011 comments on the draft first amendment to the BDCP Memorandum of Agreement.

Under the ESA, Federal agencies operate under Section 7, which does not contain any assurances similar to Section 10. The distinction between private landowners and Federal agencies reflects the latter's legal duty under section 7(a)(1) of the ESA, which provides that Federal agencies are under a "continual obligation to contribute to the conservation of threatened and endangered species." 63 Fed. Reg. 8859, 8867 (Feb. 23, 1998). Providing Federal CVP water contractors with Section 10 assurances contravenes the same continuing obligation placed on Federal agencies because it limits the water and other resources Reclamation will be expected to provide to the Plan. The Draft Plan and Draft IA fail to explain how Reclamation can comply with its continuing obligations under section 7(a)(1) of the ESA, particularly the continuing duty (if needed) to provide additional water to meet environmental needs of listed species, if BDCP provides assurances to CVP contractors that there will be no additional impacts to CVP water supply: it is the same water, and the rights to that water are held by Reclamation. As such, the Draft Plan and Draft IA must be revised to avoid providing regulatory assurances to Reclamation and/or CVP contractors.

7. <u>CVP and SWP Contractors are Not Qualified as Permittees, and Thus Cannot Obtain Regulatory Assurances</u>

In addition to violating the No Surprises Rule, neither SWP nor CVP contractors are appropriate permittees who could obtain Section 10 assurances. *See* Permittee Memo. In addition, according to the HCP Handbook, "[t]he permittee must therefore be capable of overseeing HCP implementation and have the authority to regulate the activities covered by the permit." HCP Handbook at 3-2. Similarly, as part of the USFWS ITP application, applicants are required to sign a notice which certifies that they

> own the lands indicated in this application, or have sufficient authority or rights over these lands to implement the measures of the Habitat Conservation Plan (and Implementing Agreement if applicable) covered by the Incidental Take permit. Further, upon receipt of the Incidental Take permit, [the signatories] agree to conduct the activities as specified in the Habitat Conservation Plan (and Implementing Agreement if applicable) according to the terms and conditions of the Incidental Take permit and its supporting documents.

Department of the Interior: U.S. Fish and Wildlife Service, Incidental Take Permit Associated with a Habitat Conservation Plan Application Form (Rev. October 2013) at 12, available online at http://www.fws.gov/forms/3-200-56.pdf. This provision ensures that permittees will have sufficient authority to implement the HCP's conservation measures.

However, the state and federal water contractors lack sufficient authority over either the land or operations of the CVP and SWP to qualify as a permittee under the ESA. *See* Permittee Memo. The existing CVP and SWP facilities are owned by the State and Federal Governments, and any new water conveyance infrastructure will be owned and operated by the Department of Water Resources (DWR). *See* Draft Plan at 8-70. Furthermore, the water rights associated with the BDCP, SWP, and CVP will not be held by the water contractors, and are instead held by DWR and USBR. *See, e.g.,* Water Rights Decision 1641 (December 29, 1999) at 146-149. And state and federal agencies, not the water contractors, control operations of diversion facilities, consistent with existing law. *See, e.g., id.* at 132 ("Only the DWR and the USBR can implement the objectives for operational constraints in the 1995 Bay-Delta Plan. The objectives for export pumping rates are the responsibility of each of the two projects at their respective facilities. The objectives for Delta Cross Channel operation are the sole responsibility of its owner, the USBR."); Permittee Memo at 4-5.

Because the state and federal water contractors do not have adequate authority to implement the Draft Plan, including lacking any authority to implement conservation measures relating to CVP/SWP operations and/or affecting CVP/SWP water rights as well as lacking any authority over lands in the Delta, they do not qualify as permittees and they cannot therefore obtain No Surprises assurances.[11]

D. The Draft Plan Fails to Comply with the Central Valley Project Improvement Act, Bay Delta Water Quality Control Plan, and Provisions of the Fish and Game Code Regarding Salmon Doubling

Despite the fact that our organizations have reiterated for years that any lawful BDCP must meet salmon doubling requirements in state and federal law, the Draft Plan fails to acknowledge the applicability of these requirements. *See, e.g.,* Letter to Lori Rinek, USFWS, from NRDC, TBI, Defenders of Wildlife, EDF (May 14, 2009) (incorporated herein by reference). The Draft Plan's omission indicates a failure to meet these requirements, but does not lessen the requirement that the Plan provide for salmon doubling. *Cf.* Draft Plan at 1-6 to 1-20.

---

[11] The same logic extends to permits and assurances provided under the NCCPA.

The federal Central Valley Project Improvement Act imposes an anadromous fish doubling goal on operations of the CVP that is long overdue.[12] The CVPIA directs DOI to develop and implement a program that makes "all reasonable efforts" to ensure and sustain on a long-term basis a doubling of the number of naturally produced anadromous fish in Central Valley rivers and streams, using the average levels attained during the period of 1967-1991 as the baseline. P.L. 102-575, § 3406(b)(1). The plan was due by 1995, and the doubling goal was supposed to have been met by 2002. It has not been met. *See, e.g.,* CVPIA Independent Fisheries Review Panel 2008, "Listen to the River: An Independent Review of the CVPIA Fisheries Program," ("CVPIA Fisheries Review 2008") available online at http://www.usbr.gov/mp/cvpia/docs_reports/indep_review/FisheriesReport12_12_08.pdf, incorporated by this reference.

As the CVPIA Independent Science Panel noted, DOI has yet to take on its environmental mission with the same "zeal" that it brings to its water supply responsibilities. The CVPIA Fisheries Review 2008 states that "After 16 years of implementation the CVPIA anadromous fish program is not close to its stated doubling goal, nor has it solved the problems that led to the listing of several species of salmon and steelhead under the ESA." The report concludes that DOI:

- Has not developed a proper conceptual foundation and framework for the program;
- Has organized and managed the program in a compartmentalized way rather than an integrated, systematic and scientific way;
- Has not addressed key fisheries problems at the systems level;
- Has failed to prioritize and address effectively the problems in the Delta;
- Has substantially underutilized CVPIA authorities, especially with regard to water management and the issues in the Delta.

The Panel was particularly severe in discussing DOI's reticence to use its Section 3406(b)(2) authority to make more water available for salmon:

> An excellent example of the agencies' constrained approach to their authorities is how the agencies have implemented Section 3406(b)(2)….When viewed in combination with the broad directive in Section 3406(b)(1)(B) to "modify Central Valley Project operations

[12] In addition, the Draft Plan fails to incorporate Level 4 water deliveries to the wildlife refuges, despite the requirements of the CVPIA. *See* P.L. 102-575, § 3406(d). As discussed infra, the DEIS/DEIR and Draft Plan also omit Level 4 refuge water supply from the environmental baseline.

> to provide flows of suitable quality, quantity, and timing to protect all life stages of anadromous fish," for which the 800 kaf is one explicit tool, the panel expected to find that implementation of 3406(b)(2) had occurred in this way: The agencies identify 800 kaf of dedicated storage in the system – essentially, a water volume budget – and then consistent with an identified system-wide flow regime to improve conditions for anadromous fish, Reclamation would release this stored water in requested amounts at the call of the fish managers and then protect that amount of altered flow through the rivers, through the Delta, and into the bay.
>
> We were flabbergasted to learn this is not how the agencies implement this provision. The agencies have not identified a system-wide flow regime and set of system flow objectives. Worse, Reclamation does not dedicate and manage 800 kaf of water from headwaters storage through the Delta. Instead, Reclamation releases approximately *400* kaf from CVP storage each year, aimed at supporting the needs of particular life stages at particular locations. These augmented amounts are then *diverted out of the system* at a later point. The 800 kaf accounting then includes approximately 400 kaf realized in pump restrictions in the Delta. **This approach seems fundamentally at odds with the intent and language of the legislation.**

Id. (emphasis in original). The Ninth Circuit Court of Appeals has similarly and repeatedly made clear that DOI has failed to implement this mandate, which it is required to meet by law, holding in *San Luis & Delta Mendota Water Authority v U.S.*, 672 F.3d 676 (9th Cir. 2012) that:

- The CVPIA establishes its own "restoration mandate" distinct from the environmental protections provided for in other statutes.
- The concept of primary purpose cannot be "untethered" from CVPIA's restoration mandate.
- The CVPIA distinguishes between the "primary restorative purpose (on the one hand) and those of water quality protection and meeting other legal obligations such as the ESA (on the other)." This distinction: "clearly demonstrates that an action taken to meet water quality criteria and/or ESA requirements does not, by itself, fall within the category of a (b)(2) primary purpose."
- It is improper for DOI to relegate "water needed for implementation of the Improvement Act's restoration mandate" to a secondary role.
- Crediting of ESA/WQCP releases to the (b)(2) account is only appropriate when such releases "predominantly" overlap with actions taken for the primary (b)(2) purpose.
- DOI's December 2003 Guidance is invalid in its characterization of the 1995 WQCP.
- Not every measure taken to protect some species of fish and wildlife automatically becomes a primary purpose under (b)(2). Thus, merely because a water quality release is

made for some environmental purpose does not mean that it qualifies as a (b)(2) primary purpose action: "primary purpose is narrower than the 2003 Guidance Memo suggests. It consists… only of those restoration measures which are specifically enumerated in Section 3406(b)(2) of the CVPIA."

- DOI could have limited confusion and controversy by implementing a more coherent set of accounting procedures after it became aware of the Jan. 2004 9th Circuit Decision.

The Bay-Delta Water Quality Control Plan likewise imposes a water quality objective requiring that,

> Water quality conditions shall be maintained, together with other measures in the watershed, sufficient to achieve a doubling of natural production of chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law.

See State Water Resources Control Board, Final Water Quality Control Plan for the San Francisco Bay San Joaquin River Delta, December 13, 2006, at 14, available online at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/docs/2006_plan_final.pdf (and hereby incorporated by reference). The State Water Resources Control Board's review of BDCP must demonstrate that the Draft Plan is consistent with achievement of this objective. *See also* Water Code §§ 13050(j)(3), 13242(a); *In re State Water Resources Control Board Cases*, 136 Cal.App.4th 674, 775 (2006). Likewise, Salmon doubling is also a stand-alone requirement of State law. Section 6902 of the Fish and Game Code establishes as State policy that the State shall "double the current natural production of salmon and steelhead trout resources" and that existing salmon and steelhead habitat shall not be further diminished. Similarly, section 5937 of the Fish and Game Code is a long-standing provision of State law that requires the operator of any dam, including state and federal governments, to provide sufficient water at all times to pass over or around the dam to restore and maintain naturally-producing populations of native fish in good condition. *See, e.g., Natural Resources Defense Council v. Patterson*, 333 F.Supp.2d 906 (E.D. Cal. 2004).

The Draft Plan can and must be revised to address these long-overdue requirements, include salmon doubling as an achievable biological objective, and address how DOI and DWR will meet their salmon doubling obligations in the context of BDCP.

E. **The Draft Plan Fails to Comply with Water Quality and Water Rights Requirements Under State Law**

The Draft Plan acknowledges that the State Water Resources Control Board has extensive independent authority to determine legal obligations that directly affect BDCP. These include the SWRCB's ongoing (and long overdue) update of the Bay Delta Water Quality Control Plan, including flow standards necessary to protect the fish, aquatic, and wildlife resources, and agricultural and domestic supply in the Delta; and review and permitting of the Plan's proposed change in point of diversion, which may not cause injury to any legal user of the water involved, including fish and wildlife. Draft Plan at 1-19 to 1-20. The Draft Plan asserts that the "State Water Board's participation in the development of the BDCP and in the environmental review process is intended to ensure consistency between the actions described in the BDCP and those required by the State Water Board." Draft Plan at 1-20. Despite this assertion, the Draft Plan utterly fails to address or account for anticipated changes under an updated water quality control plan and change in point of diversion review. This is most apparent in the Plan's failure to adequately incorporate and address the Board's recognition of the need for significantly increased flows into and through the Delta, as indicated by its 2010 public trust flows report and numerous comments provided during BDCP development. *See* Water Code § 85086(b) and (c) (public trust flow criteria should inform the BDCP and related Delta planning decisions); State Water Resources Control Board, Final Report, Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem, August 3, 2010 ("SWRCB 2010 Flow Report"), available online at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf. Instead of acknowledging this input and providing for increased flows at critical times of the year for imperiled fish, the Draft Plan asserts without adequate justification that exports cannot be reduced to a level sufficient to protect and restore fish and wildlife. But the Plan bases this false conclusion on its failure to adequately consider alternative sources of water supply available to exporters, which would enable diversions from the Delta to be significantly reduced while maintaining a reliable and adequate water supply.[13]

The Draft Plan must be revised to assess the proposed project's ability to meet the significantly increased flows necessary to protect and restore covered species in light of the abundant and

[13] The Draft Plan's failure to consider alternative water supply and demand reduction measures in export areas violates several other legal requirements, as well, including the failure to consider an adequate range of alternatives, failure to comply with requirements of the Delta Reform Act of 2009, and failure to consider alternatives to take, to name just a few. This failure is especially egregious in light of the fact that the Draft Plan proposes these very same alternative water supply and demand reduction measures for in-Delta diverters as a proposed form of mitigation for imposing degraded water quality conditions on those water users. DEIS/DEIR Appendix 3B at 3B-43.

affordable alternative water supply sources available to exporters. *See, e.g.,* NRDC and the Pacific Institute, "The Untapped Potential of California's Water Supply: Efficiency, Reuse, and Stormwater," June 2014, available online at http://www.nrdc.org/water/ca-water-supply-solutions.asp (incorporated herein by reference); 2013 update to bulletin 160 at http://www.waterplan.water.ca.gov/previous/b160-98/TOC.cfm (incorporated herein by reference); USBR, CVP Integrated Resource Plan (2014) at http://www.usbr.gov/mp/SSJBasinStudy/documents/cvp_integrated_resource_plan_summv2.pdf (incorporated herein by reference).

Even if it is beyond the scope of the Draft Plan to analyze these alternative water supply options in detail, the Plan may not simply pretend that these planned future investments and options do not exist and fail to consider them, especially in light of the state policy to reduce reliance on Delta water exports by investing in efficiency, recycling, advanced water technologies, local and regional water supply projects. *See* Water Code § 85021. Indeed, the Draft Plan itself proposes to reduce adverse water supply impacts for in-Delta water users imposed by the Plan's adverse water quality impacts by:

> **Develop[ing] demand management and/or conservation/recycling projects to extend available water supplies (municipal uses).** Facilitation and development of additional demand management, water conservation, and wastewater recycling projects would help reduce use of Delta diversion facilities when water quality is poor allowing for more efficient use of other existing water supplies.

DEIS/DEIR Appendix 3B at 3B-43. Of course, these measures would also "help reduce use of Delta diversion facilities" by export water users to enable reduced diversions from the Delta to meet ecosystem and species protection needs. Moreover, DWR and DOI have already acknowledged that they can choose to include and analyze the impact of measures taken outside of the Delta in this BDCP analysis. 74 Fed. Reg. 7257 (Feb. 13, 2009) ("it may be necessary for the BDCP to include conservation actions outside of the Statutory Delta that advance the goals and objectives of the BDCP within the Delta…. The EIS/EIR project area for which impacts are evaluated may be different than the BDCP geographic scope."); DWR NOP (Feb. 13, 2009) ("The EIR/EIS project area for which impacts are evaluated may be different that the BDCP geographic scope."). There is no reasonable excuse to artificially limit the scope of the analysis in the manner chosen by the Draft Plan.

Further, as noted in the attached analysis by the University of Southern California, "Water Supply Scarcity in Southern California: Assessing Water District Level Strategies," the expensive price tag of the currently proposed BDCP is likely to negatively affect the ability of local water districts and others to invest in efficiency, recycling, advanced water technologies, and other local and regional water supply projects. University of Southern California Center for

Sustainable Cities, Water Supply Scarcity in Southern California: Assessing Water District Level Strategies, 2012, available online at http://sustainablecities.usc.edu/research/publications.html (incorporated by reference). That report finds that "[w]ith a projected costs of $23.7 Billion to be paid by user fees, this project could foreclose other water supply options for Southern California." *Id.* at page x. Without a financing plan that explains how users will finance the proposed project, the Draft Plan does not and cannot accurately assess the impact of the proposed project on user fees in the future or the effect of that increase on other needed investments to meet state policy. This omission is significant, since "[t]he increasing price of imported water is [already] a major factor in local water agency efforts to conserve water and to invest in new water supply sources." *Id.* at page xi. As the report concludes, "Some investments, such as SWP proposed tunnels will preclude others due to financial constraints. Trade-off analysis and full-accounting … should be included in such analyses." *Id.* at pages xxvi-xxvii.

In addition, as we discuss in section II, the Draft Plan proposes to violate existing water quality standards protecting fish and wildlife, and the Draft Plan identifies significant degradation in water quality for other users, including agricultural and municipal and industrial uses, and fails to propose adequate mitigation for such degradation, *see* DEIS/DEIR at ES-63 to ES-65 and Chapter 8 (identifying significant and unavoidable impacts to water quality from methylmercury, bromide, chloride, electrical conductivity, organic carbon, pesticides, and selenium). Many other commentators have identified significant flaws with the DEIS/DEIR's modeling of water quality impacts. The DEIS/DEIR and Draft Plan must propose operational changes and other feasible mitigation measures to address these significant impacts.

As currently drafted, the analysis fails to provide information or analysis sufficient to support the State Board's change in point of diversion permit or to address the reasonably foreseeable impact of strengthened flow standards under an updated Bay-Delta water quality control plan.

F. The Draft Plan Violates the State's Obligations under the Public Trust Doctrine

The Draft Plan fails to adequately consider and protect against the Plan's adverse impacts on public trust resources, as it must. As discussed above, the Draft Plan does an insufficient job of addressing and incorporating the public trust flow criteria developed by the State Board in 2010, despite the fact that the Legislature specifically called for these flow criteria to be developed to inform the BDCP, any change in point of diversion permit, and other Delta planning decisions. Water Code § 85086(b) and (c). This renders the Plan's analysis insufficient to support the State Board's subsequent issuance of a change in point of diversion permit. However, the failure to adequately consider and protect public trust resources is also a violation of DWR's independent obligation to do so as a trustee state agency. "The State can no more abdicate its trust over property in which the whole people are interested … than it can abdicate its police powers."

Illinois Central Railroad Co. v. Illinois, 146 U.S. 387, 452 (1882). Indeed, DWR and other state agencies have "an affirmative duty to take the public trust into account … and to protect public trust uses whenever feasible." *Nat'l Audubon Soc'y v. Superior Court,* 33 Cal. 3d 419, 446 (1983)

The State holds title as trustee of the public trust for the benefit of the People of California. *Colberg, Inc. v. State*, 67 Cal.2d 408, 416 (1967). The State also has a duty to supervise and administer the trust so that the public may continue to use navigable waterways, like the Delta, for public trust purposes. While the obligation extends to preserving public trust uses where feasible, the failure to adequately assess alternative water supply options means that the Plan utterly fails to assess the feasibility of significantly reducing exports from the Delta over the next 70 years (50-year plan duration plus approximate permitting and construction period). The Draft Plan violates DWR's and other state agencies' public trust obligations and must be modified to incorporate feasible protections sufficient to protect and restore native fish and other public trust resources.

G. The Draft Plan Fails to Comply with the Delta Reform Act

The 2009 Delta Reform Act established several requirements that BDCP fails to comply with. First, the Act prohibits any public funding for BDCP unless it complies with the NCCPA, CEQA, and specific provisions of the Act. Cal. Water Code § 85320(b). However, because the Draft Plan violates the NCCPA, *see supra*, and violates CEQA, *see infra*, approval of the Draft Plan and provision of any public funding would violate the Delta Reform Act. Second, as discussed extensively in these comments, BDCP fails to identify the "operational criteria and flows necessary for recovering the Delta ecosystem and restoring fisheries under a reasonable range of hydrologic conditions, which will identify the remaining water available for export and other beneficial uses." Water Code § 85320(b)(2)(A). Third, BDCP fails to comply with the Delta Reform Act's requirement to reduce reliance on the Delta:

> The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.

Cal. Water Code § 85021. Appendix 3I of the DEIS/DEIR, which addresses BDCP compliance with the Delta Reform Act, wholly omits any discussion of section 85021 of the Delta Reform

Act. At a minimum, the Draft Plan and DEIS/DEIR fail to demonstrate how BDCP complies with this mandate.

Fourth, as discussed above, the Draft Plan and Draft IA do not require achievement of the Draft Plan's biological objectives, instead only requiring implementation of the conservation measures. This is inconsistent with the requirements of the Delta Reform Act, which requires that the fishery agencies "ensure" that biological performance measures "are achieved." *See* Water Code § 85321 ("The BDCP shall include a transparent, real-time operational decisionmaking process in which fishery agencies ensure that applicable biological performance measures are achieved in a timely manner with respect to water system operations.").

H. <u>The DEIS/DEIR Violate CEQA and NEPA</u>

The fundamental purpose of CEQA and NEPA is to ensure that agencies consider, mitigate, and disclose to the public potentially significant adverse impacts on the environment before approving or implementing a project. Their requirements are not mere hoops to jump through, but are intended "to afford the fullest possible protection to the environment within the reasonable scope of the statutory language." *Friends of Mammoth v. Board of Supervisors*, 8 Cal.3d 247, 259 (1972). As articulated by the legislature, CEQA is designed to prevent public agencies from approving projects if "feasible" alternatives or mitigation measures would substantially lessen the significant environmental effects." Pub. Res. Code § 21002. Another key goal is to inform decisionmakers and the public about the potentially significant environmental effects of proposed projects. *See, e.g.,* 14 Cal. Code Regs. §15002. Finally, CEQA and NEPA both require consideration of a reasonable range of alternative actions that might achieve similar goals with less environmental impact. *See, e.g.,* 40 C.F.R. §1502.14. In several key respects, the DEIS/DEIR violate fundamental provisions of CEQA and NEPA. First, the DEIS/DEIR uses flawed environmental baselines which understate the environmental impacts of the Draft Plan and Alternatives and fail to inform the public and decisionmakers of the actual impacts. Second, the DEIS/DEIR fail to include a reasonable range of alternatives, and rely on unreasonably narrow purpose and need statement to exclude reasonable alternatives. Third, the DEIS/DEIR fails to adequately analyze cumulative impacts. Fourth, the geographic scope of the DEIS/DEIR violates CEQA by excluding analysis of impacts to San Francisco Bay. Finally, as we discuss extensively in sections II, III and IV of these comments, the DEIS/DEIR fails to use sound science and provide accurate information to the public and decisionmakers regarding potential impacts of the State's proposed plan (Alternative 4), and the DEIS/DEIR's conclusions regarding several impacts are not supported by substantial evidence and understate the true environmental impacts. Because feasible mitigation measures are available, including changes to CVP/SWP operations and investments in local and regional water supplies that reduce reliance on the Delta, the DEIS/DEIR must be revised to incorporate such mitigation measures.

1. The DEIS/DEIR Use an Illegal Baseline that Understates the Likely Adverse Environmental Impacts of the Draft Plan and Alternatives

Both NEPA and CEQA require that the Project be analyzed against the existing environmental conditions (the "environmental baseline"), in order that the Project's environmental impacts can be meaningfully analyzed and compared to alternatives. 40 C.F.R. § 1502.15; CEQA Guidelines § 15125(a); *see County of Amador v. El Dorado County Water Agency*, 76 Cal.App.4th 931, 952 (1999); *Neighbors for Smart Rail v. LA County Metropolitan Transit Authority*, 57 Cal. 4th 310, 315 (2013). Under CEQA, the DEIR must "delineate environmental conditions prevailing absent the project, defining a 'baseline' against which predicated effects can be described and quantified." *Neighbors for Smart Rail*, 57 Cal.4th 439, 447 (2013) (*citing Communities for a Better Environment v. South Coast Air Quality Dist*., 48 Cal.4th 310, 315 (2010)). The purpose is to provide a "realistic baseline that will give the public and decision makers the most accurate picture practically possible of the project's likely effects." *Neighbors for Smart Rail*, 57 Cal.4th at 449 (*citing Communities for a Better Environment*, 48 Cal. 4th at 322, 325, 328).

In three distinct ways, the environmental baseline used in the draft BDCP and DEIS/DEIR fails to accurately assess the impacts of the proposed project, misleading decisionmakers and the public of the potential environmental impacts of the proposed project and alternatives in violation of NEPA and CEQA. First, the environmental baseline in the DEIS/DEIR omits implementation of floodplain habitat restoration in the Yolo Bypass and associated changes to weirs and infrastructure, despite existing permit requirements to implement these actions by 2020 as a mitigation measure for existing CVP/SWP operations. These habitat restoration projects will be implemented if no action is taken on BDCP, yet they are not included in the no action alternative. As a result, the DEIS/DEIR overstates the environmental benefits of the proposed project as compared to no action, and it substantially understates the environmental impacts of the proposed project as compared to no action. Second, the environmental baseline in the DEIR (but not the DEIS) omits implementation of the "Fall X2" action required under the 2009 Delta smelt biological opinion. This creates further confusion by creating two separate environmental baselines under NEPA and CEQA, and it results in the DEIR overstating the environmental benefits of the proposed project as compared to the no action alternative, and understating the environmental impacts of the proposed project as compared to the no action alternative. Third, the draft BDCP uses a completely manufactured environmental baseline for Chapter 9 of the draft plan, which causes further confusion and is inconsistent with the baselines used in the DEIS/DEIR.[14] Taken together, these flaws confuse the reader, undermining the

[14] In addition, the Draft Plan and DEIS/DEIR use an improper baseline for water deliveries to CVPIA wildlife refuges, failing to incorporate any Level 4 deliveries in the baseline. *See* DEIS/DEIR Appendix 3D at 3D-6.

intent of NEPA and CEQA, and result in the DEIS/DEIR overstating the environmental benefits and understating the environmental impacts of the proposed project.

i. The DEIS/DEIR and Draft Plan Provide Misleading Information Because they Fail to Include Required Habitat Restoration, Including Yolo Bypass Restoration, in the Environmental Baseline

First, the document violates NEPA and CEQA by failing to include required habitat restoration projects, including floodplain habitat restoration in the Yolo Bypass, in the environmental baseline in the DEIS/DEIR. These habitat restoration measures are required by the existing permits for SWP and CVP operations as a mitigation obligation, and they are required to be implemented regardless of whether BDCP moves forward. *See, e.g.*, 2009 NMFS Biological Opinion; 2008 USFWS Biological Opinion; Draft Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan, September 2012;[15] Notice of Intent, Draft Environmental Impact Statement / Environmental Impact Report for Yolo Bypass Salmonid Habitat Restoration and Fish Passage, California, 78 Fed. Reg. 14117 (March 4, 2013). The 2009 NMFS biological opinion includes specific criteria that must be achieved with respect to modifications to Freemont and Lisbon weirs, the amount of acreage that must be inundated as a result of restoration, and specific timelines for implementation. NMFS 2009 Biological Opinion at 607-611.

Despite these existing legal requirements, the DEIS/DEIR does not include these measures in the no action alternative or in the environmental baseline for BDCP. *See* DEIS/DEIR at 3-44 to 3-45; Draft Plan at 5.2-6 to 5.2-8. Yet the document also identifies significant environmental benefits from the Yolo Bypass restoration action, benefits that do not appear in the no action alternative despite the fact that these habitat restoration measures are required to be implemented regardless of the outcome of BDCP. *See, e.g.*, DEIS/DEIR at 11-19, 11-278 to 11-281, 11-343, 11-345, 11-487 to 11-488; Draft BDCP Plan at 5.5.3-2 to 5.5.3-7, 5.5.3-41 to 5.5.3-47 (effects analysis of proposed project on winter-run Chinook salmon, concluding in particular that Yolo Bypass restoration under BDCP is highly beneficial for salmon).[16] For instance, the draft plan

---

[15] The draft plan and associated letters between the Bureau of Reclamation and National Marine Fisheries Service are available online at: http://www.usbr.gov/mp/BayDeltaOffice/Documents/yolo.html. These documents are incorporated by reference.

[16] Confusingly, and without any analysis, the DEIS/DEIR claims that the Yolo Bypass restoration measures proposed under BDCP "go beyond those in the 2008 NMFS BiOp actions." DEIS/DEIR at 3-45. In contrast, Chapter 9 of the Draft Plan states that, "There is significant overlap in Yolo Bypass improvements between the NMFS 2009 BiOp and the USFWS 2008 BiOp and CM2. The CM2 estimate was reduced to 75% to account for this overlap." Draft Plan at 9-42. It appears that the Draft Plan includes the costs of implementing these habitat restoration requirements in the different baseline used in Chapter 9, even though they were not included in the baseline in the DEIS/DEIR or in other chapters of

concludes that, "The BDCP will provide improved adult and juvenile salmonid passage at Fremont Weir, increase the inundation period of the bypass, and enhance habitat conditions across the bypass itself." Draft Plan at 5.5.3-42. However, the 2009 NMFS biological opinion requires each of these actions on a shorter time frame than BDCP. As a result, the exclusion of Yolo Bypass restoration from the environmental baseline is highly misleading and fails to accurately assess the environmental impacts of the proposed project and alternatives, including the no action alternative.

For purposes of NEPA, the no action alternative in the BDCP DEIS/DEIR provides the environmental baseline, and "The No Action Alternative, sometimes referred to as the future no action condition, considers No Action to include continuation of operations of the SWP and CVP as described in the 2008 USFWS and 2009 NMFS BiOps and RPAs and other relevant plans and projects that would likely occur in the absence of BDCP actions." DEIS/DEIR at 4-5. Yet despite the fact that Yolo Bypass and other habitat restoration requirements of the 2008 USFWS biological opinion and 2009 NMFS biological opinion will "likely occur in the absence of BDCP actions," inexplicably, the DEIS/DEIR does not include the Yolo Bypass and other habitat restoration requirements of the biological opinions in the no action alternative. By failing to include the Yolo Bypass and other habitat restoration requirements in the No Action alternative, the DEIS overstates any environmental benefits of BDCP and understates the environmental impacts of BDCP. This fundamentally violates NEPA's purpose of informing the public and decisionmakers of the environmental consequences of a proposal and its alternatives. In order to comply with NEPA, the DEIR should be revised to include the Yolo Bypass and related requirements of the 2009 NMFS biological opinion and the habitat restoration requirements of the 2008 USFWS biological opinion in the no action alternative.

For purposes of CEQA, the environmental baseline generally is the existing conditions at the time of the NOP. 14 Cal. Code Regs. § 15125. However, the state Supreme Court's decision in *Neighbors for Smart Rail v. Exposition Metro Line* explains that this rule is not absolute, and "A departure from this norm can be justified by substantial evidence that an analysis based on existing conditions would tend to be misleading or without informational value to EIR users." 57 Cal. 4th 439, 457 (2013). The fundamental goal is to ensure that, "CEQA analysis employ a realistic baseline that will give the public and decision makers the most accurate picture practically possible of the project's likely impacts." *Id*. at 449. Footnote 5 of the court's opinion

---

the draft plan. By omitting the Yolo Bypass restoration requirements of the 2009 NMFS biological opinion from the No Action Alternative, the DEIS/DEIR fails to provide the public and decisionmakers with the analysis to show the potential environmental consequences of CM2 versus the 2009 NMFS biological opinion requirements and to accurately demonstrate the environmental impacts of the proposed project and alternatives. In addition, as noted above, it appears that BDCP proposes to have the public pay for CM2 (Yolo Bypass restoration), despite the fact that this is a mitigation obligation of the CVP and SWP under existing biological opinions.

cited an example where use of the existing conditions as the environmental baseline could be misleading:

> Amicus curiae South Coast Air Quality Management District provides a hypothetical example of factual conditions in which use of an existing conditions baseline would arguably mask potentially significant project impacts that would be revealed by using a future conditions baseline. In this illustration, an existing industrial facility currently emits an air pollutant in the amount of 1,000 pounds per day. By the year 2020, if no new project is undertaken at the facility, emissions of the pollutant are projected to fall to 500 pounds per day due to enforcement of regulations already adopted and to turnover in the facility's vehicle fleet. The operator proposes to use the facility for a new project that will emit 750 pounds per day of the pollutant upon implementation and through at least 2020. An analysis comparing the project's emissions to existing emissions would conclude the project would reduce pollution and thus have no significant adverse impact, while an analysis using a baseline of projected year 2020 conditions would show the project is likely to increase emissions by 250 pounds per day, a (presumably significant) 50 percent increase over baseline conditions.

Id. at 453, fn. 5.

As in this example from the court's opinion, in the draft BDCP exclusion of the requirement to restore floodplains in the Yolo Bypass from the environmental baseline misleads the public of the potential environmental effects. By omitting these existing mitigation requirements, an analysis comparing the project to existing habitat conditions in the Yolo Bypass would show significant increases in habitat, whereas using a baseline that includes the 2009 NMFS biological opinion requirements relating to the Yolo Bypass would presumably show there would be little change from the baseline. This is critically important, as the DEIR claims that Yolo Bypass actions would have significant benefits for fish that may offset some of the impacts of other elements of BDCP (CM1); because Yolo Bypass restoration would necessarily occur with or without BDCP, this measure cannot offset impacts from CM1.[17] The environmental baseline in

[17] As an example of how this misleads the public, at least one independent review of the Draft Plan and DEIS/DEIR have identified Yolo Bypass restoration as a mitigation measure to offset the impacts to salmon and other native fisheries, whereas a clear presentation of the Yolo Bypass restoration as part of the environmental baseline would not have mislead reviewers. Jeffrey Mount, William Fleenor, Brian Gray, Bruce Herbold, Wim Kimmerer. September 2013, Panel Review of the Draft Bay Delta Conservation Plan: Prepared for The Nature Conservancy and American Rivers ("Mount and Saracino et al. 2013"), at 2, 38-41, available online at: https://watershed.ucdavis.edu/files/biblio/FINAL-BDCP-REVIEW-for-TNC-and-AR-Sept-2013.pdf (noting that their review of the BDCP documents shows that BDCP will increase the frequency of inundation of the bypass and that the duration of inundation in the bypass would not change under the No Action Alternative). While we agree with many of the modeling

the DEIR should be revised to include the requirements of the 2009 NMFS biological opinion relating to the Yolo Bypass (RPA Actions I.6.1 and I.7) and habitat restoration requirements of the 2008 USFWS biological opinion.

ii. The DEIR Provides Misleading Information because it Fails to Include Fall X2 Requirements in the Environmental Baseline

Second, the DEIR improperly justifies the exclusion of the Fall X2 action of the 2008 USFWS biological opinion from the environmental baseline in light of the state Supreme Court's decision in *Neighbors for Smart Rail v. Exposition Metro Line*. DEIS/DEIR at 4-4 to 4-5. Because the NEPA baseline appropriately includes the Fall X2 action from the 2008 USFWS biological opinion, the document unnecessarily confuses the public and decisionmakers with two separate baselines for comparison. Equally important, just as in the prior discussion of excluding the habitat restoration requirements of the biological opinions from the environmental analysis, this too is a case where excluding the Fall X2 action from the baseline leads to highly misleading analysis. At the time of the NOP (as well as today), the Fall X2 requirement of the 2008 USFWS biological opinion was required to be implemented in every wet and above normal water year type by allowing greater outflow during the fall months than was previously required, in order to mitigate impacts of the CVP and SWP operations on Delta smelt. Yet by omitting the Fall X2 action from the DEIR, the document makes it appear that BDCP results in the same or higher outflow in the fall months than under the status quo, and makes it appear that alternatives that do not include the Fall X2 action are similar to the status quo (rather than causing significantly increased environmental impacts, given the environmental benefits of the Fall X2 action). *See, e.g.*, DEIS/DEIR at 11-1295 to 11-1298 (discussing different findings of the effects of Alternative 4 on delta smelt rearing habitat under NEPA and CEQA, concluding that, "The NEPA analysis is a better approach for isolating the effect of the alternative from the effects of sea level rise, climate change, future water demands, and implementation of required actions such as the Fall X2 requirement."). As with exclusion of the habitat restoration requirements of the two biological opinions, exclusion of the Fall X2 action from the CEQA baseline in the DEIR is misleading and confusing to the public and decisionmakers, and the DEIR should be revised to include the Fall X2 action in the CEQA baseline.

---

and biological critiques in this report, we disagree in particular with the flawed legal analysis in Chapter 2 of that review.

iii. The Draft Plan Provides Misleading Information because it Includes a Wholly Unjustified Baseline for Economic Impacts and Benefits

Third, Chapter 9 of the Draft Plan includes two new, wholly invented baselines for comparison of economic impacts and benefits. *See* Draft Plan at 9.A-1 to 9.A-4; Draft Plan at 9-40 to 9-42. This is problematic both because it provides a grossly misleading assessment of the potential economic benefits of the proposed project and because it creates significant confusion for the public and decisionmakers about BDCP's effects more generally.

The baselines used in Chapter 9 of the Draft Plan are called the "Existing Conveyance High Outflow Scenario" and the "Existing Conveyance Low Outflow Scenario," and they are only used in Chapter 9 and related appendices. *See id.* These two alternatives result in very substantial reductions in Delta exports as compared to other alternatives, including the No Action Alternative (despite the fact that the Draft Plan does not, in fact, compare them to the No Action Alternative). *See id.* The Draft Plan provides no justification for using a radically different baseline for the economics analysis (Chapter 9) from the rest of the draft plan.

The baseline used in Chapter 9 of the Draft Plan is wholly misleading and without foundation. There is no justification for providing a separate baseline for the economic analysis from that used for the environmental analysis; the document should use a consistent baseline. By using this imaginary baseline that significantly reduces water exports, Chapter 9 estimates significant economic benefits relating to water supply that presumably would not occur when compared to an accurate baseline. *Compare* Draft Plan at 9.A-44 (Table 9.A-7, showing expected water supply benefits) with Draft Plan at 9.A-4 (Table 9.A-2, showing net benefits and costs).[18] Chapter 9 should be revised to be consistent with the baseline recommended in these comments In these three distinct ways, the Draft Plan and DEIS/DEIR use flawed environmental baselines that provide materially misleading information to the public and decisionmakers about the economic and environmental costs and benefits of the BDCP and alternatives. The documents must be revised to provide a consistent, legally adequate baseline in order to fulfill CEQA and

[18] In addition to the flawed baseline, Chapter 9 includes many other substantial flaws, including: calculating economic costs and benefits out to 2075, even though proposed permits only run to 2065, *see* Draft Plan at 9.A-4; calculating water supply based on Early Late Term (2025) export levels, rather than the lower export levels resulting in the Late Long Term (2060), *see* Draft Plan at 9-16; failing to assign the cost of Yolo Bypass restoration to the water contractors as a mitigation measure, and unreasonably assigning the vast majority of costs associated with CM 2-21 to the public, *see* discussion *supra*; and by using inflated estimates of water demand in Southern California and inflated costs of alternative water supplies, as other commentators have argued. Each of these flaws tends to overstate the economic benefits of the proposed project, providing decision-makers and the public with misleading information. Accurately assessing economic costs and benefits are also important with respect to determining what alternatives are feasible. *See* 14 Cal. Code Regs. § 15126.6(f)(1).

NEPA's fundamental purpose of informing the public and decisionmakers of the likely environmental consequences of BDCP and its alternatives.

2. The DEIS/DEIR Fails to Analyze a Reasonable Range of Alternatives

CEQA and NEPA both require that a reasonable range of alternatives to the proposed project be considered in the environmental review process, including a no project alternative. Cal. Pub. Res. Code §§ 21002, 21061, 21100; tit. 14, Cal. Code Regs. ("CEQA Guidelines") § 15126.6; 42 U.S.C. § 4332; 40 C.F.R. §§ 1502.14, 1508.25(b). Unfortunately, the DEIS/DEIR fails to include a reasonable range of alternatives, particularly because it (a) fails to include a range of alternatives that achieve the standards of the ESA, NCCPA, and other environmental laws, consistent with BDCP objectives, and (b) includes no alternatives that include investments in water conservation, recycling, and other local supplies to improve water supply reliability and reduce reliance on the Delta. An alternative that includes both improved flows and investments in local water supplies is likely to result in substantial environmental benefits and improved water supply reliability, consistent with the overarching goals of BDCP, and the failure to include such an alternative violates CEQA. *See Citizens of Goleta Valley v. Board of Supervisors,* 52 Cal.3d 553, 566 (1990) (EIR must consider a reasonable range of alternatives that offer substantial environmental benefits and may feasibly be accomplished).

Indeed, as discussed elsewhere in these comments, the proposed project fails to meet the standards of the ESA, NCCPA, and other environmental laws. This is a fundamental objective of BDCP. *See* DEIS/DEIR at 2-2 to 2-3. Because the Draft Plan and most alternatives fail to achieve these standards, the range of alternatives must include more alternatives that reduce exports from the Delta in order to provide the improved flows needed to comply with these standards. The State Supreme Court's 2008 decision reviewing the CALFED EIR is instructive:

> As the CALFED PEIS/R itself recognizes, Bay–Delta ecosystem restoration to protect endangered species is mandated by both state and federal endangered species laws, and for this reason water exports from the Bay–Delta ultimately must be subordinated to environmental considerations. The CALFED Program is premised on the theory, as yet unproven, that it is possible to restore the Bay–Delta's ecological health while maintaining and perhaps increasing Bay–Delta water exports through the CVP and SWP. If practical experience demonstrates that the theory is unsound, Bay–Delta water exports may need to be capped or reduced. At this relatively early stage of program design, however, we conclude that CALFED properly applied the rule of reason when it decided to consider in the PEIS/R only alternatives that have the potential to both achieve ecosystem restoration goals and meet current and projected water export demands, and that

> will provide balanced progress in all four of the program areas. Failure to include a reduced exports alternative thus was not an abuse of discretion.

In re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings, 43 Cal.4th 1143, 1168 (2008). Unlike in 2008, practical experience (e.g., numerous court orders, new biological opinions and other permits, independent and agency scientific reviews, and the SWRCB 2010 Flow Report) has demonstrated that Bay-Delta water exports need to be reduced in order to achieve the ecosystem recovery requirements of the NCCPA and other state and federal laws.

Similarly, the DEIS/DEIR excludes consideration of the fishery agencies' more protective operational proposal for BDCP known as CS5. *See* Resources Agency, Background on Proposed Project and Operational Rules, March 14, 2013, at 4, available online at: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Background_on_BDCP_Proposed_Project_and_Operational_Rules_3-14-13.sflb.ashx (explaining that CS5 was not incorporated into the Draft Plan or DEIS/DEIR "given the geographic scope of BDCP (limited to the Delta itself)."). CS5 operations provided substantially increased Delta outflow as compared to the Draft Plan and most of the alternatives analyzed in the DEIS/DEIR, resulting in reduced environmental impacts, yet it was excluded from analysis. The DEIS/DEIR should be revised to include alternative operational proposals, such as the operational proposal developed by state and federal fishery agencies in 2013 (known as "CS5"), that provide improved flows (particularly winter/spring Delta outflow) and achieve the requirements of the NCCPA, ESA, and other environmental laws.

Second, in our 2008 scoping comments, we requested that the draft environmental documents include alternatives that improve Delta outflow and reduce water exports from the Delta, while also including investments in water conservation, recycling, and other local supplies to improve water supply reliability. In January 2013, our organizations identified a so-called "Portfolio Alternative," which includes a new conveyance in the Delta, a single tunnel, investments in levee stability and new storage, and significant investments in water conservation, recycling, stormwater capture, and other local water supplies, and requested that it be analyzed in the DEIS/DEIR. *See* attachment.[19] More than 30 members of the State legislature, more than 10 members of Congress, several water districts, other local governments, and numerous newspaper editorial boards all requested or recommended that this alternative be analyzed in the DEIS/DEIR. *Id.* DWR performed some CALSIM modeling of the operational rules proposed in this alternative, including with various conveyance sizes. *Id.* However, the agencies refused to

[19] Information relating to the Portfolio Alternative is included on the attached CD.

analyze the Portfolio Alternative, or any other alternative that includes investments in local water supplies, in the DEIS/DEIR.[20]

To the extent that the State argues that the purpose and need for the project exclude alternatives with water supply elements outside of the Delta, the purpose and need statement is inconsistent with California law[21] because it ignores the mandate of State policy to reduce reliance on the Delta and invest in regional and local water supplies, including water conservation, recycling, and similar projects, in order to improve water supply reliability. *See* Water Code § 85021. Although Chapter 2 of the DEIS/DEIR discusses the Delta Reform Act, it wholly omits discussion of this mandate of the Act.[22] It is irrational to exclude all alternatives that include investments in water conservation, water recycling, and other local and regional water supplies to improve water supply reliability. These water supply tools can provide substantial new sources of water for CVP and SWP contractors, and in combination with reduced exports from the Bay-Delta in order to improve flows and environmental outcomes, such an alternative can provide greater water supply reliability and improved environmental outcomes. Development of local water supplies is consistent with the additional project objectives under CEQA and NEPA. DEIS/DEIR at 2-3 ("To develop projects that restore and protect water supply and ecosystem health and reduce 36 other stressors on the ecological functions of the Delta in a manner that creates a stable 37 regulatory framework under the ESA and NCCPA.").

In addition, we note that the CALFED Bay-Delta program (which was approved as a Natural Community Conservation Plan) included significant investments in water conservation and other supplies in all of the alternatives, including the adopted alternative. *See* CALFED Record of Decision at 12, 19-20, 59-63; CALFED Bay-Delta Program Natural Community Conservation

---

[20] While the state included a 3,000 cfs conveyance alternative in the DEIS/DEIR and in Chapter 9 of the draft plan, neither are consistent with the Portfolio Alternative because: (1) the 3,000 cfs alternative in the DEIS/DEIR fails to use the operational rules proposed in the Portfolio Alternative, which increased Delta outflow and reduced exports; (2) the 3,000 cfs alternative in Chapter 9 assumes two tunnels under the Delta, dramatically increasing the cost by nearly $6B, as compared to a single tunnel alternative, as the State has previously admitted, *see* http://baydeltaconservationplan.com/news/blog/13-11-12/Revised_Capital_Cost_for_3_000_cfs_Single_Bore_Tunnel.aspx; and (3) the 3,000 cfs alternative in Chapter 9 does not include analysis of additional investments in local and regional water supplies, an essential element of the Portfolio Alternative.

[21] The purpose and need statement and objectives are also inconsistent with the requirements of the NCCPA because they wholly misstate that conservation standard of that Act, as discussed in section I(A)(1) of these comments. In addition, the purpose and need statement is unlawfully narrow by attempting to limit the geographic scope of BDCP to the Delta, as we discuss. In addition, to the extent that the reference to water supply goals and "full contract amounts" in the purpose and need statement screen out alternatives that reduce water exports, this would be unlawful.

[22] The Draft Plan omits any mention of section 85021 in its discussion of the Delta Reform Act, and fails to demonstrate whether and how BDCP is consistent with this section of the Act. *See* Draft Plan at Chapter 2, Appendix 3I. As currently drafted, the State's proposed project is fundamentally inconsistent with this section of the Delta Reform Act.

Plan Determinations at 9-10, 22-25, 52. In the context of BDCP, such investments can be analyzed at the program level, with established criteria identifying potential water supply costs and yields, without proscribing how particular water contractors achieve these targets. This is similar to the approach taken for most of the conservation measures in the Draft Plan and DEIS/DEIR, which are analyzed at the program, not project, level. Doing so would not require that the State actually take over implementation of these projects, but instead provides a framework for ensuring that the targets and criteria are achieved. To the extent that the State argues that these sources are not cost-effective, the way to demonstrate that is through analysis in the DEIS/DEIR, not through unsupported conclusory statements.

Third, the proposed project and other alternatives analyzed in the DEIS/DEIR will result in significant environmental impacts, including significant impacts to native fisheries and water quality, as well as cumulatively significant impacts. However, alternatives such as the Portfolio Alternative are likely to be feasible alternatives that would result in lower environmental impacts. The failure to meaningfully consider such alternatives precludes the agencies from adopting an alternative that results in significant environmental impacts. *See* Cal. Pub. Res. Code § 21081; *California Clean Energy Committee v. City of Woodland*, 225 Cal.App.4th 173, 203 (2014).

As currently drafted, the DEIS/DEIR fails to include a reasonable range of alternatives, and the documents should be revised to include analysis of the Portfolio Alternative and/or one or more other alternatives that achieve the standards of the NCCPA and other environmental laws as well as increasing investments in regional and local water supplies.

3. The DEIS/DEIR Fails to Adequately Analyze Cumulative Impacts

In several respects, the DEIS/DEIR's analysis of cumulative impacts is significantly flawed, understating the potential environmental impacts of BDCP in combination with other state and federal projects and programs.

First, the DEIS/DEIR fails to include several CALFED reservoir storage projects in its cumulative impacts analysis, despite the fact that notices of preparation, and in some cases, NEPA/CEQA documents, have been released for these projects. These include the Shasta Lake Water Resources Investigation,[23] North of Delta Offstream Storage Investigation,[24] and Upper

[23] *See, e.g.*, Shasta Lake Water Resources Investigation Draft Environmental Impact Statement, June 2013, available online at: http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=1915. Notice of the DEIS for this project was published in the Federal Register on July 1, 2013. *See* 78 Fed. Reg. 39315 (July 1, 2013). Prior to that, the draft feasibility report was released in 2012, and the Notice of Intent was published in the Federal Register in 2005. 70 Fed. Reg. 58744 (October 7, 2005). BDCP is

San Joaquin River Basin Storage Investigation.[25] The DEIS/DEIR mentions the Shasta Lake Water Resources Investigation and Upper San Joaquin River Basin Storage Investigation, but does not include either of these potential new reservoirs in the cumulative impacts analysis. DEIS/DEIR at Appendix 3D-90, 3D-92. The DEIS/DEIR claims that the North of Delta Offstream Storage Investigation is included in the cumulative impacts analysis, DEIS/DEIR at Appendix 3D-91, but it appears that all of the cumulative impact analysis is qualitative and fails to include the potential reservoir projects in CALSIM modeling, despite the CALSIM modeling available for these projects. *See, e.g.*, DEIS/DEIR at 11-3006 ("This analysis [Cumulative Effects on Fish and Aquatic Resources] is qualitative in nature.").

In combination with BDCP, these storage projects have the potential to significantly reduce Delta outflow and increase Delta exports, particularly as compared to modeled conditions in the DEIS/DEIR, which would be likely to cause cumulatively significant environmental impacts. The failure to analyze these and other storage projects (such as expansion of San Luis Reservoir or further expansion of Los Vaqueros Reservoir, both of which are being analyzed by the federal government) results in the DEIS/DEIR underestimating the cumulative environmental impacts. These projects also will cause cumulative impacts on water supply. *See* DEIS/DEIR at 5-153 to 5-154 (excluding these reservoir projects from the cumulative impacts analysis).[26]

For instance, with additional storage south of the Delta, operations in the Delta could result in greater water exports, which could increase entrainment, increase negative Old & Middle River (OMR) flows, or reduce outflow, particularly as compared to modeled conditions.[27] Appendix

---

included in the cumulative impacts analysis in the DEIS. *See, e.g.,* Shasta Lake Water Resources Investigation Draft Environmental Impact Statement at 3-13, 3-27 to 3-28.

[24] *See, e.g.*, North-of-the-Delta Offstream Storage Investigation, 2013 Progress Report, available online at: http://www.usbr.gov/mp/nodos/docs/NODOS_Progress_Report_12.26.2013.pdf.

[25] The Upper San Joaquin River Basin Storage Investigation draft feasibility report was released in January 2014, and is available online at: http://www.usbr.gov/mp/sccao/storage/docs/index.html. The Notice of Intent to prepare an EIS was published in the Federal Register in 2004. *See* 69 Fed. Reg. 5184 (February 3, 2004). The Upper San Joaquin River Basin Storage Investigation draft feasibility report includes a discussion of BDCP (see esp. pages 6-31 to 6-32), and it states that, "Increasing surface water storage in the upper San Joaquin River Basin could allow for increased system flexibility and further use of new Delta conveyance facilities, providing for even greater increases in water supply reliability." Draft feasibility report at 1-37; *see id*. at 6-6 (stating that water supply benefits are expected to increase in combination with BDCP). That report also concludes that modeling studies will be updated to account for BDCP. *Id*. at 3-8.

[26] The DEIS/DEIR also fail to adequately explain and justify the increase of 443TAF in upstream diversions, which reduce export water supply. *See* DEIS/DEIR at 5-67.

[27] As an example, the CALSIM modeling relied on in the DEIS/DEIR assumes that OMR will be less negative than required by the proposed operational rules. However, providing additional storage could result in increased inflows to the Delta and increased export pumping that could increase negative OMR as compared to the CALSIM modeling, increasing environmental impacts as compared to that in the

1B of the DEIS/DEIR admits that preliminary BDCP modeling shows that increased South of Delta storage could increase water exports under BDCP by approximately 150TAF per year, with the majority of pumping increases in wet years. DEIS/DEIR at 1B-12. Inexplicably, this preliminary modeling and analysis is not included in the cumulative impacts analysis, only this conclusory statement.

Appendix 1B claims that all of these potential surface storage projects are neither "a probable future project" nor a "reasonably foreseeable future action." DEIS/DEIR at 1B-1. This conclusion is wholly inconsistent with the existing draft feasibility studies, notices of preparation, and draft NEPA / CEQA documents referenced herein. Further demonstrating that additional storage is a reasonably foreseeable future project under NEPA, in 2013 the State wrote that, "And [BDCP] is about establishing the improved conditions to set the stage for additional future storage improvements north and south of the Delta." *See* www.baydeltaconservationplan.com/news/blog/13-05-16/Making_Storage_Work.aspx. Likewise, the National Marine Fisheries Service has concluded that, "There is a high likelihood that south-of-delta storage capabilities will be increased over the 50-year term of this permit. There is also the potential for such an increase in storage capacity to result in water operation parameters (pumping rates/timing, OMR flows, I/E ratios, etc.) that differ from those modeled in the current analysis." NMFS 2013 Progress Assessment at 18. And the Delta Stewardship Council, in their June 24, 2014 comment letter on BDCP, stated that new storage should be included in the cumulative impacts analysis. In light of the availability of CALSIM modeling for many of these proposed reservoir projects, the likelihood that new storage projects (particularly South of the Delta) will occur, the existing NEPA/CEQA documents and draft feasibility studies for CALFED storage projects, and the State's statement that BDCP "set the stage" for new surface storage, the failure to include these projects in the modeling and analysis of cumulative impacts violates CEQA and NEPA.

Second, the DEIS/DEIR fails to include Phase I and Phase II of the State Water Resources Control Board's (SWRCB) update of the Bay Delta Water Quality Control Plan. *See* Attachment 3D-A (not listing either Phase I or Phase II in the description of projects and programs included in the cumulative impacts). The SWRCB has publicly noticed both phases of these proceedings,[28] and in late 2012 the SWRCB issued a draft Substitute Environmental Document

---

DEIS/DEIR. Such differences between modeled conditions and actual operations have occurred frequently in recent years, including under CALFED and under prior biological opinions.

[28] The Notice of Preparation for Phase I was issued on February 13, 2009, and is available online at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/environmental_review/docs/nop2009feb13.pdf. The supplemental Notice of Preparation related to Phase II was issued on January 24, 2012, and is available online at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/environmental_review/docs/notice_baydeltaplancompreview.pdf.

for Phase I (lower San Joaquin flows).[29] The potential increase in flows from the San Joaquin River in Phase I of these proceedings would significantly affect operations of the CVP and SWP under BDCP, and could potentially result in increased export pumping, entrainment, outflow, residence time, and other changes in water quality in the Delta. At a minimum, the DEIS/DEIR should include modeling of SWRCB alternatives in its analysis of cumulative impacts. These proceedings began in 2009.

Third, the DEIS/DEIR fails to include planned investments in local water supply development and water conservation, particularly in Southern California. *See* Attachment 3D-A. New water conservation, water recycling, stormwater capture, and similar projects to increase regional water supplies can reduce the need for water exports from the Delta, and help increase water supply reliability. For instance, in late 2012 the San Diego County Water Authority identified more than 1.2 million acre feet in planned conservation and other water supply projects in Southern California (in addition to "650,000 AF of planned and state-mandated conservation"), the vast majority of which were not included in the 2010 Urban Water Management Plan prepared by the Metropolitan Water District of Southern California. *See, e.g.,* http://www.sdcwa.org/sites/default/files/files/board/2013_agendas/2013_01_13_FormalBoardPacket.pdf (*see* pages 161-285). While some of these projects were analyzed in Chapter 9 of the BDCP,[30] they were not analyzed in the DEIS/DEIR.

Finally, the analysis in DEIR under CEQA fails to adequately account for the impacts of climate change, in contrast to the NEPA analysis. *See* DEIS/DEIR at 4-6. At a minimum, the effects of climate change in combination with BDCP and other probable future projects must be analyzed as cumulative impacts under CEQA.

[29] The 2012 draft SED for Phase I is available online at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/2012_sed/. The SWRCB is currently revising the SED in response to comments, and plans to release a revised draft SED later this year.

[30] According to text in Chapter 9A, BDCP relied on MWD's IRPSIM model in calculating local water supplies and conservation available to retail agencies. *See* Draft Plan at 9.A-6 and FN 1. As such, it would have failed to include many of these planned projects in Southern California, thus substantially overstating demand for water from the Delta and potential water shortages. For instance, Chapter 9A estimates that recycled water increases by only 100TAF/year by 2035, *see* Draft Plan at 9.A-7, whereas SDCWA's review of existing UWMPs has identified more than 248,000 acre feet of new water supply from water recycling by 2035. *See* http://www.sdcwa.org/sites/default/files/files/board/2013_agendas/2013_01_13_FormalBoardPacket.pdf (page 283). In addition, although Chapter 9A assumes shortages in water supplies in dry years in urban areas, MWD's 2010 UWMP identified surpluses in 2035, under both single critically dry year (1977) and multiple dry year (1990-1992) hydrology. *See id.* (reproducing tables from MWD's 2010 UWMP).

4. The Geographic Scope of the DEIS/DEIR is Unlawful

CEQA requires that an EIR's analysis of significant environmental effects describe all significant direct and indirect changes in the physical environment caused by the proposed project over time. *See, e.g.,* 14 Cal. Code Regs. § 15126. An artificially truncated project description does not excuse the failure to analyze the full scope of impacts, but instead reflects a flawed project description and a flawed impact analysis. *See, e.g., Santiago County Water Dist. v. County of Orange*, 118 Cal. App. 3d 818 (1981); *San Joaquin Raptor Rescue Ctr. v. County of Merced*, 149 Cal. App. 4th 645 (2007).

Here, the draft EIS/EIR excludes analysis of potentially significant adverse impacts of the proposed project on the environment downstream of Chipps Island and in San Francisco Bay. The EIS/EIR must be revised to address these impacts.

The BDCP Plan Area's downstream boundary is at Chipps Island, excluding Suisun Bay, Suisun Marsh, and San Francisco Bay. But that does not mean that the Plan's impacts cease at that boundary. Indeed, independent analyses have identified significant impacts downstream of the Plan's boundaries that are not assessed in the draft EIS/EIR. *Cf.* National Research Council, A Review of the use of Science and Adaptive Management in California's Draft Bay Delta Conservation Plan, 2011 ("NRC Review 2011"), at 2-3, 17.

There has been no analysis of BDCP's flow, sediment, food, temperature, and DO effects on water bodies downstream of Suisun Marsh. However, the Plan reveals that "the greatest difference in the mean DO value for any day of the year was 0.95 mg/L in Suisun Marsh during March." Draft Plan at 5.3-23. With no analysis of impacts farther downstream, potentially significant impacts to San Francisco Bay remain undisclosed. The March 2014 Delta Science Program Independent Review Panel agreed: "The current Effects Analysis does not consider the influence of shifting timing of withdrawals on San Francisco Bay circulation patterns and ecology. This is a significant omission with ecologically important implications." Delta Science Program Independent Review Panel Report, BDCP Effects Analysis, Phase 3, March 2014, available online at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta-Science-Independent-Review-Panel-Report-PHASE-3-FINAL-SUBMISSION-03132014_0.pdf ("DSP Independent Science Review Panel Report 2014") at 14 (incorporated by reference).

The State Water Resources Control Board has also expressed concern that the projected increase in Suisun Marsh salinity will degrade conditions for fish and wildlife. SWRCB, Comments on the Second Administrative Draft Environmental Impact Report/Environmental Impact Statement for the Bay Delta Conservation Plan, July 5, 2013 ("SWRCB 7/5/13 BDCP Comments") at 13. The DEIS/DEIR summarily states that BDCP will contribute to "measurable long term degradation," DEIS/DEIR at 8-426, and "would contribute substantially to the adverse water quality effects," *id*. at 8-428. But the effect of these adverse impacts on the downstream ecosystem, including San Francisco Bay, are not analyzed or disclosed in the draft EIS/EIR. In addition to potentially significant salinity impacts downstream of the BDCP Plan Area, the draft EIS/EIR fails to assess impacts on turbidity and sediment supply to the Bay. The March 2014 Delta Science Program Independent Review Panel Report states:

> …this isn't a conservation plan, but rather a conservation menu that generally fails to describe how major uncertainties will be resolved. For instance, while the Effects Analysis recognizes that suspended sediment has been declining in the Sacramento River and that the new diversions would remove an additional 8-9%, all analyses used a high and constant amount with no mention of downstream sediment effects on either Suisun or San Francisco Bay.

DSP Independent Science Review Panel Report 2014 at 13. The Delta Stewardship Council and other reviewers have also noted this flaw in the geographic scope of the effects analysis and DEIS/DEIR. *See* Delta Stewardship Council, Comments on the Bay Delta Conservation Plan Draft Environmental Impact Statement/Environmental Impact Report, June 24, 2014, at 12, available online at: http://deltacouncil.ca.gov/sites/default/files/documents/files/BDCP%20Comments%20Cover%20Letter%20and%20Final%20BDCP%20EIR-S%20Comments.pdf ("DSC BDCP Comments June 2014").

The Draft Plan also admits that there may not be sufficient sediment for marsh restoration, or even maintenance of existing tidal marsh, but it fails to analyze such impacts on tidal marsh habitats in Suisun Marsh and other areas downstream of the Plan Area. *See, e.g.*, Draft Plan at 5.3-24 to -25 ("The initial effect of tidal restoration is to decrease sediment supply downstream of the Plan Area…"). It states that BDCP's in-Delta ROAs "could also lead to greater water clarity in downstream areas such as Suisun Bay," and that there is "potential for lower water clarity in the LLT under the BDCP in portions of the Suisun Bay and West Delta subregions." *Id*. These short-term reductions and uncertain long-term sediment conditions, when combined with long-term sea level inundation of existing and restored marsh areas, could result in significant losses of marsh habitat in and downstream of the Delta. Yet the BDCP fails to analyze these potential impacts, and it proposes no mitigation measures to address such impacts. DEIS/DEIR figure 8-49 shows low turbidity in 2006 downstream of the major dams on the Sacramento River and Feather River. Missing from the DEIS/DEIR are turbidity values upstream of these dams or on tributaries that have a less-impaired sediment flow to the valley floor. Clearer water in San Francisco Bay as a result of BDCP could allow sunlight to penetrate the water column further. This could change the Bay's response to nutrient input, causing increased algal blooms and degraded water quality. *See* Delta Independent Science Board, Review of the draft EIS/EIR for the Bay Delta Conservation Plan May 15, 2014 ("Delta ISB 2014"), at B-12, available online at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Attachment-1-Final-BDCP-comments.pdf. Yet as the Delta ISB and other reviewers have noted, the Draft Plan and DEIS/DEIR fail to analyze and disclose the nature and extent of these likely environmental impacts.

I. The Draft Plan Fails to Adequately Define the Elements of Governance and Adaptive Management Associated with Plan Implementation and Fails to Meet Applicable Legal Standards

The governance structure and the Adaptive Management Plan are critical components of the BDCP. Governance sets forth who will implement the Draft Plan and how, providing assurances to plan participants as well as the public that the Draft Plan will be implemented fairly, transparently, and consistent with existing statutory and regulatory requirements. Adaptive management is widely recognized as a necessary element of an ecologically sustainable HCP/NCCP. Fish & Game Code § 2820(a)(2), (8), (b)(5), (f)(1)(G); HCP Handbook at 3-24; *see* 50 C.F.R. § 17.22(b)(2)(C), (b)(5). In the Services' Five Point Policy Guidance, the Service states that "[a]daptive management is an integrated method for addressing uncertainty in natural resources management." 65 Fed. Reg. at 35252.

As discussed below, the current version of the governance chapter and Adaptive Management Plan in the Plan and Draft IA has numerous problems.

1. The Adaptive Management Plan Lacks the Necessary Details to Support the Required Findings for Permit Issuance

Given the broad complexities of the BDCP, the Adaptive Management Program is an essential and critical part of this plan. Indeed, the Services acknowledged this in a white paper on the application of the Five Point Policy to the BDCP, in which they stated that,

> [t]here is substantial uncertainty regarding the effects on listed species of a new water conveyance system and of water withdrawal, combined with effects of other human activities and natural phenomena that are reasonably certain to occur, over a time period as long as 50 years. This uncertainty is compounded by both the complexity of the Delta ecosystem and the predicted future increases in temperature and climate variability.

BDCP 5-Point Policy Memo at 1.

In order for the Adaptive Management Program to work and for the Services to be able to make their required findings for permit issuance, the Draft Plan must include "an adaptive management plan that tests alternative strategies for meeting those biological goals and objectives, and a framework for adjusting future conservation actions, if necessary, based on what is learned." *Id*. at 2; *see also* HCP Handbook; 65 Fed. Reg. at 35252.

Despite the fact that there are entire sections of the BDCP devoted to the discussion of Adaptive Management, the Plan lacks a great deal of details on how the Adaptive Management Plan will be designed. In its review of the Draft BDCP, the Delta Independent Science Board commented that the "adaptive management process is not fully developed" and is "left to a future Adaptive Management Team." Delta ISB 2014 at 3, 8-9, 11; *see id*., Appendix A at A-13 to A-23. This lack of detail led the Delta ISB to conclude that they "have *substantial misgivings* about how well the proposed adaptive management process, as proposed, will actually function as a key component of BDCP." *Id.* at 9 (emphasis added).

i. There is no Basis to Conclude that the Adaptive Management Plan will Result in the Achievement of the Plan's Biological Goals and Objectives

As discussed supra in section I(C), the Plan and Draft IA makes clear that the BDCP biological goals and objectives are not enforceable and not a part of the permit requirements. This lack of enforcement undermines the credibility of the BDCP's Adaptive Management Plan. According to the Federal Agency White Paper, the BDCP is intended to be a "results-based" HCP, which means that the permittees will be given flexibility in managing the plan "as long as [the permittees] achieve the intended result (i.e., the biological goals and objectives)." BDCP 5-Point Policy Memo at 1; *see also* 65 Fed. Reg. at 35351. However, if the BDCP's biological goals and objectives are not enforceable, there is no guarantee that the Draft Plan, through the implementation of the Adaptive Management Program, will result in the achievement of these goals and objectives. In order to cure this problem, the BDCP biological goals and objectives should be made a part of the permit requirements, guaranteeing that they are reasonably certain to occur through the Adaptive Management Program.

ii. The Plan Fails to Adequately Describe how Operations or other Actions will be Modified Based on new Information as part of the Adaptive Management Plan.

The Adaptive Management Plan is lacking a large number of details, including how the Draft Plan will modify operations in light of new information. For example, the Delta ISB commented that the Draft BDCP lacked "measures needed to evaluate actions and make adjustments," including a failure to identify "'trigger points' at which adaptive management procedures would be initiated." Delta ISB 2014 at 8. Indeed, the Delta ISB commented in its letter that it agreed with the Delta Science Program's Independent Panel's review of Chapter 5 (Effects Analysis), which, among other things, criticized the BDCP for "[c]haracteriz[ing] adaptive management as the default solution to unresolved issues and uncertainties, without clear description of how adaptive management will actually be implemented or tied to monitoring." *Id.* at 10.

At the heart of the Adaptive Management Plan is the need to make changes to the Draft Plan's implementation, including operations, if new information indicates that changes are necessary to continue to achieve the Draft Plan's biological goals and objectives. Currently, the Decision Tree is at odds with effective adaptive management as it creates brackets that inappropriately limit the potential range of operations to preclude necessary improvements in outflows, fails to identify how the agencies would decide which of the Decision Tree operational alternative should be used, and fails to explain default or starting operations under the Decision Tree. *See* Draft Plan at 3.4-24 to -26. Many scientific reviewers have criticized the adaptive management framework for these and other reasons. Delta ISB 2014 at 3, 8-9, 11; *see id*., Appendix A at A-13 to A-23; Mount and Saracino et al. 2013 at 3, 83-84, 86-87, 99-105; DSP Independent Science Review Panel Report 2014 at 8-9, 15-16, 18, 20, 41-44. This bracketing creates limits in how adaptive management will be used to achieve biological goals and objectives. If the BDCP is committed to using best available science and adaptive management, the Draft Plan must not set artificial boundaries that limit operations where those operational limits are unlikely to result in the Draft Plan achieving its biological objectives, as demonstrated *infra*.

2. The AMP Lacks Scientific Independence

The Adaptive Management Team (AMT) is chaired by the BDCP Science Manager and has primary responsibility for the administration of the Adaptive Management Program. The AMT consists of representatives from DWR, Reclamation, federal water contractors, state water contractors, DFW, USFWS, and NMFS, all of which are voting members. The IEP Lead Scientist, the Delta Program lead scientist, and the Director of the NOAA Southwest Fisheries Science Center will serve as non-voting members of the AMT. In addition, the Science Manager is hired by the Program Manager, who is directed by the Authorized Entity Group (AEG), which is comprised of federal and state water contractors, DWR and Reclamation.

The current make-up and structure of the AMT blurs the distinction between regulated entities, scientists and regulators. Moreover, the Adaptive Management Program could be perceived as essentially run by the regulated entities since the Science Manager is hired by the Program Manager, who is overseen by the AEG.

Further, there is nothing in the Draft Plan demonstrating any kind of independent oversight of the BDCP Adaptive Management Program. There is some mention of coordinating with the Delta Science Program, but as noted by the Delta Science Program's Independent Panel, the Draft Plan lacks any clarity about the coordination with the Delta Science Program. Delta ISB 2014 at A-

20. It is absolutely critical that the BDCP Science Program and Adaptive Management Program contain a clear structure for independent science oversight.

Finally, it appears that the AMT may be allowed to operate almost entirely outside of public view. There is no requirement for AMT meetings to be open to the public in any meaningful way. Instead, the Draft IA states that the AMT shall open its meetings to the public "[o]n a periodic basis." Draft IA at 30. In order to foster transparency and credibility with the public, the AMT and its discussions must be more open to the public.

3. The Draft Plan's Governance Structures and Rules, Including those Governing the Adaptive Management Program, Violate State and Federal Law, and are Likely to Result in Paralysis

The Draft Plan and Draft IA detail a complex set of rules and structures for the implementation of the Plan, including the Adaptive Management Program. The Authorized Entity Group, the Permit Oversight Group, the Program Manager, the Science Manager, the Adaptive Management Team, and the Real Time Operations Team are at the core of the governance structure. The Plan details conflict resolution processes for each of these groups or teams as it pertains to specific types of decisions.

The Authorized Entity Group (AEG) will include four members: A representative from the state water contractors, a representative from the federal water contractors, the Director of DWR, and the Regional Director for Reclamation. The state and federal water contractors are likely to be members of the AEG as the Draft Plan and Draft IA anticipate making them permittees. There are no fish and wildlife agencies on the AEG. The AEG has numerous duties and responsibilities, including hiring the Program Manager, implementation and administration of the program, implementation and oversight of the implementation of the conservation measures (except for water operations), compliance monitoring and reporting, the production and approval of the Annual Work Plan, the production of the Annual Program Report, Annual Water Operations Report, and Five Year Comprehensive Review. The AEG also is involved in the selection of the Science Manager and heavily engaged in the decision-making of all aspects of the Adaptive Management Program. *See* Draft Plan Chapters 6 and 7.

The Permit Oversight Group (POG) will be comprised of the Regional Director of the USFWS, the Regional Administrator of NMFS, and the Director of DFW. The POG is involved in a variety of implementation and oversight duties involving the Program Manager, AEG and the Adaptive Management Plan. Of particular importance, the POG has input into the Annual Delta Water Operations Plan, but does not have any ability to require changes to that plan. *Id*.

The Program Manager will be hired by the AEG and essentially manages the implementation of the BDCP Program except for water operations. The Science Manager is hired by the Program Manager and chairs the Adaptive Management Team.

Finally, the Real Time Operations Team is in charge of real time operation of Conservation Measure 1. The Real Time Operations Team is comprised of one representative each from USFWS, NMFS, CDFW, Reclamation and DWR. The team will also include a representative each from the state and federal water contractors, but those two representatives will be non-voting members of the team.

As discussed below, the lines of authority and final decision-making are complicated and, for some decisions and groups, contradictory to current law or standards of transparent and effective decision-making.

i. The Governance Structure and Adaptive Management Program Violate the Delta Reform Act Requirement that the Fish Agencies Ensure the Achievement of the Biological Performance Measures with Respect to Water System Operations.

The Delta Reform Act requires that the fish agencies must be in a position to ensure that the biological performance measures in the BDCP's water operations are achieved.[31] However, under the Plan the fish agencies (as the POG) do not have approval rights for some of the key plans and decisions that would affect biological performance of the BDCP as it pertains to water operations. First, in the case of the Real Time Operations Team, it is not clear that the fish agencies have final decision-making authority if there is a dispute. According to the Plan, the Regional Director of the relevant fish agency may only have final decision-making authority if "the Director of the project agency concurs that the change is within their authority." Draft Plan at 3.4-27. If the Director of the project agency disputes that the fish agencies have authority to make the change, there does not seem to be any recourse other than the status quo. This approach does not meet the Delta Reform Act standard.

Second, the fish agencies are not in a position to ensure that biological performance measures in the BDCP's water operation will be achieved with respect to the Annual Water Operations Plan. Practically speaking, DWR and Reclamation have final authority and approval over those plans. While it appears that the POG may find that the Annual Water Operations Plan is unacceptable, it is in DWR and the Bureau's discretion to make changes to that plan and even after the dispute

[31] The Delta Reform Act provides that, "[t]he BDCP shall include a transparent, real-time operational decision-making process in which fishery agencies ensure that applicable biological performance measures are achieved in a timely manner with respect to water system operations." Cal. Water Code § 85321.

resolution process, DWR and the Bureau have final decision-making authority. Draft IA at 72. This approach does not meet the Delta Reform Act standard.

Third, the fish agencies do not have approval rights over the Annual Work Plans or Budgets other than providing written concurrence that the "draft adequately sets forth and makes adequate provision for the implementation of the applicable joint decisions of the Authorized Entity Group and Permit Oversight Group or decisions of the agency within the Permit Oversight Group with authority over the matter." Draft Plan at 7-12; Draft IA at 71. This language is a departure from the finding that the POG is supposed to make regarding the Annual Water Operations Plan. For that plan, the POG must ensure that it is consistent with the BDCP, Implementing Agreement, and regulatory requirements. Draft Plan at 6-23; Draft IA at 71. At a minimum, the POG should be required to make a similar finding for the Annual Work Plan. The lack of the fish agencies' ability to affect changes to the Annual Water Operation Plan is troubling since that plan is likely to include funding and staffing decisions and action that could affect biological performance measures with respect to water system operations.

Finally, the Plan currently shifts responsibility for a key part of adaptive management to the Adaptive Management Team with no decision-making authority by the fish agencies under the guise of "routine or administrative matters." Draft IA at 30-32. The IA defines "routine and administrative matters" as "reassessment of and modification to problem statement sand conceptual models." *Id*. at 30-31. However, a change to a problem statement or conceptual model is hardly a "routine or administrative" matter. At the beginning of the Plan's Adaptive Management chapter, conceptual models are listed as a key part of adaptive management. Draft Plan at 3.6-2, 3.6-15. Conceptual models link the biological objectives to proposed actions. By allowing the AMT to make changes to conceptual models and problem statements, the Plan removes the fish agencies from effectively ensuring that biological performance measures will be achieved. This is not only in violation of the Delta Reform Act, but it undermines the credibility of the Adaptive Management Program in its entirety.

ii. The Governance Structure and Adaptive Management Program Appear to Improperly Delegate Operation of the CVP

Numerous state and federal laws, such as the Central Valley Project Improvement Act (CVPIA), require that the SWP and CVP be operated by the state and federal governments, respectively. *See* Permittee Memo. Federal law prohibits delegating the Secretary's policymaking role and authority. *Id*. (citing *National Park and Conservation Association v. Stanton*, 54 F. Supp. 2d 7 (D.D.C. 1999)).

While the Plan appears to attempt to disentangle DWR and Reclamation from the state and federal water contractors for purposes of CVP and SWP operations, as detailed above, the very structure of the AEG (in which two of the four voting members are water contractors), with the presence of federal and state water contractors in the Real Time Operation Team as well as on the Adaptive Management Team creates a situation in which the water contractors will have special and undue influence in CVP and SWP water operations decision-making on a day-to-day basis and for the 50 year length of the permits.

In addition, there is some confusing language in Chapter 7 in which the Implementation Office structure is described as "contemplate[ing] that DWR and Reclamation will maintain their historical roles as operators of the SWP and CVP, but provides flexibility for changing those roles if so directed by Congress, the California Legislature, or through administrative process." Draft Plan at 7-22. While it is clear that Congress and the California Legislature may change the laws regarding who can operation the CVP and SWP, respectively, it is unclear what "administrative process" would allow for such a delegation of authority.

Finally, as discussed supra in section I(C), the state and federal contractors are legally unqualified to serve as permittees, and such status would inevitably influence the operation of the CVP and SWP. Permittees have an entirely different legal relationship to the BDCP than non-permittees.

iii. The Adaptive Management Team's Requirement of Consensus is Unworkable and a Barrier to Effective Adaptive Management

The AMT is required to operate by consensus, which means that if any one member of the group objects to a decision, there is no consensus of the team. Lack of consensus triggers a drawn-out process detailed in Chapter 7.1.6. This AMT structure is unwieldy and may result in delay. Delta ISB 2014 at 8 ("the organization structure may delay rather than expedite needed adjustments"); *id*. at A-19 ("Overall, this decision-making arrangement does not seem to bring enough authority and resources for adaptive management to be implemented decisively and in a timely way. With this structure, each cycle of adaptive management would probably occur very slowly, if at all.").

iv. The Dispute Resolution Process is Unclear and could lead to Decision-Making Paralysis or Purposeful Delay Tactics

The Governance Chapter and Draft IA detail a dispute resolution process that is vague and time-consuming. Draft Plan at 7-17; Draft IA at 66-67. First, in reviewing the details of this process, it appears that the process could take as little as six weeks or may have no end in sight. While the process details various 14 day deadlines, there does not appear to be any specified deadline in which the parties submit written positions to the panel and the panel is convened. In addition, since the decisions of the panel are non-binding, the real heart of this process is determining which entity has decision-making authority over which decision. While Table 7-1 provides some details for some of the bigger decision-making points/plans, this dispute process could be triggered on any number of other decision points. At a minimum, this process needs to be detailed and clarified.

In addition, there is some question as to the utility of the dispute resolution process including the process-laden panel. A positive view of this process is that it provides an additional forum to air differences. A negative view is that this could result in abuse by certain parties in an attempt to delay decisions and actions. In any event, this process could become a costly and time-consuming process if appropriate sideboards are not included in this section.

II. SIGNIFICANT MODELING FLAWS IN BDCP UNDERSTATE LIKELY ENVIRONMETNAL IMPACTS AND MUST BE CORRECTED TO PROVIDE ACCURATE IMPACT ASSESSMENTS

A. The Water Operations and Delta Hydrodynamics Modeling for BDCP Contains Errors and Faulty Assumptions, Which are Used as Input Data for Other Analyses, Resulting in Flawed Conclusions in the DEIS/DEIR.

The flawed use of the CALSIM II and DSM2 models for BDCP understates environmental impacts. The BDCP DEIS/DEIR warns: "Given the relatively generalized representation of the RPAs assumed for CALSIM II modeling, much caution is required when interpreting outputs from the model." DEIS/DEIR at 5A-B199. The CALSIM II model results are not just used for water operations, but are the basis for many other analyses, including Delta hydrodynamics, water temperature, fisheries (habitat, production, and survival), terrestrial habitat, economics, power generation and use, and recreation. There is often no disclosure of how much caution was used when CALSIM II input was used in these analyses. The BDCP Independent Scientific Review Panel also expressed concern over a "lack of consideration of propagation of errors or sensitivity analysis in linked models," and suggested a methodology for assessing uncertainty in linked models. DSP Independent Review Panel Report 2014 at 40-41.[32]

These CALSIM II model results that require "much caution" to interpret, *see* DEIS/DEIR at 5A-B199, are presented and used in other analyses at a level of specificity that is not cautious, propagates errors, and overstates certainty. According to DWR,

> CALSIM II provides a reasonable planning level simulation of existing project operations, recognizing that the operating environment and regulatory

[32] The report is available online at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta-Science-Independent-Review-Panel-Report-PHASE-3-FINAL-SUBMISSION-03132014_0.pdf and is included with the supplementary and supporting materials we have included on a CD with our written comments.

> requirements for the projects are in a constant state of transition and change. Since CALSIM II is not a detailed operations model, it does not capture many of the complexities of forecasted and actual operations of project facilities.

See California Department of Water Resources website at: http://baydeltaoffice.water.ca.gov/modeling/hydrology/CalSim/Downloads/CalSimDownloads/CalSim-IIStudies/Benchmark/index.cfm. These limitations of the CALSIM II modeling of the BDCP means that the Draft Plan and DEIS/DEIR are not capable of reproducing actual historic operations or likely future operations at the timescale and accuracy required to adequately analyze the environmental effects of the project.

The BDCP DEIS/DEIR states "The CALSIM II model is most appropriately applied for comparing one alternative to another and drawing comparisons between the results. This is the method in which CALSIM II is applied for the BDCP." DEIR/DEIS at 5A-A15. If the value of the modeling results is relative, with unknown or undisclosed relation to actual outcomes, then the BDCP DEIS/DEIR cannot accurately assess whether biologically relevant thresholds of significance are likely to be achieved, or how projected outcomes can be related to goals and objectives. With only relative modeling results presented in a way that fails to disclose context and uncertainty, it is difficult to assess the accuracy of the evaluation of whether the BDCP alternatives are likely to achieve the BDCP's biological objectives.

In numerous locations the CALSIM II and other physical model results are presented as if they were likely to be actual, not relative, results. Conclusions are commonly drawn without regard to the warnings cited above and they are not qualified with confidence intervals or reference to the level of uncertainty inherent in model outputs. This makes it hard to trust any of the modeling output. Examples of this lack of disclosure of uncertainty include:

- Relative to the NAA, average annual Delta exports under Alternative 4 Scenario H4 (HOS) are expected to decrease by 27 TAF. DEIS/DEIR at 11-52. This is equivalent to just 0.6% of the average annual export. There is no context provided for interpreting whether such a tiny deviation will actually materialize. There is no discussion of what the margin of error is for the modeled results—an important piece of information, given all the cautionary statements about use of model results. It is thus not possible to distinguish this extremely small projected decrease in exports under the HOS from a potentially substantial 18% increase in exports under the LOS.
- At times, multiple hydrodynamic models were compared, each generating unique results. Yet these differing results are often described in vague terms, with just a few selected examples. For example, DSM2 models ROAs (Restoration Opportunity Areas) as channels or reservoirs. It does not allow dry channels or reservoirs, *see* DEIS/DEIR Appendix 5A

Section D Attachment 4 at 6, and sets the depth of all ROAs to -10.1 feet to prevent drying. This extra volume has the potential for increased dilution of salinity and other constituents in ROAs. Despite adjusting channel roughness in DSM2 to match the tidal and flow range in the RMA model, *see* DEIS/DEIR Appendix 5A Section D Attachment 4 at 10, there is not good agreement between the models at Prisoners Point and there is a "slight" underprediction of flows toward the Sacramento River in DSM2 at Three Mile Slough. *Id*. at 11. Differences due to the ROAs are "considered to be within acceptable limits for the purpose of this analysis," *id*., however the acceptable limits are not disclosed, and without peer review, this statement lacks both specificity and credibility.

- UnTRIM-model-predicted salinity at Jersey Point was 20% below observed values and DSM2 was about 20% higher than observed. UnTRIM underpredicts salinity in central and south Delta while DSM2 did "well," so UnTRIM was used here only to corroborate trend with sea level rise. DEIS/DEIR Appendix 5A Section D Attachment 4 at 13. No information is given why UnTRIM underpredicted salinity in these areas, and whether the flaw affecting salinity might also affect sea level rise predictions. The reason why the 2002-2003 period was chosen for corroboration was not explained—was there adequate variation during this period representative of the variation predicted with the project, including potential ROA configurations and sea level rise?
- The range of outcomes from TRIM/RMA versus DSM2 and CALSIM II is limited to only one potential set of Restoration Opportunity Area (ROA) configurations. *See* DSP Independent Science Review Panel Report 2014 at 41. The ROA configuration significantly influences hydrodynamics in the Delta, *id*., yet details of the ROA configuration are not provided, nor is a sensitivity analysis to other potential ROA configurations. The result is poor model agreement when the Delta Cross Channel is open, and more uncertainty in the results of all related analyses, including salinity distribution and attainment of water quality standards.

If modeling studies are to characterize that multiple environmental objectives of the BDCP can be met, modeling assumptions must adhere to the same principles as the operating criteria. This is not the case with the physical models used by BDCP, where many unjustified or incorrect assumptions have been made. Unrealistic modeling assumptions (we expand upon these below) include:

- Generalized representation of RPAs (in CALSIM II) resulting in unreliability of model output used for other analyses;
- Use of X2 estimates from CALSIM II that are unusable for comparison with actual historic operations and conditions , resulting in a lack of disclosure of the likely pattern of water management or the ability to attain other objectives;

- The BDCP version of CALSIM II underestimates north Delta exports, overestimates south Delta exports, overestimates net Delta outflow, and underestimates total exports, resulting in flawed input to every analysis that uses CALSIM II flows and exports in the Delta.
- Use of physically unjustified dispersion coefficients in DSM2-QUAL resulting in inconsistent model performance and unreliable results spatially and temporally;
- Failure to account for full residence time of particles diverted and returned to Delta waterways by agricultural diversions (in DSM2) resulting in a lack of disclosure of likely longer residence times and associated water quality impacts;
- Incorrect assumption that components in the particle tracking model (DSM2-PTM) act in a conservative manner throughout the system resulting in the failure to properly characterize the transport and residence time of water quality constituents;
- No changes in upstream reservoir management in CALSIM II based on downstream river temperatures, resulting in a lack of disclosure of likely reservoir operations and releases or ability to attain water quality and other objectives;
- Failure to properly modify operations enough to eliminate or reduce EC exceedances, resulting in a lack of disclosure of the water management required to achieve compliance or ability to attain water quality and other objectives;
- Failure to account for reasonably foreseeable water supplies and conservation opportunities, resulting in unrealistic operations.

In addition to the inability to convert modeling results into likely real-world impacts (their "relative nature") and the false precision accorded to some, but not all, of these outputs, the results of the BDCP modeling analyses are at times simply incorrect. For example, the X2 results in CALSIM II are not consistent with other studies, rendering them unusable for comparison. The ANN model approximates DSM2 model-generated salinity, and is used in CALSIM II to calculate X2. DEIS/DEIR at 5A-A7. But X2 calculated by CALSIM II using the ANN model differs substantially from that determined by the relationship with Delta outflow as calculated by Jassby et. al. 1995. *See* Mount and Saracino et al. 2013 at 48. The Jassby equation has been used by previous studies of X2-fish relationships, is used by DWR in the DAYFLOW program, and is the equation recommended by the Interagency Ecological Program. *See* Delta Science Program, Panel Report, Workshop on Delta Outflows and Related Stressors, May 2014 ("DSP Outflows Review Panel Report 2014"), at 8, available online at http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta-Outflows-Report-Final-2014-05-05.pdf.[33] No explanation is given why the BDCP analysis fails to provide a calibration of the CALSIM II methods with the Jassby methodology or with actual X2. As presented, the X2 results in the DEIS/DEIR cannot be compared to numerous other studies that have documented Delta outflow needed to produce specific benefits in this ecosystem. As a consequence, the

[33] This review also found substantial discrepancies between modeled and actual X2 locations, particularly when X2 is seaward of 56 km or landward of 81 km. *Id*. at 12.

DEIS/DEIR presents contextually confusing X2 results that make it difficult for the public and decision-makers to adequately evaluate the DEIS/DEIR's outcomes and conclusions. This information is then used to arrive at a potentially erroneous and inadequate assessment of the environmental consequences of BDCP. A proper approach would be to calibrate the two X2 models with observed data and reveal in the EIR-EIS how the models differ and the implications of those differences for different analyses that depend upon CALSIM II X2 output.

Another example of incorrect results from the CALSIM II modeling is due to a flaw that was not fixed in the BDCP-modified CALSIM II model. An independent effort found that the BDCP version of the CALSIM II model underestimates the north Delta diversions by 700,000 acre-feet per year, and overestimates the south Delta diversions by 500,000 acre-feet per year. *See* MBK Engineers 2014.[34] Their review concluded that BDCP would result in 34% less Delta outflow and 41% more export than is disclosed in the BDCP DEIS/DEIR. This 200,000 acre-foot overestimate of net Delta outflow in the BDCP version of the model results in an unrealistically rosy picture of Delta outflow in the DEIS/DEIR, and thus the DEIS/DEIR understates the environmental impacts on species dependent on Delta outflow. *See also* Mount and Saracino et al. 2013 at 48, 64-66. At times the expected Delta outflow won't actually materialize under BDCP because the water can be exported or stored upstream. The incorrect proportion of exports between north and south in the BDCP model is also a problem because it results in flawed conclusions about changes in residence time, Old and Middle River flows (OMR) and entrainment, Sacramento River flows (and salmonid survival rates), and other effects of the north Delta diversions. Residence time in the south Delta will be much greater than BDCP discloses, and the effects of the north Delta diversions (on flow, entrainment, sediment, etc.) will be much greater than disclosed. These errors also affect the water supply analysis in the DEIS/DEIR, since the timing of diversions will differ from the timing derived from BDCP modeling. This has cascading effects on all of the other analyses that depend on CALSIM II, including the analysis of upstream reservoir operations and of export timing and magnitude, as well as Delta hydrodynamics and fisheries impacts. BDCP must revise the CALSIM modeling to correct this significant error, which propagates through virtually all of the environmental analyses. Without such revisions to the models, the entire BDCP Effects Analysis fails to accurately assess likely environmental impacts and is inadequate.

In addition, the lack of adequate validation and calibration of the DSM2 model leads to it overestimating salinity in the summer and fall and underestimating salinity in the winter and spring, which has significant environmental impacts that are not identified in the document. We

[34] Walter Bourez of MBK Engineers gave an initial presentation of their modeling results to the Delta Stewardship Council's Independent Science Board on January 17, 2014. That presentation is available online at: http://deltacouncil.ca.gov/get-document/7219. We understand that a more detailed review will be submitted as formal comments to BDCP.

have previously noted the failure to properly validate and peer review the BDCP-altered CALSIM II and DSM2 models. *See* TBI, EDF, CCWD 12/21/11 letter at 10-11. In their efforts to update the DSM2-QUAL model, BDCP modelers failed to calibrate and validate the model appropriately for prediction of EC. This results in spatial and temporal unreliability, under and overestimates of the amount of certain types of habitats, the false attainment or non-attainment of water quality standards, and incorrect estimates of the amount of freshwater flow needed to attain those targets.

DSM2 consists of three linked models: HYDRO, QUAL, and PTM. The DSM2-HYDRO model predicts hydrodynamics in the Delta. The BDCP-modified DSM2-QUAL model predicts EC (a measure of salinity, which is a key attribute of environmental conditions for most aquatic organisms) and other water quality parameters in the Delta under the BDCP alternatives. DSM2-QUAL was last calibrated in 2000 prior to the BDCP calibration. To calibrate the model, channel dispersion factors (increased dispersion causes greater salinity transport) were changed. In contrast to the much better performance (i.e. model output more closely matches observed data) of DSM2-HYDRO (hydrodynamics) compared to the 2000 calibration, changes in DSM2-QUAL model performance (EC) are inconsistent, and "the EC results indicate slightly worse performance compared to the previous calibration." DEIS/DEIR Appendix 5A, Section D, Attachment 1 at 6-2, 6-4. Problems with the EC calibration include:

- Dispersion coefficients were changed in an ad hoc manner to get better performance (model matches to the observed data) at Emmaton (a compliance point), however this resulted in worse performance at Old River at Holland Cut, South Delta export locations, and Rio Vista compared to the 2000 calibration. This also resulted in a low point in dispersion coefficients at Rio Vista, which according to the DEIS/DEIR "may not be justifiable from a physics standpoint and should be addressed in subsequent analyses." DEIS/DEIR Appendix 5A, Section D, Attachment 1 at 6-2. No subsequent analysis was performed for the DEIS/DEIR. DEIS/DEIR Appendix 5A Section D Attachment 1 Table 6-1 shows the dispersion factors that were changed—but it does not disclose which changes are physically justifiable in the real world. Using unjustifiable dispersion coefficients means that water quality results and conclusions drawn from DSM2-QUAL outputs for individual stations are suspect and may not be representative of the likely conditions under BDCP. Given these flaws, the DEIS/DEIR states that the lower Sacramento River stations should be viewed as a group. DEIS/DEIR Appendix 5A, Section D, Attachment 1, Table 6-3. However the results are not presented as a group, and instead BDCP inappropriately focuses on results at individual stations, such as the Emmaton compliance point.
- BDCP modelers failed to use a different validation period than the calibration period. Use of a separate validation period is a standard modeling practice that ensures the model calibrations are relevant to other time periods. Using the same calibration and validation

periods is flawed because model assumptions may not be correct during different periods of time. This calibration used the eight years 2001-2008 based on a discussion with DWR staff that concluded there was a need for a long period with dry years. Unfortunately, the decision to use this long calibration period resulted in an invalid validation, since development of a separate validation period (a standard practice) did not occur due to lack of EC data outside of that period. DEIS/DEIR Appendix 5A, Section D, Attachment 1, Section 6. Without validating the model against another time period, the unjustified calibrations discussed above enable the model to match the 8-year calibration period chosen but their relevance to other time periods is unknown. As a probable consequence, DSM2-QUAL overestimates salinity in summer-fall and underestimates salinity in winter-spring. DEIS/DEIR Appendix 5A Section D Attachment 1 at 6-2, 6-3. It also performs worse outside of dry and critical years. DEIS/DEIR Appendix 5A, Section D, Attachment 1 at 7-1.

- EC boundary conditions at the upstream and downstream edges of the modeled area were not verified, but flow and stage verified with 2001-2004 data, and mismatches were corrected to use observed flows. DEIS/DEIR Appendix 5A, Section D, Attachment 1 at 2-4. The need for flow and stage corrections during the 2001-2004 verification period indicates that mismatches outside of that period should have been corrected as well, yet no verification outside that period occurred. No explanation for the differences is given, leaving the impression there is a lack of understanding of why the model differs so much from reality during the verification period: Mokelumne River 9% of the time, Calaveras River 2% of the time, Sacramento River 1% of the time. Presumably mismatches occur outside the verification period at the same rate. The implications of the mismatches on model accuracy and the lack of corrections outside the verification period cast doubt on modeled results and on the quality of the analysis of the environmental impacts of BDCP.

The DEIS/DEIR concludes that, "the channel dispersion factors were modified to simulate EC accurately." DEIS/DEIR Appendix 5A, Section D, Attachment 1, Section 7-1. Yet this is not the case since performance is often worse, and the changes were not justified, and the validation failed to use a different period than the calibration period.[35]

Despite the improved ability of the BDCP version of the DSM2-HYDRO model to predict hydrodynamics, the BDCP DEIS/DEIR identifies problems noted a decade and a half ago that remain unfixed in the hydrodynamics modeling. The DSM2-HYDRO model could have a datum problem at Rio Vista, where tidally-averaged stage is .7 feet lower than the observed water

---

[35] Calibration and validation have been defined by the American Society of Testing and Materials, as follows (ASTM, 1984. Standard Practice for Evaluating Environmental Fate Models of Chemicals. Designation E978-84. American Society of Testing Materials. Philadelphia, PA. 8 p.): Calibration - a test of the model with known input and output information that is used to adjust or estimate factors for which data are not available. Validation - comparison of model results with numerical data independently derived from experiments or observations of the environment.

levels. This is similar to the error observed during the 2000 calibration effort. No additional investigation appears to have occurred and there is no mention of the feasibility of fixing this error. Due to this error, "tidally-averaged metrics were not used as the key metric in assessing the stage calibration." DEIS/DEIR Appendix 5A, Section D, Attachment 1 at 4-5. However the implications of the lack of access to a reliable tidally-averaged metric are not explained. The possible relationship of this error in DSM2-HYDRO to the physically unjustified low point in dispersion coefficients at the same location in DSM2-QUAL is also not discussed. These seem likely to be related, and perhaps a simple resurvey of the datum used at Rio Vista would solve both errors. This is important because an error in the DSM2 model known for over a decade was not fixed when it was potentially feasible to do so, there was no disclosure of the steps needed to fix the error, and that error is in a location that has an important influence on tidal flows, salinity, and freshwater outflow. Failure to fix a basic error propagates that error in all the scenarios modeled. In a system with so much uncertainty, and so many important resources at stake, BDCP modelers must attempt to fix errors where they are identified, and identify why it is infeasible to fix errors when it is difficult to do so. The presence of such an error, even if limited in scope and significance, is an example of how BDCP's flawed modeling approaches have resulted in other errors we have discussed here. These compounded errors and faulty assumptions make the BDCP modeling an unreliable foundation for all the analyses discussed in the DEIS/DEIR.

The particle tracking model, DSM2-PTM, as used in the DEIS/DEIR Chapter 8 water quality analysis (and described in DEIS/DEIR 5A-A54) likely underestimates residence time, resulting in an underestimate of BDCP's impacts on water quality. Particles are removed from the system when they are diverted by agricultural intakes within the Delta, reducing residence time. Many constituents are not consumed by agriculture, so when the water is discharged back to Delta channels, the constituents return to Delta channels, concentrated by consumptive use. We stated previously, *see* 12/21/11 TBI, EDF, CCWD letter, at 13-14, that the analysis should be modified to properly account for the true residence time in the system. NMFS agreed that the DEIS/DEIR Chapter 8 water quality analysis is flawed. In a July 5, 2013 letter, NMFS stated:

> CALSIM and DSM2 were used for all constituents (with additional organism tissue models for selenium and mercury). However, DSM2 only directly models electrical conductivity (EC) and dissolved organic carbon (DOC). Other constituents were modeled as relationships to EC or using mass-balance calculations and outputs from CALSIM and DSM2 with the assumption that the constituents act in a conservative manner throughout the system, which is not universally applicable and could lead to inaccurate results. This method also results in a hybrid analysis which produces numerical output (seemingly quantitative) that is actually intended to be considered "qualitative" for several very important parameters such as DO, nitrogen, phosphorus and turbidity [see

Table 8-61]. This approach also does not take into account the likely interaction of constituents, such as that between DO and DOC, or DO and temperature.

NMFS 2013, "Big Picture" Issues for the 2013 Admin Draft BDCP EIR/EIS, at 6, available online at:
http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Federal_Agency_Comments_on_Consultant_Administrative_Draft_EIR-EIS_7-18-13.sflb.ashx.

The DEIS/DEIR acknowledges problems with DSM2-QUAL as well, cautioning that, "[s]ignificant uncertainty exists in flow and EC input data related to in-Delta agriculture, which leads to uncertainty in the simulated EC values. Caution needs to be exercised when using EC outputs on a sub-monthly scale." DEIS/DEIR Appendix 5A, Section D, Attachment 1 at 7-2. Yet elsewhere the DEIS/DEIR incautiously claims that DSM2 can show daily or less time steps, "which can help understand how salinity moves within the system with more accuracy than CalSim." DEIS/DEIR Appendix 5A, Section D at 5A-208. The limited sub-daily accuracy of the model, when combined with the flawed water quality analysis, casts doubt on the value of the results. A proper approach would be, as suggested by NMFS, to explore additional analytical methods that can better characterize anticipated water quality conditions in the system, or to use smaller-scale models that focus on particular areas of concern.

TBI and others have discovered the modeling flaws cited above. It is entirely possible that there are additional unknown flaws and errors in the CALSIM II and DSM2 modeling. We and others have commented before that the models, including the recent modifications, need to be fully documented and properly validated and should undergo a peer review. 12/21/11 TBI, EDF, CCWD letter, at 10-11; *see also* "Comments on CALSIM II" from the Environmental Defense Fund, September 14, 2001. The modeling tools (described in DEIS/DEIR Appendix 5A) that simulate statewide operational changes for the SWP and CVP (CALSIM II) and hydrodynamics and transport within the Delta (DSM2) have known limitations in forecasting water supply and water quality conditions in the current configuration of the Delta. These same model tools have undergone numerous changes by the BDCP project team to implement the new OCAP BiOps under current conditions and to forecast conditions in a radically altered Delta. Although long overdue, the additional documentation provided in the public draft is welcome. However, proper validation and peer review are still missing.

B. Certain Water Quality Modeling Assumptions are Inconsistently Applied between Alternatives, Fail to Comply with D-1641 Requirements, and Fail to Reflect Likely Management during Droughts

In addition to some of the salinity problems identified above, the DEIS/DEIR and Draft Plan also contain additional modeling problems and assumptions regarding compliance with existing water quality standards.

First, D-1641 water quality standards require salinity compliance at Emmaton. BDCP proposes to move this compliance location to Three Mile Slough. The document also uses an inconsistent EC compliance point—Emmaton for Existing Conditions and the No Action Alternative, and Three Mile Slough for the proposed project. Due to this inconsistency, BDCP fails to adequately disclose the effects of moving the compliance point, since they aren't presented separately from the effects of BDCP's proposed water management and restoration. This proposal would reduce Delta outflow and harm fish and wildlife. Yet all of the alternatives—including the No Action Alternative--result in modeled exceedances at both locations, meaning all of the alternatives generate estimates that D-1641 standards will not be met, during some year types, for some of the required durations. DEIS/DEIR Appendix 8H, at Tables EC-1 through EC-20. The document claims that "many" of these are model anomalies, *see* DEIS/DEIR Appendix 8H, at 8H-1, but as a result of these repeated anomalies in the data, a meaningful evaluation is impossible.

BDCP not only proposes (without any scientific justification) to eliminate the Emmaton EC compliance point, but it conflates this location with Three Mile Slough. The presentation of Emmaton EC and Three Mile Slough EC as equivalent in the BDCP DEIS/DEIR is misleading. DEIS/DEIR Appendix 8H tables EC-1 through EC-20 show exceedances of Water Quality Control Plan objectives for each alternative. The State Water Board previously recommended using Emmaton as the compliance location in the modeling for all of the alternatives, SWRCB 7/5/13 BDCP Comments at 21-22, yet the BDCP DEIS/DEIR fails to do this: the first row of each table (except EC-11) compares the effects on EC at Three Mile Slough under the alternatives to EC at Emmaton under Existing Conditions and the No Action Alternative. This juxtaposition of the two locations implies they are equivalent, however the second row of each table shows that EC exceedances at Emmaton are expected to occur a much greater percentage of the time than at Three Mile Slough under all scenarios evaluated. This comparison reveals that it is incorrect and misleading to say that EC at Three Mile Slough is the same as EC at Emmaton under any alternative, including No Action and Existing Conditions, and the first row of each table conflating the two locations should be deleted or modified. Since the model appears to be capable of estimating the difference in EC between the two locations under each alternative,[36]

[36] As stated above, the EC analysis is substantially flawed. The DEIS/DEIR admits that water quality results and conclusions drawn from DSM2-QUAL outputs for individual stations are suspect and may not

the table should be modified with actual model output for the Existing Conditions and No Action alternatives at Three Mile Slough. The DEIS/DEIR cannot conflate results for Emmaton and Three Mile Slough. The tables beginning at EC-12 show color-coded results from analyses that were performed on the erroneous comparison—in addition to deleting this top row, any results and conclusions from it that were used elsewhere should be deleted as well.

The actions of DWR and USBR this year demonstrate that the EC differences between Emmaton and Three Mile Slough are real and that results for the two sites should not be conflated. For instance, the April 9, 2014 Temporary Urgency Change request to the Water Board proposed that while emergency drought barriers are in place, "The compliance location for the D-1641 Agricultural Western Delta Salinity Standard at Emmaton (14-day running average of 2.78 millimhos per) is moved to Three Mile Slough on the Sacramento River." DWR and USBR, April 9, 2014, request for Temporary Urgency Change, at 5, available online at: http://www.swrcb.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/031814order_urgchg_swcv/20140409_petitioners_request.pdf (incorporated by reference). DWR and USBR further explained:

> These two forecasts show a gain of 149,000 AF in cumulative end of September carryover storage between all reservoirs as a result of implementing the emergency drought barriers. However, as described below, this savings in storage would only be achieved if the D-1641 Agricultural Western Delta Salinity Standard at Emmaton is set aside while the emergency drought barriers are in place. If hydrologic conditions warrant that sufficient water is available in upstream reservoirs to maintain this Emmaton standard, or a modification of the standard that would move the compliance point to Three Mile Slough on the Sacramento River, emergency drought barriers would not provide any savings in Delta outflow needs or end of September carryover storage in upstream reservoirs.

Id.[37] The models are "trained" to modify operations to meet the EC standard, although the training is never perfect and generally a few exceedances are found in planning model runs.

---

be representative of the likely conditions under BDCP, and therefore the lower Sacramento River stations should be viewed as a group. DEIS/DEIR Appendix 5A, Section D, Attachment 1, Table 6-3. Given that the numbers in the tables are incorrect, our discussion here focuses on the misleading presentation of the results, and not the likely erroneous results themselves.

[37] This and other elements of the 2014 Temporary Urgency Change Petitions and Orders raise additional concerns regarding future compliance with water quality and other regulatory standards during dry and drought conditions. BDCP provides no information regarding how often TUCs like this one would be requested, and does not analyze the impacts of such requests. This is yet another undisclosed impact of BDCP. DEIS/DEIR Appendix 8H-1 is misleading where it states that "DWR and USBR have every

However, the BDCP runs show far more frequent and extreme exceedances than has been commonly observed in previous planning studies. Tables EC-1 through EC-20 show greatly varying exceedances at Emmaton and Three Mile Slough for each alternative. The DEIS/DEIR Appendix 8H-1 (additional descriptions of the model limitations related to the water quality modeling results are found in Appendix 5A) states that "many" exceedances of D-1641 standards are model anomalies, and "DWR and USBR have every intention of operating SWP and CVP facilities by fine tuning reservoir storage and exports in real time to meet D-1641 standards, and any changes to D-1641 as adopted by the SWRCB." DEIS/DEIR Appendix 8H at 8H-1. This statement, when combined with the prevalence of exceedances in the model results, raises many unanswered questions:

- What proportion of the exceedances are anomalous? Which of the EC exceedances are model anomalies, and which are expected to occur under BDCP?
- Is the ability to meet water quality standards more achievable under some alternatives than others?
- If the intent is that each alternative will result in exceedances 0% of the time, and all cases of exceedance are model anomalies: 1) why is there so much variance in the anomalies; 2) what is the purpose of presenting the anomalies without more context, such as error bars; 3) how were these results used in the analysis; 4) what evidence is there to show that there will be no exceedances under any alternative; and 5) under what conditions would exceedances be unavoidable and how often would this situation occur?
- If the intent is that exceedances will be minimized, but real differences in EC compliance exist between the alternatives, then the anomalies should be better-characterized so that only the real differences between the alternatives are presented. The way the results are presented combined with the disclaimer, the analysis is not useful, and does not enable a decision maker or the public to answer any of the questions posed above.

The DEIS/DEIR states that, "If necessary, comparisons of model results against threshold or standard values should be limited to comparisons based on cumulative probability distributions." DEIS/DEIR Appendix 5A, Section C, at C6. Yet the exceedance of a standard should result in probabilities close to zero, and the lack of such output indicates that the models are inaccurate.

---

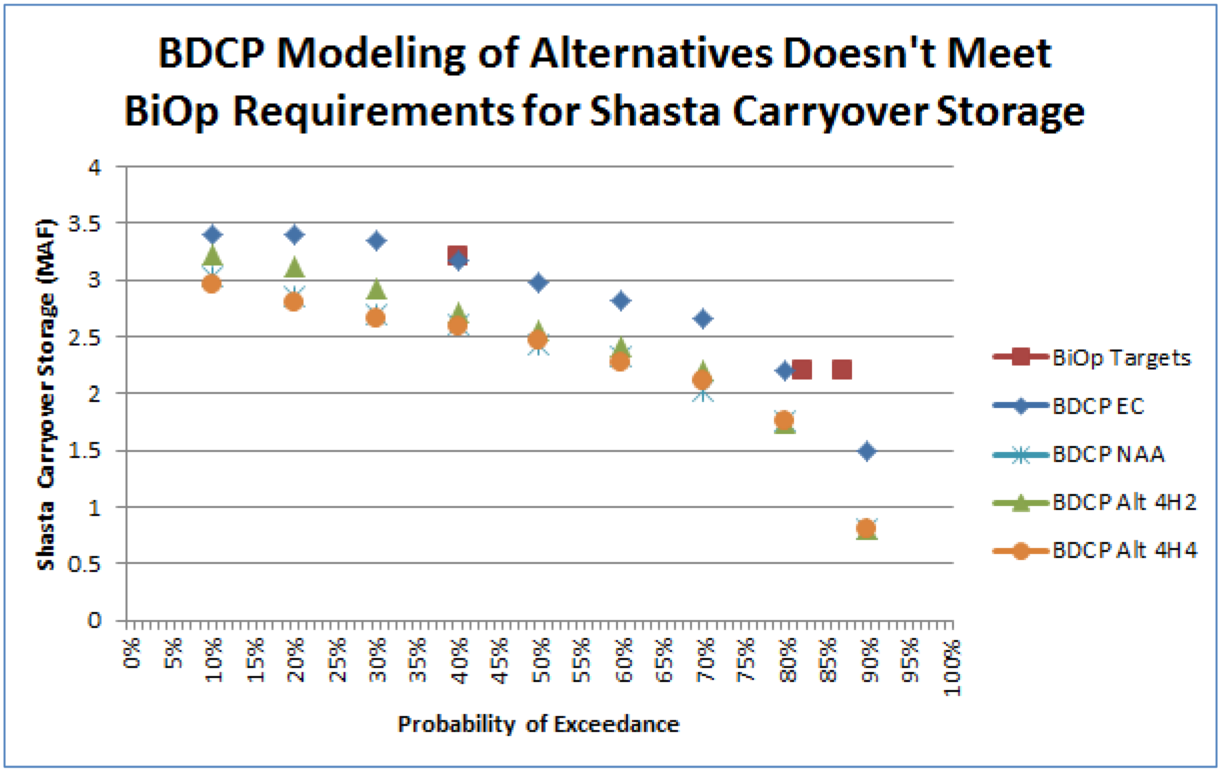
intention" of meeting D-1641 standards. This does not seem to be the case in certain dry years such as 2013 and 2014, and the effects of similar relaxations of water quality standards and other environmental requirements in the future are not analyzed or disclosed in the DEIS/DEIR, despite the fact that such changes are reasonably foreseeable. According to the 2014 independent panel review of delta outflow and other stressors, "The average measured Delta outflow during fall 2013 was approximately 2,000 cfs, which failed to meet the Board's minimum outflow requirement of 3,000 to 3,500 cfs for fall months of a critically dry year." DSP Outflows Review Panel Report 2014 at 15. Likely future waivers and relaxations of standards modeled in BDCP are yet another example of how the modeling of BDCP fails to accurately assess likely environmental impacts.

Second, D-1641 sets limits on south Delta exports based on Delta inflow, known as the export:inflow ratio (E/I ratio), during certain months of the year. The inconsistent application of the allowable E/I ratio to the different alternatives and scenarios, *see* DEIS/DEIR at ES34-ES35, is a long-standing problem with the BDCP modeling. BDCP defines the D-1641-E/I ratio—except in scenarios H2 and H4—to ignore both the inflow to the Delta being exported by the proposed north Delta intakes and those exports, thus exempting the north Delta intakes from compliance with the D-1641 export/inflow requirement. In contrast, the intent of the D-1641 E/I ratio is to limit pumping by the CVP/SWP to a fraction of Delta inflow, regardless of where the CVP/SWP intakes are located. The sensitivity analysis memo (DEIS/DEIR at 5A-D148) characterizes the approach taken in H2 and H4—the NMFS approach—as minimally different from the BDCP approach, and if this is the case, then it is unclear why a single approach was not universally followed for clarity and simplicity. Using an inconsistent E/I ratio introduces complexity, confusion, and obfuscation where there is no need for it, hampering the transparent and concise disclosure of impacts to decision makers and the public.

C. <u>The DEIS/DEIR Fails to Incorporate CVP/SWP Legal Constraints on Upstream Water Temperature in its CALSIM II Modeling, Resulting in a Failure to Adequately and Accurately Assess the Effects of Current and Proposed Operations Both Upstream and in the Delta</u>

The BDCP CALSIM II modeling fails to accurately model how reservoirs would be operated to adapt and minimize the effects of climate change and project operations on listed species and water supply, leading to inaccurate modeling results that likely underestimate environmental impacts of BDCP in the Delta. Once again, the documents offer yet another modeling disclaimer, noting that the model results may be unlikely to actually occur: "…the BDCP does not change Shasta Reservoir and upper Sacramento River operating criteria, so that changes in upstream areas derived from modeling, be they positive or negative, may not be fully reflective of the nature of actual changes that could occur." Draft Plan at 5.5.3-45. The modeling appendix shows markedly decreased end-of-year storage in Shasta Reservoir under the proposed project late long-term scenario (and even under the No Action Alternative). DEIS/DEIR 5A-C42 to 5A-C45. BDCP CALSIM II model projections for carryover storage at Shasta Reservoir do not attain those required by the NMFS 2009 Biological Opinion (RPA Action 1.2.1 at 592). In particular, as the graphic below shows (based on information in the DEIS/DEIR), the that the carryover storage targets of 2.2 MAF in 82% and 87% of years and 3.2 MAF in 40% of years in the 2009 biological opinion are not attained.[38]

[38] The DEIS/DEIR fails to demonstrate whether operations will achieve the 2009 NMFS biological opinion's performance measures for temperature compliance points on the Sacramento River, but it would



The NMFS RPA prescribed these carryover storage targets as the minimum necessary to protect winter-run Chinook salmon (and other listed salmonids) spawning in the Sacramento River. They also provide ancillary protection to fall run Chinook salmon spawning in the same rivers. Modeled operations for all BDCP alternatives lead to significantly worse operational effects upstream on salmon than the minimum required under existing biological opinions.

In contrast, modeling of existing conditions comes close to achieving the NMFS carryover storage targets for Shasta, and the independent effort by MBK Engineers appears to have used CALSIM II to correctly model BDCP with the required NMFS 2009 Biological Opinion exceedances. Modeling in BDCP needs to be revised to achieve these carryover storage requirements of the 2009 biological opinion, as these other efforts demonstrate that such modeling is feasible and has already been prepared.[39]

---

appear unlikely given the failure to achieve carryover storage targets. 2009 NMFS Biological Opinion at 592.

[39] In addition, modeling BDCP operations that fail to achieve the carryover storage requirements of the 2009 NMFS biological opinion is not consistent with the objectives of the Draft Plan. *See, e.g.*, Objective WRCS3.1 for winter-run Chinook salmon, which states that the BDCP will, "Implement covered activities so as to not result in a reduction of the primary constituent elements of designated critical habitat for winter-run Chinook salmon upstream of the Plan Area).

Unrealistic reservoir management (even under the No Action Alternative) is another significant modeling flaw that makes analyses of downstream operations and environmental impacts inaccurate and unreliable. In order to meet existing reservoir carryover storage targets, BDCP likely will have to reduce reservoir releases as compared to modeled operations, which will have cascading impacts on downstream operations (e.g., Delta outflow, Delta inflow, and exports) and on environmental impacts to fish and wildlife.

In addition, these same flawed modeling assumptions also result in additional drawdowns of Trinity Reservoir, *see* DEIS/DEIR Appendix 5A at C10, which would affect that river's Coho and Chinook salmon populations at well as its steelhead. As with the Shasta Reservoir modeling, these drawdowns occur even under the No Action Alternative. These impacts should not and are unlikely to be allowed to occur. As a result, the modeling is unrealistic and misrepresents likely water management and likely environmental impacts under BDCP.

D. <u>Modeling of Operations Relating to the High Outflow Scenario are Flawed, and Demonstrate that the High Outflow Scenario is Not Reasonably Certain to Occur in Many Years</u>

BDCP's assumption that outflows sufficient to meet the High Outflow Scenario (HOS) will occur when needed is flawed, and the current approach to achieving the HOS does not appear reasonably certain to occur. BDCP plans to release the enhanced spring outflow in the Alternative 4 High Outflow Scenario from Oroville Reservoir in order to avoid impacting storage in other reservoirs. However if end-of-May Oroville storage is projected to be less than 2 MAF, additional flow is not released, nor is flow released above the 17,000 cfs power house capacity. In drier years, only export curtailment is used to achieve the HOS spring outflow, unless exports would be less than 1500 cfs. The DEIS/DEIR does not clearly document how often these combined limits are expected to prevent the HOS spring outflow from occurring. The end-of-May storage offramp is expected to occur 30% of the time, *see* DEIS/DEIR, Appendix 5A, at C73, and the 1,500 cfs export offramp is expected to occur as much as 40% of the time, *see* DEIS/DEIR, Appendix5A, at C320. As such, it appears that the BDCP HOS will not be achieved a significant portion of the time, contrary to the assumptions in the environmental analyses.[40]

In addition, the proposed reoperation of Oroville Reservoir to achieve the High Outflow Scenario should be peer reviewed. NMFS has commented in the past that:

[40] The 2014 review of BDCP modeling by MBK Engineers also found significant flaws in the modeling of the High Outflow Scenario.

> the potential temperature compliance point included in the Dec 2012 Settlement Agreement for Licensing of the Oroville Facilities… would require compliance to 64° F from May-September in the high flow channel, and the Robinson Riffle criteria for protection of spring-run Chinook in the low flow channel, which could be affected as a result of changes in end of May storage and resulting diminishment of the cold water pool. Because of the potential biological importance of re-operation of Oroville, we recommend that the entire set of decisions and effects analysis be submitted for independent peer review to further assist in predicting these effects.

NMFS 2013 Progress Assessment at 21. In addition to the failure to properly model the reoperation of Oroville Reservoir or the temperature constraints downstream of it and other reservoirs, the way the temperature model output is presented renders the analysis invalid. One of the appendices states:

> There would be small to moderate reductions in May storage and small to moderate increases in September storage under the HOS relative to the ESO. Despite these changes, year-round water temperatures in the Feather River would not substantially [sic] changed by HOS or LOS scenarios, because mean monthly water temperatures would not differ by more than 4% from those under ESO regardless of month or water-year type (Table 5C.5.2-154 through Table 5C.5.2-157).

Draft Plan, Appendix 5C, at 5C.5.2-292. This temperature analysis is fundamentally flawed and will likely result in significantly greater environmental impacts than identified in the documents, because:

First, a percentage change in temperature is meaningless and an invalid means of determining impacts or comparing alternatives; instead, the focus should be whether the changes exceed biologically important thresholds. Thresholds are biologically more important than absolute differences (or percentage differences). An increase in temperature that crosses a biological threshold is more significant than a larger increase that stays below the threshold. The 3.5% maximum increase predicted for September of Below Normal years under HOS, *see* Draft Plan, Appendix C, at Table 5C.5.2-156, appears to be based on a 2.1 degree Fahrenheit increase over a temperature of 61 degrees, *see* Draft Plan, Appendix C, at Table 5C.5.2-154.[41] This same increase when measured on the Celsius scale is 7.5%. Regardless of each percentage increase being correct and misleading without additional context, a 2.1 degree F increase in water

[41] This does not match the other table, even when rounding is considered.

temperature can have significant lethal and negative sub-lethal effects on salmonid and non-salmonid species.

Second, mean monthly water temperatures are a poor indicator of biological conditions – salmon and other native fish and wildlife respond immediately and dramatically to actual temperature conditions, and lethal and sub-lethal temperature thresholds are frequently measured as daily, 3-day, or 7-day averages. However, a monthly average temperature will frequently be exceeded on a weekly or daily basis – the frequency and magnitude of the exceedances are inversely related to the length of the relevant timestep. Summertime peaks, daily fluctuation, and exceedance curves for important biological thresholds would provide more accurate assessment of environmental impacts.

E. The DEIS/DEIR Fails to Adequately Analyze Environmental Impacts in the Early Long Term (ELT)

The DEIS/DEIR generally only provides modeling results for the Late Long Term (LLT – 60 years from now), and it states that, "For the purpose of BDCP EIR/EIS impacts evaluation, Alternatives' modeling results at LLT phase are considered." DEIS/DEIR Appendix 5A at A-4. The lack of modeling and analysis of operations and environmental impacts in the Early Long Term (ELT, which includes climate change effects in 2025) prevents a meaningful analysis. ELT results are needed to help distinguish the effects of climate change from project operations and to demonstrate the impacts during the first several decades of operations. There are significant changes in operations, flows, and environmental impacts between the ELT and LLT; for instance, this table below shows changes in exports between the ELT and LLT.

Average Annual Exports	ELT	LLT
Alternative 4 HOS	4,705 cfs	4,413 cfs (-6%)
Alternative 4 LOS	5,591 cfs	5,255 cfs (-6%)

Source: Draft Plan, Chapter 5, at Tables 5.3.2 – 5.3.3. HOS is the High Outflow Scenario and LOS is the Low Outflow Scenario.

The DEIS/DEIR Appendix 5A Section C (CALSIM II and DSM2 Modeling Results) presents LLT modeling results only. We echo the comment previously made by the Delta Stewardship Council that BDCP needs to provide modeling results for ELT, not just LLT, in the DEIS/DEIR. Delta Stewardship Council, Responsible Agency Comments, 2013 Administrative Draft, Bay Delta Conservation Plan Environmental Impact Report/Environmental Impact Statement, July 11, 2013 ("DSC 2013 BDCP Comments"), at 17, available online at: http://deltacouncil.ca.gov/sites/default/files/documents/files/DSC_Letter_on_BDCP_Review.pdf (incorporated by reference).

F. The Presentation of Average Results (Including Flows and Temperatures) Obscures and Understates Likely Environmental Impacts

As the DEIS/DEIR repeatedly warns, model output for a single point in time is not necessarily reliable, and therefore proper use of results requires "much caution" and is limited to a general comparison of relative averages and exceedances on a monthly basis. *See* DEIS/DEIR Appendix 5 at 5A-A15, 5A-B199, 5A-C5, and 5A-C6. Although some sub-monthly modeling was conducted for the north Delta intakes, and some hydrodynamic modeling used sub-daily flows, BDCP generally used monthly average flows in its hydrologic modeling. At times, annual or year-type averages are presented in the Draft DEIS/DEIR. While use of averages can at times be helpful, it is not always the proper tool for use in assessing impacts, and without proper context, it can obscure potential impacts, especially in biological systems where outcomes are often determined by threshold and extreme values, more than by average conditions. Average results from physical models were presented in the BDCP DEIS/DEIR in the following ways that obscure potential impacts:

- In the in the DEIS/DEIR Appendix 5A Section C, BDCP exports are shown as year-type averages. There can be significant year-to-year variability in exports. Averaging fails to convey that variability and the associated variability in export-related impacts. For example, conditions that produce the highest entrainment values may control outcomes in future years, more than the average, long-term condition (an extreme example would be that an extinction or near-extinction event in one year will not be mitigated by improved conditions in subsequent years). More information than just the average needs to be presented.
- The averaging period proposed for OMR flows is undisclosed in the Alternative 4 Decision Tree Scenarios. Table B-13 from the DEIS/DEIR, Appendix 5A, Section B lists monthly average flows, yet states that USFWS and NMFS OMR criteria would be met, which require compliance on a 14 day average basis. Without presenting the most-negative flows, the DEIS/DEIR fails to disclose the full impacts to the Delta ecosystem and fails to demonstrate that operations would comply with the biological opinions.[42]
- The averaging period proposed for Sacramento River bypass flows is undisclosed in the Alternative 4 Decision Tree Scenarios. Table B-13 from the DEIS/DEIR, Appendix 5A, Section B does not state if it is a daily average or an instantaneous flow. The SWRCB has expressed concern that reverse flows at Freeport would become more common July-

[42] In addition, neither Table B-13 or any other information in the DEIS/DEIR or Draft Plan explains how OMR rules based on water year type will actually be implemented (given the inability to precisely forecast water year type, particularly early in the year), what method of forecasting will be used, and how that may differ from modeled operations and thus modeled environmental impacts. The same is true for other operational parameters that are based on water year type.

November if BDCP fails to apply the bypass flow on an instantaneous basis. SWRCB 7/5/13 BDCP Comments at 13. The impacts of the proposed averaging period on biological resources must be disclosed.

- The DEIS/DEIR appendices do not appear to analyze the effect of changed residence time but rather draw a conclusion based on the average change in residence time over all time periods. DEIS/DEIR Appendix 5C. Residence time is presented for a limited number of time periods of the model simulation period to represent a variety of hydrologic conditions. Residence time in the Delta changes dramatically in response to hydrology and operations. *See* DSP Independent Science Review Panel Report 2014 at 65. Changes in residence time would be expected to alter primary productivity, pH, and temperature, and thus alter transformations of constituents, with longer residence times likely to negatively impact water quality and ecosystem function. However, average change is not relevant to any processes and thus not important to any covered species. This analysis should be expanded and the results should be integrated into other areas of Appendices C and D.
- ESO flows could be as much as 6500 cfs less than EBC2 flows (in November) when months are evaluated individually, and not grouped by month and water year type.[43]

In a comment letter on the administrative draft Plan and DEIS/DEIR, NMFS stated:

> The results of these models signal a need for further investigation to determine why they are not what are "expected". It seems that upstream releases between ESO and EBC2 do not match as well as thought, as seen in Plan Table C.A-47 and EIR-EIS Tables C-15-5,6,7,8.[44] Some summertime and fall months in drier years are very different, which may be what is causing the biological models to show a negative egg survival response. The table below shows the results of month-to-month comparisons of flows out of Keswick for LLT. It indicates that the ESO flows could be as much as 6500 cfs less than EBC2 flows (November) when months are evaluated individually, and not grouped by month and water year type.

NMFS 2013 Progress Assessment at 12.

[43] In addition, BDCP modeling shows delta outflow in October of many years in excess of BDCP's proposed operational requirements. *See* Mount and Saracino et al. 2013 at 48, 52, 64-66. They concluded that these modeled outflows, which would substantially benefit delta smelt, are unlikely to occur. *Id*.

[44] This reference is to Table C.5.2-2 in the Administrative Draft Plan, entitled "Difference and Percent Difference in Flows in the Sacramento River at Keswick, Year-Round." For reasons that are not explained, this Table has been removed from the public draft documents, and the Draft Plan and DEIS/DEIR fail to explain whether and how this discrepancy was resolved.

The Plan and DEIS/DEIR often analyze averages when averages are not the proper tool for assessing impacts, however the inverse problem occurs with the use of physical model results in other models. If BDCP were to heed its own warnings about the proper use of these results, then it would only use averages and statistical representations of the model output as input to other models. Since averages are often not the proper tool for assessing impacts, this approach would leave biological models lacking input data. But the public BDCP documents appear to be scrubbed of non-averaged data, yet those detailed data were still used in biological models inappropriately. This results in documents that hide potential impacts from the public, and present overly-confident biological model results. A proper, more consistent and informative approach would be to allow use of detailed physical model results—both in other models and the public documents—on a case by case basis based on a detailed understanding of model accuracy and errors, and to prohibit use of potentially erroneous results on a case by case basis as well. This would maximize the value of the modeling and minimize the propagation of errors.

III. BDCP FAILS TO USE A SCIENTIFICALLY SOUND APPROACH TO SETTING BIOLOGICAL OBJECTIVES, IDENTIFYING AND EVALUATING STRESSORS, AND DESIGNING CONSERVATION MEASURES

Our organizations have been involved with the planning of BDCP's conservation strategy (Conservation Strategy) for several years. Throughout that time, we have emphasized the need for a planning and evaluation process and a project description that clearly articulate the project's goals and its specific biological outcomes (objectives) and that clearly links those targets to the factors that impair the ecosystem and covered species in the Delta today (stressors). The Draft Plan should then describe extent that stressors must be ameliorated (stressor reduction targets) in order to achieve its objectives; this description of the problem sets the context for designing actions (conservation measures) that the Draft Plan will undertake to alleviate stressors. Finally, the intended outcomes (projected effects) of the individual conservation measures should be tabulated and explicitly compared to the Draft Plan's stressor reduction targets and, ultimately, its objectives, so that the public can clearly understand the need for and relationship among various Plan elements as well as the adequacy of and logic behind the Conservation Strategy. In numerous letters, memoranda, and meetings with all BDCP parties, we described the structure of this "Logic Chain" and the importance of such a transparent explanation of the Conservation Strategy both for (a) evaluation of the project proposal in the permitting phase (i.e. is the Plan sufficient to accomplish the needed ecosystem improvements?), and (b) the post-implementation, adaptive management phase (i.e. have Plan components produced the anticipated benefits or is there a need to adjust the suite of measures or their implementation?).[45]

[45] *See, e.g.*, Letter from TBI, EDF, and DOW to BDCP Steering Committee, December 20, 2009; Letter from American Rivers et al. to BDCP Steering Committee, November 3, 2010; Memorandum to J. Meral and D. Nawi from J. Cain et al. re: Necessary analytical steps for completing a successful BDCP

We have persistently encouraged BDCP to utilize criteria for viable populations (McElhany et al. 2000; Lindley et al. 2007) to identify and address important conservation needs and opportunities of the covered species. *See, e.g.,* Letter from TBI, EDF, and DOW to BDCP Steering Committee December 20, 2009. This approach emphasizes that viable populations simultaneously display adequate levels of four key attributes of viability: abundance, productivity, spatial distribution, and life-history or genetic diversity. The essential nature of these attributes of viability is generally accepted throughout the conservation science literature. Meffe and Carrol 1994. We review the Draft Plan and DEIS/DEIR through this lens because, even though the attributes influence each other, actions in the Plan may impact species viability by altering one or more of these attributes, independent of effects on other attributes. The assessment of Plan impacts on covered species should address positive and negative effects to each attribute of viability. We briefly review the meaning of each of these attributes of viability here.

Abundance: The number of organisms in a population is a common and obvious species conservation metric. For instance, endangered species recovery plans (USFWS 1996; NMFS 2014) and conservation programs such as the Anadromous Fish Restoration Program (AFRP) generally identify abundance targets against which conservation success may be measured. Populations or species with low abundance are less viable and at higher risk of extinction than large populations for reasons that include environmental variation, demographic stochasticity, genetic processes, and ecological interactions. Abundance is also correlated with and contributes to other viability characteristics including spatial extent, diversity, and productivity. In itself, however, simply increasing abundance of organisms (or any other single viability characteristic) is not sufficient to guarantee viability into the future.

Productivity: The ability of populations to grow when conditions are suitable is essential to conservation success. Species or populations that display persistent negative population growth, as well as populations with limited ability to respond positively to favorable environmental conditions, are less viable and at higher risk of extinction. As we use them here, productivity parameters are expressed as rates (such as survival rate, offspring per adult female, etc.) and, refer to the ability of organisms to survive to reproduction and their reproductive success in the absence of density-dependent factors. Desirable population growth rates are commonly determined by identifying an abundance target and a date in the future by which that abundance should be attained; the population growth rate is then calculated as the minimum population

---

Environmental Effects Analysis (EA) and NEPA/CEQA document, July 11, 2011; Memorandum to J. Meral et al. from TBI, EDF, and Contra Costa Water District re: Review of Appendices C and D, December 21, 2011; Memorandum to J. Meral from J. Rosenfield re: "Review of BDCP Effects Analysis Appendix G" December 22, 2011; Memorandum to J. Meral et al. from J. Rosenfield re: "Preliminary Review of BDCP Effects Analysis Appendix F", February 9, 2012.

growth needed to achieve the desired abundance in the available time frame. This approach does not always provide adequate productivity as it may result in population growth rates representing impaired productivity for a given species (for instance, if the abundance target could be achieved in less time by a more "healthy" population). While population growth rates vary, depending on environmental conditions, demographic conditions, and how abundance relates to local carrying capacity, species are often characterized as having "intrinsic" population growth rates that reflect their life history and demographic characteristics (age at first reproduction, fecundity, survival, and sex ratio). The reproductive success rates and life-stage specific survival rates observed under good conditions in the field, and in the absence of density-dependent limitations, are valid reference points for determining adequate productivity of managed populations.

Spatial Distribution: Maintaining or restoring spatial distribution of fish and wildlife species is a critical component of protecting these species and maintaining the public trust. The notion that spatial distribution is inversely proportional to extinction risk is axiomatic to modern conservation biology. MacArthur and Wilson 1967; Meffe and Carrol 1994; Laurance et al. 2002. Populations or species with limited or less varied geographic distributions are more vulnerable to catastrophic events, such as an episode of lethally elevated water temperature, disease, a toxic spill, drought, or other localized disturbances. The effect of geographic distribution on extinction risk is also apparent in the geographic attributes of extant freshwater fish species. Rosenfield 2002. Increased spatial distribution reduces susceptibility to localized catastrophes, predator aggregations, and disease outbreaks while simultaneously increasing the probability that at least some dispersing individuals will encounter habitat patches with favorable environmental conditions. The need to maintain adequate spatial distribution is regularly acknowledged in regulatory planning and decision-making regarding the Delta and its environs. *See, e.g.,* NMFS 2014.

Life-History and Genetic Diversity: Natural diversity needs to be protected both within populations of specific public trust species and within the ecosystem as a whole. Natural diversity (life history patterns) allows organisms to adapt to and benefit from environmental variability. In addition, variability among individuals in a population increases the likelihood that at least some members of the population will survive and reproduce regardless of natural variability in the environment. Diversity across a population is especially important in highly variable ecosystems such as the Delta. Although only genetically based traits are subject to evolution and not all diversity is genetically-based, it is a trait itself (genetically based or not) that confers the ability to survive and reproduce in different environments. Thus, in a conservation sense, both genetically-based diversity and phenotypic diversity that is a response to the environment (eco-phenotypic diversity) are important and must be conserved. Many of the native fish species in the San Francisco Estuary demonstrate high levels of life-history diversity that is believed to reflect the evolutionary history of success in environments that changed, unpredictably from year-to-year. Bennett 2005; Williams 2010; Rosenfield 2010; Miller et al.

2010. Thus, differential impacts to particular life history types (e.g. early migrants, late-spawning individuals, slow growing individuals, etc.) should be avoided to maintain viability of covered species.

In the logic chain planning framework, species-specific objectives are always expressed in terms of desired levels of these attributes of viability – objectives define the parameters that reflect viability for each species concerned. Lower levels of the logic chain (e.g., stressors, stressor reduction targets, conservation measures) articulate hypotheses regarding how the conservation strategy may attain these desired levels of abundance, productivity, spatial distribution, and diversity. Even though the Draft Plan provides a description of the attributes of viability as applied to the covered species, Draft Plan at 5.2-26, it frequently confounds these basic metrics of desired outcome with "habitat" conditions it believes will produce improved viability. In so doing, it improperly substitutes a hypothetical means of achieving success (such as "habitat restoration") for a definition of success for conserving species in the Plan Area (SMART targets for each attribute of viability) and that substitution changes the definition of success from conserving viable populations to providing specified quantities and qualities of "habitat." Furthermore, the Draft Plan generally fails to identify SMART objectives for covered species related to each of the four attributes of viability; when it does identify objectives reflecting the attributes of viability, the Draft Plan and the DEIS/DEIR fail to analyze the conservation strategy and operational alternatives in terms of their ability to attain these foundational targets.

As currently drafted, the BDCP repeatedly fails to adequately articulate or identify in a logical, transparent, and consistent manner the connection between its goals, objectives, stressors, stressor reduction targets, and conservation measures; in many cases, the explanation of one level of the Plan's logic chain contradicts the rationale provided for the level above or below it (e.g. conservation measures do not address presumed stressors, or stressor reduction targets are clearly inadequate to attain the Plan's stated objectives). Adequately described Plan objectives (those that would be useful in evaluating the draft Plan and in adaptively managing implementation of a final Plan) must be specific, measureable, achievable, relevant to a particular goal, and time-bound; most of the draft Plan's objectives do not include all of these essential elements. To the extent that objectives are adequately described, many of them are clearly inadequate to attain species-specific goals or the larger goal of ecosystem restoration. The DEIS/DEIR fails to rigorously evaluate many intended outcomes of the Conservation Strategy in even a qualitative fashion and many of the outcomes that are evaluated are not compared to the desired outcomes described in the biological goals and objectives or stressor reduction targets. Furthermore, the Plan overstates the benefits arising from the Conservation Strategy; the outcomes described in the DEIS/DEIR do not match those the Plan needs to attain, as described by its own biological goals and objectives (*see* Chapter 3 Conservation Strategy). Finally, numerous inadequacies and potential biases in the analyses of conservation measure outcomes are addressed below.

The importance of, and functions served by, well-defined desired biological outcomes of the Plan (biological goals and objectives) are adequately described at the outset of the Conservation Strategy, which states:

> Biological goals and objectives are the foundation of the Conservation Strategy and are intended to provide the following functions.
> - Describe the desired biological outcomes of the conservation strategy and how those outcomes will contribute to the long-term conservation of covered species and their habitats.
> - Provide, where feasible, quantitative targets and timeframes for achieving the desired outcomes.
> - Serve as benchmarks by which to measure progress in achieving those outcomes across multiple temporal and spatial scales.
> - Provide metrics for the monitoring program that will evaluate the effectiveness of the conservation measures and, if necessary, provide a basis to adjust the conservation measures to achieve the desired outcomes.

Draft Plan at 3.1-3. In order for objectives to provide adequate guidance to project planners, decision-makers, and the public and, in order to realize the functions the Plan identifies for them, BDCP's objectives must be specific, measureable, attainable, relevant to the goal they describe, and time-bound ("SMART"). The requirements for SMART objectives are well-developed in the business planning literature, and BDCP purports to provide SMART objectives. *See* Draft Plan at 3.3-3. However, as we discuss, most of the objectives in the Plan do not meet the SMART criteria.

The Conservation Strategy describes numerous biological goals and objectives (a welcome advance over previous versions of the Plan that we have reviewed); however most of the objectives fail to satisfy the intended functions of Biological objectives described above. Many of the goals and objectives are not adequate to produce the level of benefits to ecosystem processes and covered-species that are required by an HCP/NCCP and most of the objectives are not adequately defined. Of equal concern, the Plan's approach (its Conservation Strategy) for attaining objectives largely or completely ignores certain key stressors that are believed to inhibit the ecosystem today and the conservation measures do not match with the stressors that are identified as driving ecological decline/preventing ecological restoration in the Project Area. Finally, analysis of outcomes anticipated to result from the Conservation Strategy (in both the Plan and DEIS/DEIR) are either not compared to the stated objectives and/or stressor reduction Targets or demonstrate that the Plan will not attain its objectives and stressor reduction Targets.

A. <u>Many of the Biological Goals and Objectives are not Legally Adequate</u>

Numerous objectives in the BDCP Conservation Strategy merely codify the status quo; in some cases they allow for further deterioration of covered species' populations and ecosystem elements. As we have previously emphasized and discuss elsewhere in these comments, because the BDCP is intended to serve as the basis for regulatory compliance with the NCCPA, the Draft Plan must provide for the conservation and management of Covered Species within the Planning Area. For species that exist exclusively within the BDCP Plan Area, the BDCP must provide the measures necessary for the species' conservation (recovery). For species that migrate through the BDCP Plan Area, BDCP must provide measures necessary for the species' conservation in the Plan Area. *See* Letter from Defenders of Wildlife, TBI, and NRDC to Chuck Bonham dated July 10, 2013; *see* discussion *supra* in section I(A). Beyond simply mitigating impacts of the Plan, conservation measures must be drafted to deal with both covered activities' impacts and to achieve conservation of the covered species in the Plan Area. Because the NCCPA defines conservation with respect to species' status and biological needs, as opposed to simply analyzing and mitigating for the Plan's impacts on the covered species, a Plan's conservation measures must be designed to be consistent with what is necessary to "conserve" or recover a covered species and only activities "compatible" with conservation are permitted.

1. <u>The Biological Objective for Longfin Smelt Productivity is Inadequate</u>

One of the BDCP's objectives for longfin smelt (Objective LFSM1.1) states that BDCP will "Achieve longfin smelt population growth", such that "Future indices of annual recruitment […] are equal or exceed expected levels based on the 1980–2011 trend in recruitment relative to winter-spring flow conditions." Draft Plan at 3.3-120. The Conservation Strategy provides a specific definition of annual recruitment and explains that the objective will be met: "…if, after year 10, 50% (5 of each 10 consecutive years) or more of future indices… " reflect higher abundance than would be predicted based on the 1980-2011 relationship of longfin smelt abundance with Delta outflow. Draft Plan at 3.3-124.

This objective is specific, measureable, and time-bound, however, the objective falls short of the biological outcome necessary to meet BDCP's legal requirements to restore longfin smelt; thus, it is not adequate to the goal of restoring this species.

i. The Objective Improperly Assumes that the Plan will do little to Restore the Species and Predicts Continued Decline of Longfin Smelt

The "Global goal" for productivity of this species (i.e. the target that the Plan suggests would represent full recovery of species productivity) is defined as:

> Achieve productivity (abundance indices) equal to or greater than predicted for 5 of 10 years based upon a regression of **1967 to 1987** abundance on December through May mean outflow (or X2).

Draft Plan at 3.3-119 (emphasis added). The Draft Plan's target of matching productivity to 1980-2011 period is much less than the global productivity goal as longfin smelt productivity per unit flow is well-known to have declined (probably more than once) during the 1980-2011 period. Kimmerer 2002; Rosenfield and Baxter 2007; Thomson et al. 2010. The productivity objective will not achieve the goal for this species; the USFWS Draft Recovery Plan target for longfin smelt recovery called for restoration of population dynamics (i.e. the mean and variance associated with both abundance and productivity) typical of the 1967-1984 period. USFWS 1996. This productivity objective for longfin smelt is, in fact, a codification of an inadequate and undesirable status quo for this species. In the period from 1980-2011, the longfin smelt population index should have exceeded its average (on a flow-corrected basis) in approximately 50% of years and it should have dropped below its average in approximately 50% of years-- that is the nature of a mathematical average; thus, all the Draft Plan's longfin smelt productivity objective requires is to match productivity that has occurred recently, not the much higher productivities that occurred earlier in the historical data series. The Draft Plan's objective for longfin smelt productivity improperly defines success as maintaining the level of productivity that occurred after this species' productivity was severely compromised. Therefore, this objective does not satisfy one of the primary functions of defining biological objectives: to describe how the desired biological outcome of the conservation strategy will achieve the long-term conservation of covered species.

ii. The Biological Objective Ignores the Importance of Longfin Smelt Overall Abundance to Conserving this Population; Setting a Productivity Objective that is "Flow Corrected" Effectively Eliminates What the Best Available Science Indicates is a Strong Relationship between Delta Outflow and Longfin Smelt Abundance

The Plan must develop objectives for each attribute of viability, *see* McElhany et al. 2000, for each covered species and measure projected outcomes against these desired outcomes. The Draft Plan has no specific objective for longfin smelt *abundance*. Productivity is an important metric of viability, *see id*., but even an objective that defined an adequate level of productivity cannot substitute for other important attributes of viability, such as abundance. The attributes of viability are inter-related (e.g., sustained high productivity will produce higher abundance) but they are not redundant of each other. So although it is important that the Estuary's productivity is restored with respect to production of longfin smelt per unit of flow, that is a different measure from the (equally important) total abundance of longfin smelt.

Though no abundance objective for longfin smelt is set by the Draft Plan, it does suggest an intent to maintain longfin smelt abundance at index levels that were common between 1990 and 2000. *See* Draft Plan at 3.3-124. This is clearly inadequate; longfin smelt abundance indices during this period were low enough to prompt filing of a petition to list longfin smelt as a federally endangered species (in 1993), and the species was ultimately listed under CESA in 2009 and the U.S. Fish and Wildlife Service determined in 2012 (responding to a petition filed in 2007) that listing of the species under the ESA was warranted but precluded. The average longfin smelt index in the first three years of the Draft Plan's target period (1990-1992 average: 151) was less than one fifth of the average in the three years leading up to filing of the successful ESA petition for this population in 2007 (2004-2006 average: 756.3). Given that population abundance indices of longfin smelt reached lows during the 1990-2000 period that were a fraction of the levels observed when the population was eventually listed as a threatened species, the 1990-2000 period cannot represent a "recovery" for longfin smelt. The average longfin smelt index (as measured by CDFW's Fall Midwater Trawl) for the 1987-2011 time frame was 4,920 or approximately 30.4% of the 1967-1987 average (16,210) anticipated under the USFWS 1996 Draft Recovery Plan for this population.

Implicit in the Draft Plan's wording of its productivity objective is that longfin smelt abundance in a given year is largely a function of ecological conditions related to freshwater flow rates (or X2 position) in the winter and spring. For decades, researchers have detected statistically significant relationships between freshwater flow and longfin smelt abundance; these relationships hold over orders in magnitude in both flow and indices of longfin smelt abundance. Stevens and Miller 1983; Jassby et al. 1995; Kimmerer 2002; Rosenfield and Baxter 2007; Kimmerer et al. 2009; Mac Nally et al. 2010; Thomson et al. 2010. In addition, there are well-known relationships between various other stressors on the population and freshwater Delta outflow. *See* Rosenfield 2010 (e.g., pelagic food web productivity, entrainment, etc.). The productivity objective defines the expectation for abundance *with respect to flow*; by "correcting" longfin smelt abundance for Delta outflow, this objective does not account for total abundance as a factor contributing to longfin smelt viability – the objective focuses on changes in abundance due to anything *except* flow.

iii. Delta Outflow is Significantly Affected and Reduced by CVP/SWP Operations in Many Years

In addition to its inadequate productivity objective, failure to set an abundance objective, and tepid expectations for abundance, the Draft Plan's longfin smelt productivity objective is also flawed because it ignores the effects of CVP/SWP operations on Delta outflow. Given that Delta outflow explains an extraordinarily large fraction of long-term variability in the longfin smelt population index and water management operations under the BDCP will differ from operations under the status quo (i.e., operations under BDCP affect actual Delta outflow relative to available runoff), the metric associated with this objective should be scaled to some measure of annual hydrology (e.g., unimpaired runoff) not to a measure of hydrology that will be modified by the operations in the Plan. As the Conservation Strategy notes, the CVP and SWP have a major effect on *actual* Delta outflow because those two projects control releases of water into the Delta and exports of water from the Delta. Therefore, because the metric employed by this productivity objective calibrates annual longfin smelt abundance to reflect whether it is above or below a value based on *actual* Delta outflow, BDCP operations that result in lower actual Delta outflow also simultaneously reduce the target value for longfin smelt abundance. As a result of setting a productivity objective that measures performance after removing the effect of flow, it is possible that if (when) the BDCP results in reduced Delta outflows (i.e. X2 moves upstream), then the productivity metric could be satisfied even as total abundance declines. Such an outcome is clearly at odds with restoring longfin smelt viability, yet the Plan clearly anticipates reductions in freshwater outflow during the December-May period (particularly over the longer term).

The Draft Plan's intent in choosing an objective of flow-corrected productivity is to remove the climatically driven part of the freshwater flow effect on longfin smelt recruitment:

> The primary purpose of [the longfin smelt productivity] metric is to remove the <u>climatically driven</u> part of the freshwater flow effect on longfin smelt recruitment. This effect is best reflected in winter flows, because <u>outflow during other seasons is more strongly influenced by the SWP/CVP</u> operations. As described above, the correlation of the composite index with spring flow is nearly as strong as the correlation with winter flow, so the conceptual preference for basing the subobjective metric on the winter outflow regression equation is to some extent academic.

Draft Plan at 3.3-123 (emphasis added). The choice to measure productivity against *actual* outflow (which is a product of human management and which will be influenced by the BDCP itself) rather than some measure of annual precipitation (e.g. full natural flow; runoff into the rim station reservoirs) wholly ignores the effect of SWP/CVP operations on Delta outflow. If BDCP results in greater exports of water during some years (an outcome that is expected), then actual Delta outflows will be lower than they are currently under analogous hydrological conditions; this would effectively "lower the bar" needed to satisfy the longfin smelt productivity objective because *actual* outflow forms the denominator of the metric envisioned in this objective. As currently constructed, the longfin smelt productivity metric would be informative about the efficacy of non-flow related conservation measures in restoring longfin smelt populations (because the influence of *actual* flow is effectively "removed" by the flow correction). But a metric that incorporates unmodified hydrology (e.g., full natural or unimpaired flow) during a given year is necessary to allow an apples-to-apples comparison among BDCP alternatives and performance of longfin smelt under the current water management regime because it would retain the very important effect of water operations under human control on longfin smelt abundance.

iv. The Objective Improperly Assumes Only a Small Fraction of the Responsibility for Restoring Longfin Smelt Productivity

The Plan's objectives must be based on the biological outcomes that are consistent with its legal requirements. By contrast, the Conservation Strategy explains that its rationale for benchmarking this longfin smelt objective to the 1987-2011 period was "…because this is the entire period for which all three individual survey indices [used in the metric for this objective] are currently available." Draft Plan at 3.3-120. It is impermissible to define Plan objectives by an arbitrary decision regarding data availability (i.e. adding in information from two shorter data series that are less suitable to understanding progress towards the objective). By allowing data availability (in this case, availability of less desirable data) to dictate the desired biological conditions that reflect recovery of longfin smelt, the Conservation Strategy sets on its head the logical progression from goals to objectives to stressor reduction targets to conservation measures to Metrics used to evaluate efficacy and adaptively manage implementation of the Conservation Strategy.

Similarly, the Plan fails to justify why the BDCP does not take full responsibility for improvements needed to attain the global objectives for longfin smelt. Although some longfin smelt live outside of the Plan Area for at least part of their life cycle, Rosenfield and Baxter 2007, the Draft Plan's rationale for relying on the unknown and perhaps non-existent potential for restoration actions outside the Plan Area to restore longfin smelt is unjustified by the current scientific information-base for longfin smelt. By assuming only a small fraction of responsibility for the total improvement in longfin smelt productivity (and by failing to set an adequate abundance objective) that will be required to restore longfin smelt (e.g., to levels described by the USFWS 1996 Draft Recovery Plan for Delta fishes), the BDCP Conservation Strategy implicitly assumes that additional substantial restoration is possible (and will occur) for this species outside the Plan Area. By contrast, for Chinook salmon and steelhead, the Conservation Strategy is very specific in its allocation of conservation responsibility within the Delta (BDCP's responsibility) and outside of the Delta, *see* Draft Plan at 3.3-140 and Appendix 3.G; the Plan assumes that 50% of the needed improvement in Central Valley salmonid productivity will be occur within the Delta, by BDCP. Yet, the biological objective for improving longfin smelt productivity is far less than half of what is needed to restore this species, despite the facts that longfin smelt:

- Delta outflow (and X2) is persistently correlated with the vast amount of variation in longfin smelt abundance over the past 45 years of sampling. Jassby et al. 1995; Kimmerer

2002; Rosenfield and Baxter 2007; Kimmerer et al. 2009; Thomson et al. 2010; Mac Nally et al. 2010; Rosenfield 2010; and,

- Some fraction of the population may spend its entire life within the Plan Area and most or all of the population spends most of its life cycle in areas where ecological conditions are strongly affected by Delta outflow. Rosenfield and Baxter 2007; Rosenfield 2010.

v. The Plan Anticipates Long Term Declines in Longfin Smelt Abundance and Productivity Relative to the Status Quo and Offers no Description or Expectation of Additional Restoration Activities Inside or Outside the Plan Area that Would Lead to Restoration of the Species' Abundance or Productivity

Because the conservation standard implied by the longfin smelt productivity objective and the Draft Plan's expectations of future abundance are inappropriately low, the Conservation Strategy fails to incorporate conservation measures that are necessary (in either number or magnitude of effect) to adequately enhance the species' population. For example, longfin smelt populations are projected to decline from unacceptably low levels on average and under most of year types in alternatives 1-7 as evaluated in the DEIS/DEIR. *See, e.g.,* DEIS/DEIR at Tables 11-1A-8, 11-2A-7, 11-3-7, 11-4-8, 11-5-8. It is difficult to imagine actions outside of the Plan Area that are available to federal and state trustee agencies, that could accomplish restoration of longfin smelt, much less the majority of the necessary restoration (the gap between the Plan's flow-corrected productivity standard and the flow-corrected productivity global objective or the gap between recent abundances and historical abundances that represent a healthy population) that the Plan apparently assumes will occur. The failure to identify actions inside or outside the Plan Area with a reasonable likelihood of significantly improving longfin smelt productivity or abundance is more egregious given that most of the water management scenarios considered in the DEIS/DEIR reduce winter-spring Delta outflows compared with the current baseline – a Delta outflow baseline that state water and fish and wildlife management agencies consider to be inadequate for this species. *See, e.g.,* CDFG (2010) at 94 ("Recent Delta flows are insufficient to support native Delta fishes in habitats that now exist in the Delta"); SWRCB 2010 Flow Report at 5 ("Recent Delta flows are insufficient to support native Delta fishes in today's habitats").

To the extent that the BDCP does rely on undescribed future actions when it assumes only a small fraction of the responsibility for restoration of longfin smelt, the Plan highlights additional problems with its description of this objective. This objective does not satisfy the Plan's need for objectives to serve as a "… benchmark […] by which to measure progress in achieving […] outcomes across multiple temporal and spatial scales"; nor does it provide a "… metric […] for the monitoring program that will evaluate the effectiveness of the conservation measures and, if necessary, provide a basis to adjust the conservation measures to achieve the desired outcomes."

See Draft Plan at 3.1-3. There is no way of differentiating the effects of BDCP actions from recovery actions taken outside the BDCP on longfin smelt's flow-corrected productivity (i.e. no way to distinguish progress towards the 1980-2011 productivity pattern from progress towards the higher global objective (population dynamics similar to those in the 1967-1984 period; USFWS 1995) for this species.

vi. The Plan Sets an Unacceptably Long Timeline for Attaining its own Inadequate Targets for Longfin Smelt Productivity

Finally, the time frame set for achieving the BDCP's productivity objective (20 years after implementation begins) is unacceptably long. Here, the timeline for attaining biological outcomes seems to be a product of the timeline for conservation measures identified in the Conservation Strategy. This is contrary to the purpose and function of setting Biological objectives; the timeline for conservation measures (and the mix of Conservation Strategy itself) should be designed to produce the desired biological outcome within a timeframe that is appropriate for conservation needs. Even assuming the specified level of productivity for longfin smelt were acceptable (and it is not), it is indefensible to wait twenty years to produce this "improvement" in productivity, especially for a species that has declined as dramatically as longfin smelt. Waiting 20 years (10 generations of longfin smelt) before this sub-par level of productivity will be achieved condemns this species to linger indefinitely at population levels that merited its listing as an endangered species.

2. Biological Objectives for Delta Smelt are Inadequate

i. The Entrainment Objective is Inadequate

One objective for Delta smelt (objective DTSM1.2) states the Plan's intention to:

> Limit entrainment mortality associated with operations of water facilities (i.e., CVP and SWP) in the south delta to ≤5% of the delta smelt population, calculated as a 5-year running average of entrainment for subadults and adults in the fall and winter and their progeny in the spring and summer.

Draft Plan at 3.3-108. Because the Delta smelt geographic range is completely contained within the Plan Area, BDCP has responsibility for attaining global and BDCP objectives for this species – the two types of goals and objectives are one and the same for this species. The Global objective for this species regarding entrainment (Global objective 1.2) is to: "Maintain a cumulative entrainment of equal to or less than 5% per year across all life stages." Draft Plan at 3.3-107. By calculating the proportional entrainment of Delta smelt as a 5-year running average, the Plan allows potentially devastating impacts to the population in any one year. This objective could be satisfied if 25% of the population were entrained in any one year, as long as entrainment was not detected in previous years. Thus the BDCP objective is not consistent with the Global objective for this species. By expressing the Objective only as a 5-yr running average (without also specifying annual limits), the objective is significantly weaker than the existing incidental take limit for this species, which prohibits take of adult Delta smelt that would exceed 5% of the population in any year. *See* USFWS 2008 Biological Opinion at 387.

ii. Delta Smelt Objectives are not Adequately Described to Inform Plan Development or Adaptive Management

Many of the Conservation Strategy's biological objectives are inadequately defined and, as a result, they cannot be of use in design of conservation measures, assessment of the Conservation Strategy as whole, or post-implementation performance evaluation of the Plan. Most of the objectives in the Plan do not meet the SMART criteria. For example, no time-frame is given for attainment of the Delta Smelt entrainment objective, so this objective is not clearly defined and thus neither it, nor the actions designed to attain it, can be fairly evaluated. Another BDCP objective for Delta smelt (objective DTSM1.1) is also inadequately defined to be of much use. The objective states:

> Increase fecundity of delta smelt over baseline conditions as measured through field investigations and laboratory studies conducted through year 10 and refined through adaptive management.

Draft Plan at 3.3-108. Although the intent here is laudable, there is no indication of what it means to "increase" fecundity (how much is enough?). Also, the objective does not indicate by when the (undefined) target will be met (in other words, it is not time bound; we assume that the phrase "through year 10" refers to the period during which the baseline will be defined). As a result, this objective does not adequately describe the conservation standard for Delta smelt, nor can it be used to assess whether the Plan's conservation measures are adequate to achieve that conservation standard. In essence, this statement regarding the Plan's intent to increase delta smelt fecundity is equivalent to having no intent to increase Delta smelt fecundity.

The final part of objective DTSM1.2 ("Assure that the proportional entrainment risk [to delta smelt] is evenly distributed over the adult migration and larval-juvenile rearing time periods") is ill-defined. There is no definition of "evenly distributed" entrainment risk and no indication of when this objective will be attained. These are crucial omissions as the objective's intent (to protect life history diversity of delta smelt by preventing repeated and disproportionate impacts to certain segments of the species' temporal distribution) is essential for conservation and restoration of this species. *See* Bennett 2005. As a result, this objective cannot be used to assess the adequacy of conservation measures (pre-implementation) or to measure the Plan's efficacy in restoring endangered species (post-implementation). This is a common problem for the objectives in the Draft Plan as the Effects Analysis (Draft Plan Chapter 5) acknowledges that this and similar (and equally important) BDCP objectives are not adequately described; for instance, in describing why the Plan's likelihood of attainment is not evaluated for objectives intended to protect life history diversity (timing of migration) within Chinook salmon runs (WRCS3.2, SRCS3.2, FRCS3.2, STHD3.2), the Effects Analysis states: "The biological objective requires further refinement in order to establish the metrics by which it could be assessed." Draft Plan at 5.2.-41.[46]

It is possible for the Draft Plan to describe these important objectives to limit life history impacts in measureable terms. For example, BDCP could set limits on Delta smelt entrainment and salmonid mortality during migration that occur on a smaller time-step, within the limits already described in other objectives, so that all of the allowable entrainment/mortality does not impact one particular life history variant (early vs late spawners/migrants, smaller vs. larger spawners/migrants, etc.) disproportionately. Attaining the clear intentions of Delta smelt objective DTSM1.2 (to reduce total entrainment mortality and to reduce the entrainment impact in any given time period) would require a set of objectives that are tiered over different time scales. Setting an annual limit (not averaged over 5 years) on entrainment at 5% of the Delta smelt population makes sense; if entrainment is approaching 5% within any given year, corrective actions (that should be specified in the Plan), would be required. But, protection of life-history diversity within the Delta smelt population calls for a limit on entrainment at shorter time steps. Delta smelt salvage is generally recorded within the 6 month (26 week) period from mid-December through mid-June; thus, allowing for a maximum of 0.5% of the population to be entrained in any two-week period would complement the annual limit, while also providing protection for temporally, defined segments of the population within a year. Similarly, a time-step greater than 1 year could be applied to prevent repeated occurrence of maximum annual entrainment limits – 5% entrainment every year is not desirable and may lead to jeopardy for Delta smelt. For example, a threshold of 3% entrainment as a 5-year running average would be consistent with the other temporally-defined entrainment objectives described here, while increasing protection for the species.

[46] Notwithstanding these limitations, as we discuss below, available scientific information indicates that the Draft Plan is unlikely to achieve many of the draft biological objectives.

3. Biological Objectives for Sturgeon are Inadequate

i. Objectives are Not Adequately Described to Inform Plan Development or Adaptive Management

Similarly, objectives for green and white sturgeon are too poorly defined to provide guidance regarding necessary or effective management actions or regarding the success or failure of any actions that are taken under the BDCP. For example, one green sturgeon objective (GRST1.1) is to:

> Increase juvenile green sturgeon survival (as a proxy for juvenile abundance and population productivity) throughout the BDCP permit term and increase adult green sturgeon survival (as a proxy for adult abundance and productivity) by year 15.

Draft Plan at 3.3-190. An analogous objective exists for white sturgeon. We agree that juvenile survival of green sturgeon must be improved to conserve these two Central Valley fish species. Israel and Klimley 2008; Israel et al. 2008. However, the BDCP objective is not specific enough to be actionable or enforceable: What does "increase" mean? How much improvement is enough? At what level of survival should the Plan's efforts be declared a success? The Effects Analysis acknowledges:

> Current spawning-to-adult abundance is unknown, so evaluating an increase as a result of the BDCP is not currently feasible. The capacity to meet this objective will be a topic of the adaptive management program.

Draft Plan at 5.2-46. NMFS previously commented on the inadequacy of Draft Plan objectives for sturgeon species, writing: "The biological objectives for sturgeon abundance and productivity (under GRST1) are vague and rely too much on "documenting the current distribution" and future studies." NMFS 2013 Progress Assessment at 15.

There are numerous ways to set meaningful conservation objectives for sturgeon survival despite a perceived lack of desired information. If current survival rates for these two species in the Central Valley are unknown, the Plan could set objectives that are tied to survival estimates in river systems where sturgeon populations are relatively stable or increasing. Alternatively, the Plan could have set survival objectives for sturgeon that are consistent with population growth, given survival estimates from other stages of these species' life cycles (as it does for salmonid survival objectives). If that information is not available or adequate, the Plan could have set an objective regarding biological parameters that are closely related to survival rates (e.g. growth rate, condition factor, hatching success, etc.). By establishing an objective as an unspecified improvement over an unknown value, the BDCP limits its ability to develop a Conservation Strategy that is adequate to produce desired biological outcomes or to evaluate that strategy (e.g. in the Effects Analysis). Moreover, the Draft Plan's claim that this will be a topic of Adaptive Management discussions is feeble. Adaptive management is an approach that allows managers to adjust the strategy for attaining desired outcomes (for example, under what circumstances would the Plan allocate more or less effort to certain conservation measures to adaptively manage towards an objective?); adaptive management is not a technique that allows one to determine what the desired outcome is for the Plan. The Draft Plan habitually an incorrectly relegates to "adaptive management" any decision that is inconvenient to make now – these are simply failure to plan that will lead to paralysis of adaptive management in the future.

As currently developed, the BDCP does not set a target for sturgeon survival that is consistent with conservation of these species. By failing to identify any measure of current sturgeon survival against which an improvement can be measured, the Plan calls into question whether it has an adequate grasp of the conservation challenges facing these or other species. It is not acceptable to permit a Plan with objectives for covered species survival rates that only lead to extinction at a slightly later date than without the Plan.

4. Biological Objectives for Through-Delta Salmon Survival are Inadequate

The Plan describes through-Delta survival objectives for Central Valley steelhead and each temporally-defined run of Central Valley Chinook salmon and separate objectives for fall-run Chinook originating from the San Joaquin River Valley and those originating from the Sacramento River Valley. These targets were calculated by estimating the total increase in survival, throughout each population's life-cycle, necessary to attain certain Cohort Replacement Rates (CRR: the quotient of a given generations abundance divided by the abundance of the generation that produced it) that are assumed to contribute significantly to recovery. Half (50%) of the total needed improvement in survival was allocated to improvements in through-Delta survival that would be entirely the responsibility of the BDCP; the other half of the improvement in steelhead and Chinook salmon survival would be accomplished by non-BDCP actions that occur outside of the Plan Area.

i. The Objectives are Inadequate as the Timeframes for Achieving the Biological Objectives are Arbitrary and Too Long to Generate any Reasonable Expectation of Recovery

Although we applaud the transparency and detail of the methodology presented in the technical appendix, Draft Plan Appendix 3G (Proposed Interim Salmonid Delta Survival objectives), some of the assumptions embedded in this approach lead to through-Delta survival targets that are insufficient to support recovery of these salmon populations. For example, the technical appendix describes its approach to incremental improvement in steelhead and Chinook salmon CRRs and survival as follows:

> Using average fish generations (3-years) as the unit of time, we identified intermediate time steps at BDCP Year-19 (three generations past dual conveyance) and a CRR target of 1.2; another intermediate time step at Year-28 (another three generations) and a CRR target of 1.3; and a final time step at Year-40 (four more generations) and a CRR target of 1.4, for spring-run, fall-run, and late fall-run Chinook salmon and steelhead. CRR targets of 1.3, 1.4, and 1.5 at the same respective time steps were used for winter-run Chinook salmon based on recognition of their endangered status. These CRR targets were selected to put the covered salmonids on a population growth trajectory to achieve the previously published BDCP Global goals (BDCP 2012) identified in Table 4.

Draft Plan, Appendix 3G at 7. Table 4 in this Appendix reveals that the desired CRR's were chosen in order to attain global goals of population abundance sometime in the 40-50 year, post-implementation time frame. *Id*. at 21. The global goals used here for population abundance are lower than those expected under the Anadromous Fish Restoration Program (AFRP) of the Central Valley Improvement Act (CVPIA) in some cases (such as winter-run Chinook salmon). Attainment of the AFRP's targets for salmonid abundance is already long overdue pursuant to both state and federal law. *See* P.L. 102-575, § 3406(b)(1); Cal. Fish and Game Code § 6902. There is no justification for planning to not attain the AFRP targets or to attain them only after waiting for an additional 40 years or more, given the ability to make additional efforts to achieve these targets.

The NMFS targets for CRRs (and the Delta survival estimates they derive from these CRR's) are abnormally low for a recovering Chinook salmon population. In fact Table 4 of the technical appendix shows that populations of <u>all</u> salmonids are expected to drop initially from current levels, because current survival rates are so low, and remain below these starting levels for over 20 years. As modeled in the Appendix, the Draft Plan anticipates extirpation of all San Joaquin salmonid populations (fall-run Chinook salmon, spring-run Chinook salmon, and steelhead) within the first 10 years of the BDCP (though they are artificially resurrected in year 10 to allow continued modeling). Application of the methodology provided in Appendix 3.G for calculating salmonid survival objectives will lead the BDCP to accept worse conditions for San Joaquin River fall-run Chinook, spring-run Chinook, and steelhead – including possible extinction in the next decade. Even if conditions do improve in the future under BDCP, allowing a prolonged decline in populations of covered species in the "short term" greatly increases their risk of extirpation and is inconsistent with the BDCP's purposes and authorizing legislation.

Although such low population growth rates might be acceptable as an average over a long time-period, there is no justification for targeting recovery of Central Valley salmonids over 40 years, or 13 generations, in the future. Normal Chinook salmon and steelhead populations have the intrinsic (and demonstrated) potential to grow from current levels to the desired abundance targets (the overarching goals for abundance in the Central Valley, identified in Table 4 of the Appendix) in less than 4 generations.[47]

The assumption that a species' recovery timeline is tied to the expected implementation of a particular conservation measure is improper and arbitrary. Whereas, objectives must be attainable (the "A" in a SMART objective) this does not mean that the timing of that particular conservation measure should drive the timing of the desired outcome. Such an approach represents a failure to consider conservation actions not included in the Conservation Strategy or expediting timelines for conservation actions that are included in the Conservation Strategy in a way that would lead to attainment of biological outcomes in a desirable time-frame. Again, objectives (and the time bounds for attaining these desired outcomes) should drive development of the Draft Plan, not the other way around. The Draft Plan's failure to first determine conservation needs of covered species, and then design a Conservation Strategy to meet those needs leads to troubling outcomes. For example, the first target for improvement in salmonid survival is at year 19 of the Plan; this interval was chosen because it is ~3 Chinook salmon generations after the expected implementation of the dual conveyance in year 10. Draft Plan, Appendix 3G at 10. Thus, the Draft Plan uses the conservation measure to set the objective, rather than setting an objective and devising a Conservation Strategy to attain that objective. In tying the objectives' time frame to completion of the new conveyance, the Plan exposes each of the 5 covered salmonid populations to grave risk if completion of the dual conveyance is delayed. Indeed, the Plan and technical appendix assume that Central Valley salmonids will continue to decline in the first 10 years of the Plan. *Id*. at 20.

Accelerating the improvement in attainment of desired salmonid survival rates would not require a potentially infeasible construction schedule for the dual conveyance element of the BDCP (Conservation Measure 1). There are other measures available (e.g., increased Delta through-flow, reduced export pumping in the South Delta, Yolo Bypass restoration) for which there is strong scientific evidence that they are likely to improve salmonid survival through the Delta,

[47] From a biological perspective, Cohort Replacement Rates (CRR) of 1.2 to 1.4 represent anemic growth in populations of Pacific salmon. If we assume that males are as abundant as females in a spawning cohort, we can use Quinn's (2005) findings from numerous populations to estimate Cohort Replacement Rates of Chinook salmon. This procedure produces CRR's that range from ~>3-9 for Chinook salmon and from ~4.6-13.0 for steelhead. We have clarified with that author that the freshwater and ocean survival rates used to calculate the CRR's were derived from a numerous populations of each species and none of those populations would be considered "pristine" or unimpacted by human activity. Quinn 2014 personal communication. Other authors studying multiple Chinook salmon populations have found similarly high freshwater survival rates. Healey 1991; Bradford 1995.

and other actions that the Plan asserts can improve survival (such as targeted predator removal) that could be implemented more aggressively until the dual conveyance is operational. Also, the technical appendix does not explain why it would take 9 years (approximately 3 Chinook salmon generations) to attain desired interim survival levels *after* dual conveyance operations begin. Survival through the Delta in one year is not in any way affected by survival in previous years – it is not a cumulative effect. If the dual conveyance is, as the Technical Appendix assumes, the key to improved through-Delta survival for Central Valley salmonids, then the benefits of such a conveyance ought to accrue immediately upon completion and operation of the new diversion facility (e.g. year 10).

ii. The Survival Objectives for San Joaquin Basin Salmonids are Flawed Because the Methodology for Determining Survival Objectives Produces Inconsistent Targets for Chinook Salmon Entering the Delta from the San Joaquin and Sacramento Rivers at the Same Time of Year

Although the methodology for calculating necessary improvements for salmonid through-Delta survival is the same for all populations considered, the methodology produces inconsistent outcomes that reflect an inadequate Conservation Strategy. For example, because overall survival rates differ between Sacramento and San Joaquin populations of fall-run Chinook salmon (San Joaquin survival being much lower), the methodology for calculating necessary improvement in through-Delta survival produces lower future survival for San Joaquin fall-run Chinook salmon than it does for fall-run emanating from the Sacramento River. The objective states:

> Objective FRCS1.1: For fall-run Chinook salmon originating in the San Joaquin River and its tributaries, achieve a 5-year geometric mean interim through-Delta survival objective of <u>27% by year 19</u> (from an estimated 5%), <u>29% by year 28,</u> and <u>31% by year</u> <u>40</u>, measured between Mossdale and Chipps Island. For fall-run Chinook salmon originating in the Sacramento River and its tributaries, achieve a 5-year geometric mean interim through-Delta survival objective of <u>42% by year 19</u> (from an estimated 40%), <u>44% by year 28</u>, and <u>46% by year 40</u>, measured between Knights Landing and Chipps Island. …

Draft Plan at 3.3-158 (emphasis added).

The Draft Plan simply adopts these two different targets without offering any rationale as to why juveniles of the same sub-species, that enter the Delta at approximately the same size and in the same season, would experience such radically different survival rates. While BDCP is required to achieve conservation in the Plan Area for salmon (not recovery *per se*, but measures in the

Delta that are sufficient to achieve recovery in combination with actions outside of the Plan Area) the proposed objectives lock in the current disparity between north and south delta habitat suitability (which results in lower survival for salmon and other species) for which CVP/SWP operations play a major role. This outcome is inconsistent with global and BDCP objectives that seek to increase spatial distribution of covered species by restoring populations that spawn or rear in the southern Delta and San Joaquin Valley. Objectives for San Joaquin salmon survival need to be strengthened and revised to ensure they are compatible with existing legal obligations.

5. <u>Objectives for Community and Ecosystem Conservation are Inadequate</u>

The Conservation Strategy identifies numerous landscape scale objectives (related to a reserve system, ecological process, increased fish and wildlife movement, and increased habitat suitability for covered species) as well as well as for numerous natural communities (e.g. tidal mudflat, tidal brackish emergent, tidal perennial aquatic, vernal pool complex, etc.). Inclusion and attainment of such broad scale objectives for the Draft Plan are essential to ensure that the Draft Plan achieves the requirements of the NCCPA. *See* Fish and Game Code §§ 2820(a)(3), (4).

i. Objectives are not Adequately Described to Inform Plan Development or Adaptive Management

Unfortunately, none of the community and ecosystem conservation objectives identified are sufficiently well-defined to serve the functions of SMART objectives. Without this level of specificity, it is impossible to know whether the objectives are sufficient to the larger goals and legal requirements of an HCP/NCCP and it is not possible to judge whether the actions specified in the conservation strategy will produce the necessary level of benefit. For example, while goal L.1 is an excellent aspiration for the BDCP, there is no way to know whether the associated objectives will allow the Draft Plan to attain it. Goal L1 reads:

> A reserve system with representative natural and seminatural landscapes consisting of a mosaic of natural communities that is adaptable to changing conditions to sustain populations of covered species and maintain or increase native biodiversity.

Draft Plan at 3.3-35. None of the objectives associated with this goal are time-bound – there is no way to tell whether the goal will be satisfied early or late in the Plan's permit term (if at all). While the objectives are somewhat specific regarding acreage to be restored, there is little specificity regarding the desired final condition or location of these acres. For example, objective L1.6 ("Increase the size and connectivity of the reserve system by acquiring lands adjacent to and between existing conservation lands") does not define what is meant by "increased size" and "connectivity" – how will we know when or if this target is attained? Also, this objective's call for increased biological connectivity is simplistic, as not all connectivity is desirable; in this particular ecosystem, "connectivity" has resulted in the damaging spread of invasive predators and competitors and ecosystem architects such as clams and *Egeria*. Clearly, objectives like L1.4 ("Include a variety of environmental gradients (e.g., hydrology, elevation, soils, slope, and aspect) within and across a diversity of protected and restored natural communities") are far too vague to meet the Plan's stated purpose for objectives, which are to serve as "the foundation of the conservation strategy" and to provide descriptions of: desired biological outcomes; how those outcomes will contribute to the long-term conservation of covered species and their habitats; benchmarks by which to measure progress in achieving those outcomes across multiple temporal and spatial scales; metrics for the monitoring program that will evaluate the effectiveness of the conservation measures. Draft Plan at 3.1-3. There is no imaginable circumstance where such a general statement could provide a basis to adjust the conservation measures to achieve the desired outcomes.

Similarly, the objectives associated with goal L.2 ("Ecological processes and conditions that sustain and reestablish natural communities and native species," Draft Plan at 3.3-40) do not provide guidance on critical questions like "how much?", "where?" and "by when?" – the answers to these questions are essential for objectives to perform the functions identified for them by the Plan; as a result, these objectives are merely sweeping statements that do not allow planners, permit-granting agencies, or the general public to understand the intent of the Draft Plan or analyze whether the conservation strategy is likely to accomplish these ends (and by when).

6. Conclusion: Draft Biological Objectives are Inadequate

In summary, although we applaud the effort to include biological goals and objectives into the Draft Plan, we find that most of the objectives identified:

- Do not meet the standards required by the NCCPA or ESA; and/or,
- Are not articulated to the degree that they can guide development of either the Plan's Conservation Strategy or its Adaptive Management plan.

The Draft Plan's objectives are inadequate to attain the conservation standard in the Plan Area for most species. Recovery of species means that they display sufficient levels of all attributes of viability, including abundance, productivity, spatial distribution, and diversity, *see* McElhany et al. 2000; the Draft Plan does not include objectives for each of these attributes for any of the covered species. As described above for longfin smelt, the failure to identify specific desired outcomes for each of these attributes of viability (e.g. "abundance" for longfin smelt) means that implementation and adaptive management of the BDCP will not respond to continued degradation of those characteristics of covered species.

The inadequacy or absence of key biological objectives becomes apparent immediately as the Conservation Strategy moves down the logic chain to identify stressors that impede attainment of those objectives (stressors are described in more detail below). Although numerous stressors are mentioned or implied throughout the various documents, there is only spotty and disjointed analysis of the relative or absolute importance of different stressors on different organisms (or life history stages) and what analysis is presented is often internally inconsistent. As a result, in many cases, the Conservation Strategy is not designed to ameliorate the stressors that are most important for attaining the desired biological outcomes (objectives) necessary for restoration of covered species' populations. Projected benefits of the Conservation Strategy will not emerge if the stressors the Plan addresses are not those that actually limit species' viability. Furthermore, the failure to link conservation measures to the most important stressors means that some claims that conservation measures will benefit a species do not reflect the Plan's biological objectives – unless the Plan's intended benefits to species are captured by its stated objectives, there is no way to evaluate the Plan's projections of benefits to covered species (prior to adoption of the Plan), or to evaluate the success or failure of conservation measures, or to manage the Conservation Strategy adaptively (post-implementation).

B. The Draft Plan and DEIS/DEIR Fail to Evaluate Biological Outcomes Against Biological Goals and Objectives

The Draft Plan and DEIR/DEIS fails in most cases to measure projected outcomes of the Conservation Strategy and water operations against the desired biological outcomes described in the objectives. The first recommendation of the Delta Science Program Independent Review Panel (2014) was that the "Analysis of biological effects needs more consistency and specificity." DSP Independent Science Review Panel Report 2014 at 12. Commenting on the Draft Plan's own evaluation of its ability to evaluate the Conservation Strategy's biological objectives that review panel wrote:

> Approximately 72% of the objectives for covered fish could not be fully evaluated at this time due to insufficient information. The overall net effects conclusion for each species seemed to be based on the judgment of the authors, rather than a systematic ranking of attribute importance, change in response to the BDCP, and uncertainty in the rankings … A systematic approach for synthesizing the net effect on each Covered Species was not used even though a ranking system was described that could have been used as a semi-quantitative scoring approach. Instead, professional judgment was used to assess the overall net effect.

DSP Independent Science Review Panel Report 2014 at 22.

The failure to generate expected outcomes in terms that would be comparable to the objectives is not solely due to technical challenges or lack of modeling capacity. For example, the expected outcomes for Delta smelt entrainment under different alternatives (*see* Figures 11-1A-1, 11-1A-2, 11-2A-1, 11-2A-2, 11-3-1, 11-3-2, 11-4-1, 11-4-2, 11-5-1, 11-5-2, 11-7-1, 11-7-2, 11-8-1, 11-8-2) are reported in the same terms as objective DTSM1.2 (e.g. the mean proportion of the adult and larval/juvenile population, respectively, lost to entrainment-related mortality each year). These analyses clearly demonstrate that alternatives 1 through 5, at least, are not projected to attain the relevant biological objective for Delta smelt in most year types (making it extremely unlikely that any of these alternatives would meet the 5 year running average target). Despite having produced the relevant analysis, the DEIS/DEIR fails to connect the dots between the biological objectives that were supposed to have driven development and review of alternatives and operations, and the projected outcomes of those alternatives and operations so that readers could understand which of the alternatives studied offered the best chance of meeting the stated objective.

This same failure to compare projected outcomes to desired outcomes occurs throughout the DEIS/DEIR. For each Alternative studied, Chapter 11 provides a table entitled, "Estimated Differences Between Scenarios for Longfin Smelt Relative Abundance in the Fall Midwater Trawl or Bay Otter Trawl." *See, e.g.,* DEIS/DEIR at 11-2492 (Table 11-8-7). These tables clearly display that longfin smelt populations are expected to decline as compared to current conditions in most year types of each Alternative studied, except for Alternative 8. *Id*. Objective LFSM1.1 declares that the Plan's intention is to *increase* population productivity (relative to freshwater flow) compared to current conditions. The comparison between expected and desired outcomes show that most (and perhaps all) of the alternatives studies are inadequate to achieve the Plan's own conservation standards.

The failure to compare expected outcomes in the DEIS/DEIR to the biological objectives set in the Plan's Conservation Strategy undermines the purposes for setting biological objectives in the first place (as described in the Draft Plan at 3.1-3). Development of the Conservation Strategy must be guided by specific, measureable, achievable, relevant, and time bound targets to allow evaluation of the relative benefits of conservation measures and suites of conservation measures in achieving those targets. Because the Effects Analysis does not describe expected outcomes that can be compared to the Plan's objectives, there is no way to know whether the Conservation Strategy is adequate and there is no way to compare the relative merits of different alternative Conservation Strategies and their interactions with different operational regimes.

C. The Draft Plan and DEIS/DEIR Fail to Accurately Identify, Prioritize, or Analyze Key Stressors that will be Addressed to Assure Attainment of Desired Outcomes (Objectives), and as a Result the Draft Plan and DEIS/DEIR Overemphasizes the Benefits of Certain Actions and Underestimates the Adverse Impacts

In order for the BDCP to realize the objectives and goals it defines (much less those that are required to actually accomplish its legal responsibilities), it is vital for the Plan to accurately characterize what forces prevent attainment of desired biological outcomes currently ("stressors") and the level of stressor reduction needed to promote attainment of the objectives. Obviously, focusing on unimportant or less important stressors will lead to inefficient, slow, and perhaps incomplete attainment of biological objectives. Development and prioritization of specific conservation actions is premature until there is adequate description of the Plan's objectives and a science-based assessment and ranking of the key stressors that prohibit attainment of the objectives.

The Plan's description of stressors is ad-hoc, incomplete, internally inconsistent, and its justification of stressor reduction lacks scientific rigor. For example, Appendix 5F (Biological stressors on Covered Fish) opens by declaring: "Biological stresses can result from competition, herbivory, predation, parasitism, toxins, and disease." Draft Plan, Appendix 5F at 5.F-i. Stressors such as habitat loss or direct export-related mortality (salvage) by SWP and CVP export operations receive almost no attention in this Appendix – curious given that the Conservation Strategy's focuses on restoring habitat and attempting to significantly reduce export-related mortality. Furthermore, this Appendix pays no attention to the driving effect of reductions in freshwater flow into, through, and out of the Delta on most of the stressors affecting covered fish species dynamics; this is a major and grave omission because freshwater flow reductions are widely acknowledged to be one of the most important stressors for numerous native species in this ecosystem. *See, e.g.*, SWRCB 2010 Flow Report; CDFW 2010. Ineffective and inefficient migration of aquatic species is one of the many effects of altered/reduced freshwater flows; although the Plan identifies these effects as key stressors for certain covered species, they are not analyzed or compared to other stressors in this Appendix on the biological stressors to covered fishes. Instead, the Appendix focuses exclusively on four "key biological stressors:" invasive aquatic vegetation, predation, invasive mollusks, and *Microcystis*. Draft Plan, Appendix 5F at 5.F-i.

D. The Draft Plan Uses Inconsistent and Scientifically Unsupported Estimations of the Relative Importance of Stressors

Both the Draft Plan and DEIS/DEIR are internally inconsistent regarding the estimation of the relative or absolute importance of stressors. The documents frequently fail to provide any support for their assertion that certain stressors are actually limiting population viability or ecosystem productivity. In many cases, the Draft Plan and DEIS/DEIR documents ignore evidence of stressor importance, even when those documents acknowledge the existence of the stressor.

1. The Draft Plan and DEIS/DEIR are Internally Inconsistent and Fail to Use the Best Available Science Regarding the Importance of Entrainment as a Stressor

The problem is particularly vexing with regard to known stressors such as entrainment. Despite the best available science demonstrating that entrainment-related mortality can be a significant stressor on many covered species, both the Draft Plan and the DEIR/DEIS fail to accurately acknowledge this. Instead, they maintain that current entrainment rates have only minor effects on covered species. In part, this erroneous conclusion stems from a persistent focus on “average” (mean) entrainment across years in the Draft Plan and DEIS/DEIR. The mean is an inappropriate and misleading metric because (a) covered species do not experience persistent “average” conditions, they experience individual years with either high entrainment of low entrainment, and (b) the impact of entrainment mortality is believed to vary substantially with different annual (or seasonal) environmental conditions; thus, entrainment impacts (and many other kinds of negative impacts) to covered species are periodically (not continually) severe. *See, e.g.*, Kimerrer 2008; Kimmerer 2011; Rosenfield 2010. Both the Draft Plan and DEIS/DEIR repeatedly underplay the importance of current entrainment levels. But the Draft Plan identifies entrainment-related mortality as a stress for each of the aquatic covered species and both the Draft Plan and DEIS/DEIR commit considerable space to analysis of both the reduction of this stressor that will presumably arise from moving the point of water diversion (Conservation Measure #1; CM1) and the “operational flexibility” that will be gained from CM1. By emphasizing that current entrainment rates are not a significant stressor on covered species, the Draft Plan demonstrates that construction and operation of its primary conservation measure (adding an additional point of diversion; CM1) will have minimal environmental benefits and that the environmental impacts from operation of CM1 are likely to worsen conditions for salmon and other covered species.

Entrainment-related mortality has been studied more intensively than most, if not all, of these other stressors. While the precise impact of this stressor, in terms of its incremental contribution to extinction risk, is unknown (and perhaps, unknowable), species-specific, and varies with regard to year-type and population status; the relative impact of this stressor on covered fish species and ecosystem productivity is well established. For example, Kimmerer 2008 found direct entrainment-related mortality of winter-run Chinook salmon to be approximately 10% of the juvenile winter-run population, on average, at the highest export flows recorded and that these were "higher than expected based on management targets for the Delta"; he further cautioned that indirect, entrainment-related mortality could be high as well and he concluded:

> From a population maintenance standpoint, the calculated loss rate at the export facilities would be a significant component of direct anthropogenic mortality.

Kimmerer 2008 at 24.

With regard to Delta smelt, numerous studies that have estimated the relative effect of putative stressors on this population found that entrainment-related mortality was one of the more important stressors. Kimmerer 2008, 2011; Mac Nally 2010; Thomson 2010; Maunder and Deriso 2011; Rose et al. 2013a,b.[48]

It is simply not credible for the Plan and DEIS/DEIR to suggest that the impacts of south Delta export operations on the BDCP's covered aquatic species might be small. In addition to the quantitative analyses of entrainment-related mortality described above, the California Department of Fish and Wildlife's life history conceptual models for Chinook salmon (Williams 2010), Delta smelt (Nobriga and Herbold 2009), white sturgeon (Israel et. al. 2009), and longfin smelt (Rosenfield 2010) conclude that mortality arising from CVP and SWP water export operations in the south Delta are one of the more important stressors on covered species. In addition to these syntheses of scientific information on entrainment-related impacts to covered species, the USFWS 2008 and NMFS 2009 biological opinions identify entrainment as an important stressor and attempt to minimize that impact so as to avoid jeopardy to Delta smelt and endangered anadromous species; entrainment-related mortality is also the primary stressor addressed by the SWP's incidental take permit for longfin smelt. CDFG 2009.

For both Delta smelt and winter-run Chinook salmon, the Draft Plan and DEIS/DEIR repeatedly overstate the uncertainty surrounding the level of impact caused by entrainment and the threat posed by this stressor despite the:

- wealth of recent, detailed studies of the importance of entrainment to many covered species
- strong conceptual support for addressing entrainment as a priority stressor, and
- the Draft Plan's own emphasis on reducing entrainment through its primary conservation measure (creation of a new point of water diversion)

[48] The Plan and DEIS/DEIR documents incorrectly assert that Maunder and Deriso 2011 did not find evidence of adult entrainment impacts on the Delta smelt population. Maunder and Deriso's results clearly identify adult Delta smelt entrainment as an important impact to Delta smelt abundance, though their interpretation of this result downplays its importance for reasons that are not clear. In fact, Rose et al. (2013b) recently argued that Maunder and Deriso's interpretation of their own analyses improperly downplayed the magnitude of the entrainment-related mortality impact.

For example, regarding Delta smelt entrainment, the Plan states:

> Changing the primary point of diversion to the north Delta will contribute to further reducing the already low levels of entrainment of delta smelt (averaged across all water-year types) currently required under the USFWS (2008) BiOp. The entrainment levels required under the BiOp, which are much lower than historical levels, will be met or further reduced under the BDCP, depending on the water-year type.

Draft Plan at 3.3-100 (emphasis added). Similarly, the DEIS/DEIR declares:

> Despite the number of delta smelt that have been entrained by the State Water Project (SWP) and Central Valley Project (CVP) export facilities … the direct effects of water diversions on the overall population dynamics of delta smelt are not well understood and there is disagreement among experts about the magnitude of these effects (Bennett 2005; Kimmerer 2008; Kimmerer 2011; Miller 2011).

DEIS/DEIR at 11A-11. Similarly, the Draft Plan lists entrainment as an "important" threat and stressor for the winter-run Chinook salmon population, but then immediately downplays this determination, declaring:

> These facilities [including the SWP and CVP water export pumping facilities] also change the hydrodynamics in Delta channels and directly or indirectly increase vulnerability to entrainment at unscreened diversions. However, the effects of entrainment mortality on the population dynamics and overall adult abundance of winter-run Chinook salmon are not well understood.

Draft Plan at 3.3-128. And, after identifying entrainment-related mortality as an "important threat and stressor" to winter-run Chinook salmon, the DEIS/DEIR concludes:

> No quantitative estimates have been developed to assess the potential magnitude of entrainment losses for juveniles migrating through the rivers and Delta, or the effects of these losses on the overall population abundance of returning adult Chinook salmon. The effect of entrainment mortality on the population dynamics and overall adult abundance of winter-run Chinook salmon is not well understood.

DEIS/DEIR at 11A-56. Finally, we note that the Draft Plan and DEIS/DEIR do not discuss the "uncertainties" regarding impacts of other stressors to nearly the same extent as they focus on what is unknown about entrainment-related mortality. The Delta Independent Science Board emphasized this uneven treatment of uncertainties as a major problem with the current Draft Plan and DEIS/DEIR, finding:

> Uncertainties are inconsistently and incompletely addressed … Uncertainties accompany every action and consequence discussed in the DEIR/DEIS, ranging from the designations of habitats for individual species, to projections of entrainment, to modeling results used in the analyses. When combined, these uncertainties will be compounded and propagate. Although the Draft BDCP discusses some of these uncertainties, they are treated inconsistently in the DEIR/DEIS and are largely ignored in the Executive Summary … If the outcomes of an action are considered too uncertain or speculative, it is sometimes argued in the documents that this uncertainty is sufficient reason not to address the issue of uncertainty at all.

Delta ISB 2014 at 5.

2. <u>Example: Spawning Habitat Limited by SAV</u>

i. Stressors that do not relate to species' objectives

Often times, the Draft Plan's identification of stressors appears to be a post-hoc justification of proposed conservation measures rather than an effort to alleviate barriers to attainment of desired outcomes (objectives). For example, Appendix 5F claims that: "Removal of invasive SAV is expected to increase the availability of freshwater spawning habitat for longfin smelt in the Delta." Draft Plan Appendix 5F at 5.F-iii. As described above, the Draft Plan inappropriately fails to identify improvements in longfin smelt abundance or longfin smelt spatial distribution as desired biological outcomes (objectives) of the BDCP; the Plan also fails to identify spatial distribution or abundance objectives for Delta smelt. Thus, the Conservation Strategy must anticipate that increased availability of spawning habitat will improve longfin smelt and Delta smelt productivity, which are identified objectives of the Draft Plan. However, the specific micro-habitats that longfin fish use for spawning are unknown, *see* Rosenfield 2010, so there is little or no support for the claim that SAV removal will increase availability of spawning habitat for longfin smelt. Similarly, the Appendix states that: "There is no indication … that the delta smelt population is limited by the amount of suitable spawning habitat area because they spawn throughout the Delta in different years." Yet despite this acknowledgement, and the acknowledgment that "[s]pawning habitat for Delta smelt in the wild is unknown," the Conservation Strategy and the incredibly confusing summary of Delta smelt conceptual models located in the Effects Analysis nevertheless asserts that the extent of tidal marsh habitat is of "moderate" importance for the success of Delta smelt egg deposition.[49] Draft Plan at 3.3-100; Draft Plan at 5.5.1-7. Despite the statement cited above from Appendix 5F, the DEIS/DEIR claims that one of the main purposes of BDCP's tidal marsh restoration (CM4) is to increase suitable spawning habitat for Delta smelt, DEIS/DEIR at 11-278, and the DEIS/DEIR claims benefits to Delta smelt spawning from removal of submerged aquatic vegetation, DEIS/DEIR at 11-283. So, the Plan, its technical appendices, and the DEIS/DEIR are ultimately confused and inconsistent with regard to the limitations imposed on smelt species' abundances by spawning habitat limitations.

Ironically, while neither the benefits of increasing total spawning habitat acreage nor the efficacy of the proposed mechanism to accomplish that (SAV removal[50]) are obvious, it is very clear that both smelt species are jeopardized by the increasingly narrow spatial distribution of available spawning habitat. The loss of access to spawning habitat, particularly along the San Joaquin River and in the Central Delta, confines Delta smelt and longfin smelt spawning to a very small area and this represents a significant risk to both species' viability. *See* Rosenfield 2002; Rosenfield 2010. This stressor (limited spatial distribution of spawning habitat) is not identified in the Draft Plan. This is yet another example of how the BDCP's failure to identify the most important stressors results from its failure to thoroughly and adequately describe biological objectives for each attribute of viability. If the Draft Plan had identified an objective for the "spatial distribution" attribute of viability for Delta smelt and/or longfin smelt, that desired outcome would naturally have led to a focus on the stress presented by limited spatial distribution of available spawning habitat (as distinct from total acreage of spawning habitat) and the Draft Plan might then have targeted the relevant stressor with appropriate conservation measures.

3. <u>The Draft Plan Fails to Document the Impact of the Presumed Illegal Harvest Stressor</u>

In another example of failure to adequately evaluate stressors, the Plan's emphasizes "Illegal Harvest" as a stressor on numerous covered fish species. Although the Plan expresses great faith that it will reduce the illegal harvest stressor for all the covered salmonid and sturgeon species, there is a big difference between reducing a presumed stressor and that progress leading to attainment of a desired (or required) outcome – if the stressor is not that important in limiting population viability, reducing the it will not lead to improved population viability. The problem statement for CM17 provides no assessment of the extent of illegal harvest, citing only one reference to published literature (a paper dealing with green sturgeon) and reference to the memo that describes CM17. We do not dispute that increasing staffing at CDFW's anti-poaching units

[49] The DEIS/DEIR notes that agency opinion is that this attribute is of "low" importance.
[50] However, it is important to note that removal of SAV may have other benefits for covered species.

may lead to a reduction in sturgeon poaching and it is possible that reduced poaching of adult sturgeon will help attain productivity targets for these two species. But neither the Effects Analysis nor the Conservation Strategy explains their ranking of the impact of this stressor relative to other stressors affecting sturgeon species.

The Conservation Strategy provides absolutely no basis for its expectation of benefits to salmonids from reduction in the illegal harvest of juvenile salmon, and the suggestion that reductions in the illegal harvest of juvenile salmon will have a favorable impact on salmon populations is inexplicable. Illegal harvest (or "poaching") of juvenile salmon is not mentioned as a significant stressor to these populations in the DRERIP conceptual life history model for salmonids. Williams 2010. Illegal harvest of these fish may occur; but does it actually affect abundance or productivity of Central Valley salmonids? And if so, is it a threat on the same level as other stressors to these populations? The Conservation Strategy is strangely unambiguous about the need to reduce the illegal harvest stressor, stating "any reduction in illegal harvest of covered fish species, whether inside or outside the Plan Area, is expected to contribute to the achievement of the biological goals and objectives for the covered fish species." Draft Plan at 3.4-319. This strong statement is in stark contrast to the Plan's equivocality and uneven treatment of entrainment-related mortality as a priority stressor discussed above, even though entrainment (in terms of salvage and expanded salvage) is a somewhat quantifiable impact for each of the covered species and poaching of juveniles is not. Though illegal harvest is unquantified in all cases and the numbers of juvenile salmon that are taken in illegal harvest almost certainly pales before the tens of thousands of Chinook salmon that appear in salvage (a small fraction of the number that are entrained in the SWP and CVP south Delta diversion infrastructure; *see* TBI 2012, the Plan strongly implies that illegal harvest of salmon juveniles is a more important stressor on salmonids than other potential stressors, including entrainment-related mortality. This implication is not credible.

Even if poaching of adults is a significant problem for some salmonid populations, the degree of the problem is likely to vary across the different salmon populations based on factors that affect their susceptibility to poaching (i.e. the duration and timing of their presence in the Central Valley and the size of the waterways in which they are found). In his 398-page tome on Central Valley salmonids, Williams mentions "poaching" or "illegal harvest" of adult salmon twice (an indication of the relative importance of this stressor). Williams 2006. He acknowledges that though is difficult to quantify illegal harvest impacts, there are "some indications that it may be significant" for spring-run Chinook salmon. *Id*. at 248. However, no similar statement is made with regard to winter-run, Sacramento or San Joaquin fall-run or late-fall run Chinook salmon, or Central Valley steelhead. Both the Draft Plan and Williams 2006 suggest that spring-run Chinook salmon populations may be relatively more susceptible than other populations to poaching because they hold in small streams for weeks or months during the summer before spawning. Draft Plan at 3.4-322. However, this is immaterial to the Draft Plan's illegal harvest stressor reduction target for spring-run Chinook salmon (and all other populations), which specifies that poaching will be reduced "in the Plan Area," Draft Plan at 3.3-151-152, which is not in the habitat (upstream) where spring-run are believed to be more susceptible to illegal harvest. Furthermore, susceptibility to poaching is not an evaluation of the impact of illegal harvest in absolute or relative terms. The Effects Analysis (Chapter 5) inexplicably asserts that winter-run Chinook salmon are also susceptible to poaching, Draft Plan at 5.5.3-37, even though these fish hold in fresh water for a much shorter period than spring-run Chinook salmon and exhibit this behavior in a much bigger river that is much more easily patrolled than the high mountain streams used by spring-run.

In sum, the Conservation Strategy and Effects Analysis assert, without analysis or supporting data, that illegal harvest "in the Plan Area" on adult sturgeon and both juveniles and adults of all Central Valley salmonid populations and that any reduction in that stressor will translate to meaningful progress towards attainment of related species-specific objectives. There is simply no support for these assumptions and many, particularly those regarding covered salmonid populations, are not likely to be true.

4. <u>The Draft Plan Fails to Adequately Describe, Evaluate and Address Delta Outflow and Other Known Flow Stressors</u>

The Conservation Strategy fails to identify entrainment-related mortality or Delta outflow rates as stressors to longfin smelt despite the fact that two longfin smelt-specific objectives specifically incorporate these stressors. For example, one longfin smelt productivity objective uses flow-corrected abundance as its measure (LFSM1.1) and the other productivity objective sets a limit on entrainment-related mortality rates at the CVP and SWP (LFSM1.2). However, in the same tables that identify these desired biological outcomes, only "lack of food resources" is identified as a stressor for longfin smelt. As described in our critique of objective LFSM1.1, there is overwhelming evidence that Delta outflow is strongly correlated with stressors on longfin smelt populations in this Estuary. Jassby et al. 1995; Kimmerer et al. 2002; Rosenfield and Baxter 2007; CDFG 2009; Kimmerer et al. 2009; Mac Nally et al. 2010; Rosenfield 2010; CDFG 2010; Thomson et al. 2010. Delta outflow may be a direct stressor on both population abundance and distribution, as it affects larval transport and subsequent spatial distribution. Kimmerer 2002b; Dege and Brown 2004; Rosenfield 2010. The Department of Fish and Wildlife's life history conceptual model for longfin smelt describes "Delta outflow" and "salinity" (which is directly related to Delta outflow) as "important" stressors with "medium" to "high" certainty of impact and it explicitly links another important stressor, entrainment-related mortality, to Delta outflow rates. Rosenfield 2010 at 30. The Plan's failure to identify these two factors as major stressors on longfin smelt populations is inexplicable, especially since both freshwater flow and CVP/SWP operations also affect the "lack of food resources" that the

Conservation Strategy identifies as the sole stressor it will attempt to address. Jassby et al. 1995; Kimmerer 2002; Rosenfield 2010.

In contrast to stressors like "lack of food resources" or "predation" or "illegal harvest", the reduction of which are consistently identified by the Plan as means for attaining numerous biological objectives, significant reductions and alterations to the timing of freshwater flow into, through, and out of the Delta are inconsistently identified as stressors. However, numerous state and federal agencies concur that reduced or otherwise altered patterns of flow into, through, and out of the Delta are among the most important stressors to native organisms and communities in the Delta. We have described this major shortcoming of the BDCP approach in numerous previous letters and communications; for example, regarding an appendix to a previous version of the Draft Plan, we wrote:

- ..a panel of experts convened by the SWRCB for its flow hearings (SWRCB 2010) found "<u>[F]low modification is one of the few immediate actions available to improve conditions to benefit native species</u>";
- the State Board (2010) itself specifically addressed the BDCP stating: "…<u>this [Public Trust Flow] report highlight[s] the need for the BDCP to develop an integrated set of solutions, to address ecosystem flow needs</u>, including flow and non-flow measures. …One cannot substitute for the other; <u>both flow improvements and habitat restoration are essential to protecting public trust resources</u>";
- the DRERIP conceptual life-history models for Delta smelt, longfin smelt, and salmonids (for instance) each clearly identify water exports and fresh water flow (or the position of X2) as important drivers of population response;
- the Final Recovery Plan for Central Valley salmonids (NMFS 2014) repeatedly emphasizes the need to improve fresh water flow conditions in the Delta and to reduce entrainment at water exports;
- the Delta Science Council's Independent Science Board (DSC 2011) found that both "Changed hydrograph; reduced inflow and outflow" and "Entrainment at pumps & other diversions" were key stressors in the Delta (the former was listed in three different stressor categories)…"

Memorandum to J. Meral from J. Rosenfield re: Review of BDCP Effects Analysis Appendix G December 22, 2011 (emphasis added).

Even though they are not explicitly identified as key stressors, the Draft Plan and DEIS/DEIR strongly imply that decreased and altered flow patterns are a major force affecting many of the covered aquatic species. For instance, increased flows are a key difference between the "High Outflow" and "Low Outflow" scenarios of Alternative 4 and, the High Outflow scenario performs better than many other Alternative 4 scenarios (though still inadequately) with regard to several of the biological objectives for aquatic species (such as OBAN escapement predictions for winter-run Chinook salmon, *see* Draft Plan Appendix 5G at Table 5.G-19). But, because the Draft Plan's treatment of freshwater flow as a stressor that impedes attainment of numerous biological objectives is inconsistent, the Conservation Strategy fails to consider flow augmentations as a specific conservation measure that would reduce these stressors. Even Alternative 4 produces no flow-related effects that are considered "beneficial" under both a NEPA and CEQA standard, *see* DEIS/DEIR at 11-55 (Table 11-4-SUM1) because flow levels under this alternative do not constitute a substantial improvement over the status quo.[51]

Specific examples abound of the Draft Plan's failure to treat flow as an important stressor that can and should be addressed by the BDCP. The Draft Plan states that "altered migration flows" are a stressor for each of the covered salmonid populations, but, when it sets stressor reduction targets for these species, the Conservation Strategy seeks only to prevent further degradation to these migration flows. For instance, for winter-run Chinook salmon, the migration flow stressor target is: "Ensure that north Delta intake operations do not increase the incidence of reverse flows in the Sacramento River at the Georgiana Slough junction." Draft Plan at 3.3-139; *see also* Draft Plan at 3.3.151; 3.3.159, 3.3.169 (stressor reduction targets for spring-run Chinook, fall-run Chinook, and steelhead respectively). In other words, even where it does identify flow impairment as a major stressor to several species, the Conservation Strategy seeks only to maintain the status quo, rather than seeking to reduce this stressor directly compared to current conditions.

Given such strong indication of the importance of flow modifications to sturgeon, it is indefensible that "altered flows" are not identified in the "assumed stressors" associated with biological objectives for either of the sturgeon species (perhaps more alarming, none of the stressor reduction targets identified for sturgeon species are specific, measureable, or time-bound, so it is not clear what, if anything, BDCP will do to actually address species-specific stressors). The National Marine Fisheries Service, commenting on an earlier version of the Draft Plan's biological objectives, requested greater emphasis on the need for adult attraction flow for sturgeon species. NMFS 2013 Progress Assessment at 15. Indeed, the Conservation Strategy

[51] One exception to the Draft Plan's failure to improve freshwater flow conditions is its provision of flows through Fremont Weir and the Yolo Bypass, both of which result from physical modifications to the landscape, rather than alterations in flow volumes. However, as we discuss elsewhere in these comments, both of these "improvements" are actually an example of BDCP's flawed baselines as both of these actions are already required under the NMFS 2009 biological opinion, even if BDCP is not approved and implemented.

identifies "Flow Operations" as an important "threat and stressor" to both white sturgeon and green sturgeon populations, stating:

> River flows influence white sturgeon spawning, habitat availability, and prey resources, and have been shown to be related to YOY abundance. Modifications of flow rates have the potential to provide an unnatural cue for spawning, which could result in lowered reproductive success. The dispersal of larval white sturgeon is dependent on high spring river flows, which optimally consist of multiple large flow pulses. Reduced seasonal flows or flows mismatched ecologically with sensitive early life stages may reduce dispersal of these life stages when they are most vulnerable to native and nonnative predation. Flow reductions may serve to reduce or eliminate YOY survival even if spawning was successful. Outflow influences YOY, juvenile, and adult white sturgeon bay and delta habitats by influencing salinity. Tagging data demonstrate white sturgeon move upstream when saline waters encroach eastward in dry years, while white sturgeon expand use of bay habitat when brackish water is pushed westward in wet years (Israel et al. 2009).

Draft Plan at 3.3-197; *see also id*. at 3.3-183 (green sturgeon).

Thus, the Plan clearly identifies the negative and important effects of altered freshwater flows and then either refuses to identify them as important stressors or fails to set targets for alleviating the stress caused by freshwater flow alterations, or both. This is a major inadequacy of the Draft Plan that defeats the point of clearly:

- linking species-specific biological outcomes (objectives) to forces that currently prevent the attainment of those objectives (stressors);
- describing reductions in those stressors to a degree (stressor reduction targets) that will facilitate attainment of the objectives;
- and then, designing conservation measures of appropriate type and magnitude to produce the specific desired effects.

E. The Draft Plan Fails to Describe how Proposed Conservation Measures Match, in Either Type or Scope, the Stressors it Identifies and the DEIS/DEIR Fails to Analyze how Outcomes of these Conservation Measures Address the Draft Plan's Desired Outcomes (Stressor Reduction Targets and Biological Objectives). As a Result the DEIS/DEIR and Draft Plan Fail to Adequately Evaluate the Adequacy or Efficacy of the Conservation Strategy

The National Research Council criticized a previous version of the Bay Delta Conservation Plan as "…a post-hoc rationalization of the water supply elements contained in the BDCP" and "a list but not a synthesized plan for the restoration activities." NRC 2010. Unfortunately, this remains an apt description of the Draft Plan in many respects. The conservation measures presented in the BDCP do not appear to be designed achieve specific reductions in stressors that are necessary in order to achieve desired outcomes (SMART biological objectives); instead, they are incompletely described actions whose benefits are assumed to provide benefits. There is no evaluation of how different levels of investment in a particular conservation measure might provide different levels of benefit; neither is there an evaluation of how different conservation measures interact with each other to produce positive or negative synergies. Very often, the Plan, EA, and DEIS/DEIR simply assume that the conservation measures work perfectly as described, with no analysis given to how outcomes might differ if the conservation measures are less than 100% successful. The Delta Independent Science Board identified this as the first of its "major concerns" with the Draft Plan, stating:

> Expectations for the effectiveness of conservation actions are too optimistic.— Throughout the DEIR/DEIS, the BDCP actions, as supplemented by Avoidance and Minimization Measures and Mitigation Measures, are assumed to produce the anticipated benefits when they are needed to offset any impacts of BDCP actions. In essence, it is often argued that Conservation Measures (CM) 2–22 will have sufficient positive benefits for covered species to counterbalance any negative impacts of water diversions and changes in flow caused by proposed alternatives (CM1). This is an implausible standard of perfection for such a complex problem and plan…. It would be better to begin with more realistic expectations that include contingency or back-up plans.

Delta ISB 2014 at 5; *see also* DSP Independent Science Review Panel Report 2014 at 45, 57.

1. The Draft Plan makes Unfounded and Unanalyzed Assertions Regarding the Efficacy of the Illegal Harvest Reduction Measure (CM17) and Fails to Evaluate Whether the Conservation Measure is Appropriately Scaled to the Magnitude of the Problem they are Intended to Address.

The Conservation Strategy offers conservation measure 17 (CM17 – additional investment in anti-poaching law enforcement teams) as a response to the Illegal Harvest stressor. Both the green sturgeon and white sturgeon DRERIP conceptual life history models, Israel and Klimley 2008; Israel et al. 2009, which are not referenced, mention illegal harvest of these species as an important (though unquantifiable) stressor, and we do not dispute that reducing illegal harvest of sturgeon in the Delta is worthwhile pursuit. However, the Plan's analysis of the problem and rationale for its proposed solution (CM17) appears limited to the following statement: "California has a population of approximately 37 million people (U.S. Census Bureau 2012), but has fewer than 200 field wardens. This is the lowest game warden-to-population ratio of any state in the nation." Draft Plan at 3.4-318.

Despite an acknowledged lack of information on the extent of the problem, the Draft Plan vastly overstates claims regarding the likely impact of illegal harvest for salmonids and the likelihood that CM17 will solve those problems. The Effects Analysis simply asserts, "The BDCP will help reduce illegal harvest of adult winter-run Chinook salmon." Draft Plan at 5.5.3-22. Again, this confuses efficacy of the conservation measure with importance of the stressor. In this case, the Effects Analysis assumes that illegal harvest is of moderate importance to the population and that there is moderate certainty of that effect. Draft Plan at 5.5.3-22. In fact, there is no certainty at all of the effect of poaching on the winter-run Chinook salmon population or any salmonid population, *see* Williams 2006, Williams 2010, and it is unlikely that poaching is a large impact on most of these populations. Nonetheless, the Effects Analysis claims: "… with high certainty that there will be a high positive change to the illegal harvest attribute for adult winter-run Chinook salmon, as well as for foraging and migrating juveniles." Draft Plan at 5.5.3.23.

Similar conclusions are drawn for spring-run Chinook salmon. The conclusions of high impact are over-inflated and neither the Conservation Strategy, Effects Analysis, nor the DEIS/DEIR offers supporting evidence to support this "high" level of certainty. This finding is attributed to the opinion of one agency biologist who wrote the memorandum describing the conservation measure and its costs – this hardly represents a rigorous or independent review of conservation measure effects and reveals no effort to compare the relative merits of different conservation measures.

Conclusions regarding illegal harvest reductions of steelhead are also overstated and are not supported by the available scientific information. The Effects Analysis states:

> "… it was assumed with <u>low certainty (based on relatively little information)</u> that illegal harvest of steelhead juveniles and adults is an attribute of <u>low importance</u>. It is concluded that there will be a <u>high positive change to the illegal harvest attribute for steelhead under the BDCP, with high certainty</u> based on the analysis

> presented by Roberts and Laughlin (2013) that is discussed further in the winter-run Chinook salmon analysis."

Draft Plan at 5.5.6-10.

However, the memorandum by Roberts and Laughlin presents no analysis whatsoever regarding the extent of illegal harvest of steelhead or winter-run Chinook salmon. There is no information in Roberts and Laughlin's memo that justifies a high certainty of high positive change resulting from reductions in steelhead poaching; there is also no information presented that can square these high expectations with the *low importance* of the stressor to begin with.

Because there is not even a qualitative estimate of the scope of the illegal harvest problem, the Conservation Strategy provides no way to evaluate whether CM17's proposed increase in enforcement staffing is adequate, too much of an investment, or too little. Also, the Draft Plan fails to evaluate whether this conservation measure's efficacy will be reduced by effectiveness of other conservation measures, such as the effort to reduce migration delays at the Fremont Weir (CM2). The Conservation Strategy relies heavily on a memo from CDFW regarding the cost for this action, but that memo provides no estimate of the benefits anticipated from CM17 or whether more benefits could be expected from an even larger effort. Roberts and Laughlin 2013.

The Draft Plan states that, "increased enforcement as part of CM17 will be focused on the Bay-Delta area and its waterways; however, increased enforcement outside of the Plan Area may occur as part of CM17." Draft Plan at 3.4-319. But the Draft Plan then states: "spring-run Chinook salmon are expected to experience the greatest benefit, because their over-summer holding and ease of locating may make them more susceptible to poaching than other runs." *Id*. at 3.4-322. Most current spring-run Chinook salmon holding habitat is far from the Delta in streams that drain the slopes of Mt. Lassen; staff time allocated to enforcing anti-poaching regulations for over-summering spring-run Chinook salmon will clearly not be available for in-Delta enforcement efforts. Similarly, the Effects Analysis suggests that reduced winter-run Chinook salmon poaching will occur due to enforcement efforts upstream on the Sacramento River holding grounds of this species. Draft Plan at 5.2-40. This holding habitat is approximately 2.5 hours or more from Fremont Weir; thus, staff that conduct anti-poaching efforts in winter-run holding habitat are not available for in-Delta efforts at that time. Also, winter-run Chinook salmon hold in the mainstem of the Sacramento River where they are less susceptible to poaching than, for example, spring-run Chinook salmon, *see* Williams 2006, and where anti-poaching efforts may be more challenging than in areas with fewer river access-egress options. Furthermore, the Effects Analysis suggests that anti-poaching efforts from CM17 will extend into the San Joaquin River drainage. Draft Plan at 5.5.5-54. Neither the Plan not the DEIS/DEIR describe how all of these divergent presumed benefits from the conservation measure (and the Plan describes others, not mentioned here) will be realized.

2. The Draft Plan Makes Unfounded and Scientifically Inaccurate Assertions Regarding the Efficacy of Tidal Marsh Restoration (CM4; Presumed Food Web Benefits)

The BDCP Conservation Strategy focuses heavily on restoration of food web productivity in the Plan Area. Indeed, increases in the availability of prey is identified as a stressor reduction target for longfin smelt (Draft Plan at 3.3-120), and salmonids, splittail, delta smelt, and sturgeon (Draft Plan at 5.E-149 (Table 5.E.4-39)). The main proposal for addressing limited food web productivity is to restore thousands of acres of tidal and shallow sub-tidal habitat (CM4). The plan describes two principal purposes of this action: (1) to provide habitat for covered species, and (2) "To enhance the ecological functions and services of the Delta especially in regard to the Delta foodweb that supports many covered fish species." Draft Plan Appendix 5E at 5.E-ii.

As we have stated repeatedly, our organizations generally support tidal and shallow sub-tidal habitat restoration in the Bay-Delta as a means of improving the quantity and quality of habitat for numerous wildlife species (especially, migratory waterfowl) and fishes that use these habitats extensively (e.g., Sacramento sucker), but, the BDCP must provide benefits to the fish and wildlife species that are covered by the Plan; ancillary benefits to other native species are welcome, but they cannot be the basis for permitting and implementing an HCP or NCCP. *See, e.g.,* EDF, NRDC, TBI, and DOW "BDCP: Performance Assessment from the Conservation Perspective" September 2011; Memorandum to J. Meral et al. From J. Rosenfield re: "Preliminary Review of BDCP Effects Analysis Appendix F" February 9, 2012. Contrary to the Draft Plan's assumptions and assertions in the DEIS/DEIR, there is little scientific evidence indicating that that restoration of the type and extent discussed in BDCP is likely to stimulate food production that will substantially benefit most of the covered species; there is no evidence that any increase in food availability will extend far beyond the immediate vicinity of the restoration projects to benefit life stages of covered species that do not frequent the restored habitat (*see below*).

i. The Draft Plan Misrepresents Cited Scientific Literature with Regard to the Potential Efficacy of Proposed Tidal Marsh Restorations to Covered Species

In comments on earlier versions of the BDCP, we documented the misrepresentation of scientific literature in BDCP documents regarding the likely effects of tidal marsh restoration. *See* "Partial Review of 2011 Draft of the BDCP Effects Analysis, April 4, 2011; Memorandum to J. Meral et al. from J. Rosenfield re: "Preliminary Review of BDCP Effects Analysis Appendix F" February 9, 2012. These mischaracterizations have not been corrected in the Draft Plan and thus the claims that specific benefits from proposed tidal marsh restorations are likely to accrue to covered species remain misleading and/or overstated.

The large uncertainties and potential negative effects to numerous fish species of restoring tidal marshes in the San Francisco Estuary were well-articulated by Brown (2003); he summarized the situation as follows: "… there is a high degree of uncertainty regarding the benefits of tidal wetland restoration for native fishes, including special status species such as delta smelt (*Hypomesus transpacificus*), chinook salmon (*Oncorhynchus tshawytscha*), steelhead rainbow trout (*O. mykiss*) and splittail (*Pogonichthys macrolepidotus*). Brown 2003 at 3. However, the Draft Plan cites Brown 2003 repeatedly as evidence that tidal marsh restoration will be good for a variety of covered fish species, *see, e.g.,* Draft Plan at 3.4-119, even though there is nothing in Brown 2003 that would support that conclusion as the paper focuses on the rather large uncertainties and potential pitfalls of that position.[52]

The Draft Plan cites the 2009 DRERIP Evaluation conducted for BDCP (Essex Partnership 2009) in a way that implies that these reviews supported the notion that restoration in the Cache Slough ROA would "Increase rearing habitat area for Chinook salmon (Sacramento River runs), splittail, and sturgeon." Draft Plan at 3.4-121. However, that preliminary DRERIP review rated potential benefits to sturgeon and most Sacramento River Chinook salmon runs as "low" (at best) with low to minimal certainty (fall-run Chinook salmon were seen as possibly experiencing "moderate" benefits from this restoration, but again certainty was rated "low" for this potential outcome); on the other hand, potential negative outcomes from this restoration effort were judged to be of "medium" magnitude (at worst) for all the covered species. Essex Partnership 2009 (2009 DRERIP Evaluation).

As we stated in our review of earlier BDCP efforts to justify the Draft Plan's tidal marsh restoration proposal, references to "Healy 1991" and "Kjelson 1982" are misleading; Healy (1991) is a 20+-year old book chapter that describes Chinook salmon behavior across the coast throughout their life cycle – it provides no support for the notion that BDCP's proposed restoration of Suisun Marsh habitats will benefit Chinook salmon. Kjelson et al. 1982 (also the source of most of the information about salmon in this system in Healy 1991) provides no support for the notion that BDCP's proposed restoration of Suisun Marsh habitats will benefit Chinook salmon.

---

[52] Similarly, the Draft Plan cites "Siegel (2007)" as supporting claims regarding the benefits of tidal marsh restoration for numerous covered species, Draft Plan at 3.4-121, but this document is a "first draft" that clearly states that it is: "incomplete and not fully vetted" and that "…the very short time frame for development of this first draft means it is neither complete nor subjected to adequate scrutiny as a complete package." Seigel 2007 at 5.

Similarly, Hobbs et al. 2006 is referenced as supporting the notion that Suisun Marsh restoration will benefit longfin smelt and delta smelt, but this paper does not reference the potential effect of marsh restoration on either of these covered smelt species – in fact, the words "marsh", "Suisun Marsh", "wetlands", and "restoration" do not occur at all in that paper, whereas the importance of the low salinity zone for rearing of both species is repeatedly emphasized. The Draft Plan cites "Moyle 2008" and "Fresh 2006" in support of a claim of benefits to covered species from proposed restoration of tidal marsh in the Suisun Marsh and Cache Slough ROAs. Draft Plan at 3.4-121. However, because these papers are not listed in the literature cited section of this document, it is not possible to review their relevance to the claims made in the Draft Plan.

ii. The Draft Plan fails to match conservation measures to the presumed drivers of ecosystem stress they are intended to address

Approaches to ameliorate limited food web productivity should either address the causes of food supply limitations (i.e., produce stressor reduction) or circumvent those forces that currently result in reduced food supplies. The point of clearly identifying and characterizing stressors is to ensure that conservation measures are designed specifically to attack these problems. Thus, it is surprising that the stressors the Plan and DEIS/DEIR identify as limiting food supplies for covered species are <u>not</u> those that would be ameliorated by increased tidal marsh restoration. The Plan argues variously that invasive clam species (which graze on phytoplankton) and altered estuarine chemistry (both nutrients and toxins), and other stressors are the likely forces that drive the decline in this estuary's food web productivity. For example, in its rationale for setting the food web stressor reduction target relevant to its longfin smelt objective, the Conservation Strategy explains:

> Researchers have hypothesized that a major factor in the decline of longfin smelt abundance is related to invasion by *Potamocorbula* and its subsequent disruption of the foodweb (Carlton et al. 1990; Alpine and Cloern 1992; Orsi and Mechum 1996; Kimmerer 2002a; Baxter et al. 2008:36). There is evidence that the disruption of the foodweb is the most significant change in the estuary's carrying capacity for other fishes (e.g., Kimmerer et al. 2000; Kimmerer 2006).
> …
> Total ammonia levels may be another factor affecting covered fish species by inhibiting primary productivity (Ballard et al. 2009; Dugdale et al. 2007; Dugdale et al. 2012 in Parker et al. 2012; Glibert 2010; Glibert et al. 2011; Parker et al. 2012; Wilkerson et al. 2006), altering the phytoplankton species assemblage (Baxter et al. 2010; Glibert 2010), or altering the role of invasive species (Ballard et al. 2009). The primary source of total ammonia in the Delta is effluent discharged from wastewater treatment plants, and the primary contributing facility is the Sacramento Regional Wastewater Treatment Plant. The frequency, severity,

> and distribution of effects from total ammonia levels are the subject of ongoing research, but current science indicates a high likelihood that decreasing loading of total ammonia from the Sacramento Regional Wastewater Treatment Plant would have beneficial consequences for phytoplankton productivity and thus the productivity of the pelagic foodweb in and downstream of the Sacramento River in the Plan Area. Section 3.5.1, Ammonia Load reduction, describes the analysis underlying this conclusion.

Draft Plan at 3.3-126. Assuming that these food supplies are currently limited by stressors such as invasive clams, altered aquatic nutrient ratios, *Microcystis*, or contaminants, then any food supply benefit of the BDCP's habitat restoration will be substantially reduced by these very same problems.

Despite the Plan's focus on non-habitat related stressors as the drivers of decline in foodweb productivity, the Conservation Strategy does not identify measures to directly combat these stressors. Instead, the Conservation Strategy focuses on inundation of low-lying habitats under the expectation that these will generate food for covered species. The Plan does not describe why it believes that food produced by these "restored" wetlands and floodplains would not be subject to the same negative impacts (clam grazing and/or altered water chemistry) that it contends drive the current limits on food web productivity. Indeed, the Conservation Strategy at times acknowledges that its description of benefits likely to arise from tidal marsh and floodplain inundation are highly uncertain because of the risk that food produced on the restored areas will be consumed by invasive clams. The Effects Analysis states:

> Translation of the potential production implied by the prod-acre index into food for covered fish species is complicated by biological and physical conditions… In particular in shallow areas <u>grazing rates of clams can exceed phytoplankton production rates resulting in no augmentation of zooplankton or other food sources for covered fish species</u> (Lucas et al. 2012). Hydrodynamics can affect water residence time and the movement of food from sources to potential fish feeding areas. Because clam grazing rates and hydrodynamics vary across the Delta, the potential of primary production changes in Table 5.E.4-39 and Figure 5.E.4-86 to effectively convert to food for covered fish species will likely vary significantly among and within subregions and will depend greatly on local conditions and by large scale drivers of conditions such as flow, salinity and temperature."

Draft Plan, Appendix 5.E, at 5.E-147. The Plan does not seem to acknowledge that, if estuarine chemistry is limiting productivity (as the Conservation Strategy suggests), then restoration of shallow water habitats will do nothing to address that limitation.

In its confusing, and ultimately unresolved, portrayal of some of the stressors that may affect estuarine food supplies for covered species, the Effects Analysis states:

> In a precursor to the broader work by Glibert et al. (2011), Glibert (2010:229) concluded the following.
>
> > *"[A] clear management strategy* [for managing food web impairments] *is the regulation of effluent N discharge through nitrification and denitrification. <u>Until such reductions occur, other measures, including regulation of water pumping or manipulations of salinity, as has been the current strategy, will likely show little beneficial effect</u>."*
>
> This suggests recognition that other attributes (stressors) such as entrainment may also be of importance, albeit secondary importance [to estuarine stoichiochemistry], according to Glibert (2010).

Draft Plan at 5.5.1-4 (emphasis added).

We and many other independent scientific reviews are skeptical of the analyses and nutrient management approach to foodweb stimulation promoted by Glibert (2010; Glibert et al. 2011). *See, e.g.,* Cloern and Jassby 2012; Cloern et al. 2014; DSP Outflows Review Panel Report 2014. However, we agree that management actions should respond to (or at least not be blind to) the root causes of the problems they are intended to address.[53] Ironically, though the Effects Analysis cites this argument, it does not acknowledge that restoration of tidal marsh and sub-tidal habitat do not respond to, and would be impaired by, the stressors the Draft Plan cites as driving food web productivity declines.

Meanwhile, the BDCP Plan and DEIS/DEIR documents do not analyze the documented effects of:

---

[53] This paper was the subject of a scathing re-analysis by Cloern et al. 2012 which showed that:

> …CUSUM-transformed variables often have an apparent statistically significant correlation even if none exists between the original untransformed series. Moreover, even if a statistically significant relationship could be established between CUSUM-transformed variables, there is no proven basis for inferring relationships between the original variables. … As a real example, Glibert (2010) inferred a strong negative association between delta smelt abundance and wastewater ammonium from regression of CUSUM- transformed time series. However, the Pearson correlation ($r = -0.096$) between the time series … is not significant, even under the naive IID assumptions ($p = 0.68$). In short, correlations between CUSUM-transformed variables should not be used as a substitute for analysis of the original untransformed variables.

Cloern et al.2012.

- Increased freshwater flow rates (and the related position of the salinity field, "X2") on production of zooplankton species that covered fish species eat. Jassby et al. 1995; Kimmerer 2002;
- Increased freshwater flow rates on the alleged food web effects arising from unbalanced nutrient concentrations. Dugdale et al. 2007, 2012, 2013;
- Reduced south Delta exports (and associated hydrodynamic modifications) on food web productivity. Jassby et al. 2002; Cloern and Jassby 2012; and
- Freshwater flow management on the susceptibility of this ecosystem to invasion by disruptive, non-native species. Winder et al. 2011.

iii. The Draft Plan's Analysis of CM4 Fails to Use the Best Available Science and is Inconsistent with Numerous Peer Reviews

Many of the purported benefits of CM4 are unsupported by the BDCP Effects Analysis and/or they are contradicted by previous analyses and published literature. Although at times the document acknowledges uncertainty, by and large the Effects Analysis reiterates assertions made throughout the document regarding the presumed benefits of BDCP's tidal marsh restoration efforts, stating:

> Restored tidal marshes are expected to provide increased phytoplankton production, which will benefit zooplankton such as copepods that are an important prey item for listed fish (e.g., delta smelt, longfin smelt, and splittail), other estuarine fish, and other aquatic organisms. Substrates in restoration areas will provide habitat for macroinvertebrates which will also result in beneficial food web effects.

Draft Plan at 5.4-11. The Effects Analysis fails to support this claim with a specific analysis relating its conservation measures to the attainment of stressor reduction targets. For example, the Conservation Strategy identifies the following stressor reduction target for longfin smelt:

> Increase the average late-winter and early-spring (late February to April) density of zooplankton (target of 7,000/m3 of calanoid copepods) in the Cache Slough ROA, West Delta ROA, and Suisun Marsh ROA and/or supply adequate transport flows (sustained or pulse flows) to move longfin smelt larvae to areas with adequate food resources (target of 7,000/m3 of calanoid copepods). Achieve this target by year 15. Increasing food abundance will contribute to increased longfin smelt juvenile survival immediately following yolk-sac absorption by providing food resources suitable for juvenile longfin smelt within the Plan Area.

Draft Plan at 3.3-120.

We approve of the specificity of this stressor reduction target (though we do not comment here on its adequacy), but the point of providing such targets is to guide the Effects Analysis and DEIS/DEIR to evaluate whether such targets will be met by the Conservation Strategy, as proposed. Neither the Effects Analysis not the DEIS/DEIR delivers an analysis of food web effects that are comparable to the target above.

The presumption that tidal marsh restoration will substantially improve food production for most or all of the covered fish species ignores the weight of scientific and agency opinion which indicates that the expectation of food exports are highly uncertain and too small to significantly benefit pelagic fish species even if the amount of food web stimulation that the Plan anticipates actually occurs. For example, in 2012 the U.S. Fish and Wildlife Service stated that, "The plan's ultimate conclusions regarding the outcome of creating such large new areas of tidal marsh remain more positive and certain than the literature and scientific authorities suggest they should be. U.S. Fish and Wildlife Service, FWS BDCP Effects Analysis red flags for March, 2012 ("USFWS Red Flags 2012") at 8-9. In its 2013 comments on proposed habitat restoration under the BDCP, the Delta Stewardship Council noted that, "[s]ome suggest enhanced flow may also provide more reliable benefits to the ecosystem than marsh restoration, the benefits of which are less certain and not yet well documented." DSC 2013 BDCP Comments. Similarly, in its review of the Effects Analysis' estimation of food web impacts resulting from physical habitat restoration under the BDCP, the Delta Science Program's Independent Review Panel wrote "…the BDCP analyses are ambiguous and conclusions and estimates of net effects overestimate the net positive impacts of conservation measures. DSP Independent Science Review Panel 2014 at 59. Regarding habitat restoration in particular, they wrote

> Restoration of tidal wetlands (and other communities) is highly uncertain and at least an extremely long process. <u>The Effects Analysis does not adequately justify the critical assumption of the benefit of tidal wetland restoration as a food web subsidy for covered pelagic fish given the uncertainties of tidal wetland restoration itself</u>. A critical issue is the implicit expectation that restoration activities will result in increases in abundance of lower trophic levels, but it is uncertain whether the resulting increased production will result in food web pathways supporting covered species. The presentation of phytoplankton-based and tidal wetland macrophyte detritus-based food webs as alternative ecosystem processes, rather than as an integrated system, also significantly complicates the interpretation of the potential benefit of BDCP restoration. For foraging salmonids, the Effects Analysis did not evaluate the reduced extent to which salmonids would have access to rehabilitated habitat when the north Delta intakes are operating and flows are reduced.

Id. at 7-8. In addition, they wrote that,

> …there is great uncertainty associated with the restoration of the wide range of ecosystems slated for restoration. Many of these systems have a poor record of achieving restoration, especially in short-to-moderate time periods. This range of ecosystems also varies considerably in the degree of difficulty of restoring functions. Nonetheless, the outcomes for conservation measures and their interaction and effectiveness are glossed over and uncertainties are not apparent in conclusions and summary discussions.

Id. at 37. Furthermore, that panel found that the Draft Plan and DEIS/DEIR frequently failed to assess the potential negative impacts of conservation measures, such as habitat restoration, stating:

> With respect to food webs, wetland and aquatic systems restoration are assumed to be effectively restored and functional immediately or in a short time frame and meet the biological objectives of the BDCP. This result is based on a number of additional assumptions, all of which contain considerable uncertainty. Similarly, while potentially negative impacts on the success of restoration are considered in passing, e.g., invasive bivalves, <u>none of their potential effects are incorporated into their analyses or conclusions.</u> <u>The simplest effects perspective of the BDCP is that it edits out all potential outcomes except for the most favorable one</u>.

Id. at 57. A separate review by a different assemblage of independent experts concluded that many of the BDCP's assessments of impacts "… hinge on overly optimistic expectations about the feasibility, effectiveness, or timing of the proposed conservation actions, especially habitat restoration." Delta ISB 2014 at 3.

Another review of BDCP conducted by experts in ecosystem processes and aquatic ecology of the Bay-Delta ecosystem (this one commissioned by The Nature Conservancy and American Rivers) reached a similar conclusion, noting that "The BDCP is overly optimistic about the likely benefits of tidal marsh restoration to the smelt species, <u>particularly the extent of food production</u>." Mount and Saracino et al. 2013 at 70-71 (emphasis added). They conclude:

> The BDCP is overly optimistic about the potential benefits to delta and longfin smelt of physical habitat restoration. Longfin smelt do not appear to use marshes as habitat to any great extent. Delta smelt are also considered pelagic but their persistent abundance in the Cache Slough complex, and greater abundance in shallow rather than deep water, suggests some potential benefit to their population

> of expanded marsh in that area. The magnitude of this benefit is impossible to predict, as is the degree to which marsh and floodplain restoration might cause an increase, or reverse the decline, in the delta smelt population. Under these conditions it is premature to assert that the restoration activity will have such an effect, until studies including pilot projects and even some smaller full-scale restoration projects can show whether an effect is to be expected.
>
> The idea that restored marsh and floodplain will export substantial amounts of zooplankton to the open waters of the estuary is not tenable. The ecology of shallow waters suggests that shallow areas are more likely to be sinks for zooplankton. Even if they were sources, simple mass-balance considerations indicate that the resulting export would produce at most a small enhancement of extant zooplankton of the open waters. This idea should be dropped from discussions of BDCP.

Mount and Saracino et al. 2013 at 82. In general, scientific reviews of the potential for large-scale tidal marsh restoration to produce significant benefits to pelagic fish species in the Bay Delta (e.g. via enhanced food web productivity) have concluded that such effects are speculative and unlikely to be realized to the extent expected by the BDCP Effects Analysis. For example, the National Research Council in 2010 concluded that, with respect to the USFWS 2008 biological opinion's habitat restoration action in the RPA,

> The tidal habitat management action in the RPA requires creation or restoration of 8,000 acres of intertidal and subtidal habitat in the delta and in Suisun Marsh. This action has not been controversial because it does not affect other water users. The committee finds that the conceptual foundation for this action (Action 6) is weak <u>because the relationship between tidal habitats and food availability for smelt is poorly understood</u>. … The committee recommends that this action be implemented in phases, with the first phase to include the development of an implementation and adaptive management plan (similar to the approach used for the floodplain habitat action in the NMFS biological opinion), but also to explicitly consider the sustainability of the resulting habitats, especially those dependent on emergent vegetation, in the face of expected sea-level rise. In addition, there should be consideration of the types and amounts of tidal habitats necessary to produce the expected outcomes and how they can be achieved and sustained in the long term. The committee supports the monitoring program referred to in Action 6, and appropriate adaptive management triggers and actions.

NRC 2010 at 6.

A recent review by nine authors with vast experience in fisheries and shallow sub/inter-tidal habitats of the Bay-Delta (Herbold et al. 2014) concluded:

> Movement of plankton from a tidal marsh (beyond the immediate area of tidal exchange) is <u>likely to be limited and to decrease strongly with distance</u>. <u>Even under ideal circumstances, plankton in water discharged from tidal marsh cannot greatly affect the standing crop of plankton in large, deep channels</u>. Feeding by clams and other introduced species can further reduce contributions of marsh plankton to open-water foodwebs.

Herbold et al. 2014 at 1-2 (emphasis added). These authors also found that, "In the modern San Francisco estuary, tidal wetlands can be important habitats for many fishes, but likely will have little effect on the export of food available to fish at any significant distance." *Id*. at 3. And they state:

> Restored tidal wetlands are unlikely to have much effect on food webs in the upper estuary's open waters. The shallow depth and small volume of water on tidal wetlands compared to the vast volume of open water in the Delta channels and Suisun Bay means that the flux of wetland phytoplankton and zooplankton would be inconsequential to pelagic food webs. We are unaware of reports from the worldwide literature in which substantial quantities of zooplankton are exported from marshes to open waters, whereas several studies show net import of zooplankton to fish consumption on site.

Id. at 4.[54]

These conclusions echo findings of BDCP's own earlier review of six tidal marsh restoration measures considered in the BDCP; for the most part, these tidal marsh restoration measures have been retained in the current BDCP Conservation Strategy. In our review of this earlier effects analysis (the 2009 DRERIP evaluation, *see* Essex Partnership 2009), which considered a variety of conservation measures in addition to tidal marsh restoration proposals (but no alternative water management regimes), we found that "… covered species are expected to receive only "Minimal" or "Low" benefits from most of the proposed conservation measures" and "…a substantial portion of the positive results are characterized by "Low" to "Minimal" certainty.

[54] While publication of this paper occurred after publication of the BDCP documents and the DEIS/DEIR, each of the authors has been available to the BDCP planning team and several of the authors have been engaged in the planning and technical analyses of BDCP components. Their conclusions are not new results, but represent longstanding perspectives of experts in the Bay-Delta ecosystem's aquatic foodwebs.

Thus, the actual outcome of many of these actions is likely to be significantly less than projected, based on magnitude scores alone. TBI letter to BDCP Steering Committee, August 17, 2009 at 3-4.

iv. The Draft Plan and DEIS/DEIR assume benefits accrue to species that are unlikely to benefit from the Conservation Measure, even when the presumed benefit is not related to a previously identified stressor.

The Draft Plan and DEIS/DEIR tend to claim that projected benefits from conservation measures will benefit numerous species even when the presumed benefit does not alleviate an identified stressor on the species' population. For example, with regard to habitat restoration, the Effects Analysis claims repeatedly that species such as steelhead may benefit from the anticipated increase in potential rearing habitat associated with tidal marsh restorations; this expectation is contradicted by the Habitat Restoration Appendix's acknowledgement that "steelhead are generally thought to move quickly through estuarine habitats because of their larger size at outmigration." Draft Plan, Appendix 5E, at 5.E-116. Similarly, the conceptual model for Central Valley salmonids concludes "Spring Chinook, or at least the Butte Creek population, pass quickly through the Delta, so habitat restoration there seems unlikely to do much for them. The same is probably true for late fall Chinook, and for steelhead." Williams 2010 at 41.

In fact, an expert panel convened by the BDCP planning process (the 2009 DRERIP evaluation) to review the potential benefits of tidal marsh measures found that, with the exception of effects to Sacramento splittail (a species that does well in marsh habitats), five of the six tidal marsh measures evaluated were expected to generate "minimal" to "low" benefits, at best, for the covered fish species and the likelihood of these small benefits was "minimal" to low" in most cases. By contrast, each of the six regional tidal marsh restoration efforts studied in detail by the expert panel was expected to generate negative effects of "moderate" to "high" magnitude (with "medium" to "low" certainty) for covered species. These negative impacts included the potential for restored wetlands to harbor or facilitate impacts from invasive competitor and predator species. For both positive and negative impacts, the magnitude of effects generated by tidal marsh restoration was acknowledged to depend on site-specific considerations among other uncertainties. Essex Partnership 2009. In their more recent review, the Delta Science Program Independent Review Panel emphasized similar concerns, stating:

> Migrant life histories are less likely to benefit from habitat restoration activities, which are a key focus of the BDCP conservation measures. This implies that spring Chinook and steelhead may experience less benefit from BDCP actions than other salmonid species, or they may even experience a negative net effect in response to reduced spring flows. The key question, which deserves more

> attention in the BDCP, is whether the migrant life history will sufficiently benefit from conservation measures to offset moderate negative impacts related to reduced spring flows.

DSP Independent Science Review Panel Report 2014 at 30; *see id*. at 57-58.

v. The Draft Plan makes the unfounded assumption that all planned restorations will occur when and to the extent planned and will be 100% successful.

In addition to the lack of scientific evidence that the Bay-Delta food web is likely to be substantially improved by restoring tidal marsh habitats, there is great uncertainty regarding the assumed effectiveness of marsh restoration measures – that is, even if tidal marsh restoration supports the Bay-Delta food web in the manner anticipated by the Draft Plan, there is no certainty that each individual restoration will be maximally effective in producing these results. If some of the restoration actions are less effective at producing food for covered species (or more effective at supporting invasive competitor or predator species) than the Plan assumes, then the overall benefit of this measure will be reduced. The State Water Resources Control Board identified this general concern, in its July 5, 2013 comment letter, which states "The fishery and aquatic resources impact analysis does not appear to analyze scenarios in which conservation measures are not 100% successful." SWRCB 7/5/13 BDCP Comments at 32.

Similarly, there are growing concerns that physical and economic limitations (including the lack of willing sellers) may prevent BDCP from achieving the overall restoration acreage. Reviews from NMFS (2013), USFWS (2013), SWRCB (2013) and the Delta Science Program Independent Review Panel (2014) have raised the concern that the physical characteristics of the Estuary cannot support the tidal marsh restoration. For instance, the State Water Resources Control Board, commenting on the 2013 Administrative Draft of the BDCP, wrote:

> The BDCP relies on habitat restoration to provide adequate ecosystem conditions to achieve the biological goals and objectives of the project. Available tidal energy, and the associated tidal exchange, might be attenuated as restoration projects begin to be constructed and put into operation. The reduction in tidal exchange might reduce the export of phytoplankton and reduce turbidity. Both of these effects might reduce the effectiveness of existing and future restoration areas.

SWRCB 7/5/13 BDCP Comments at 5. The Board also expressed concern that the Administrative Draft of the BDCP did not "appear to analyze the effects of changes in tidal energy exchange that may result after construction and implementation of habitat restoration projects, and how those changes in tidal energy might affect transport of food and turbidity to locations where pelagic species are present." *Id*. The current public draft of the BDCP still fails to analyze the effects of habitat restoration on tidal energy and vice versa.

The Delta Science Program Independent Review Panel points to another potential physical limitation on the BDCP's ability to effectively restore tidal marsh habitats:

> *The issue is sediment supply for these restorations. The BDCP assumes a constant* sediment concentration for the time period of the plan (Appendix 5.E, pp. 43-44: turbidity held constant in models and interpretations), yet they indicate that sediment concentration has been declining over the past 50 years (p. 109) and that the BDCP conservation measures will further reduce the sediment supply by an additional 8-9%. <u>While in their discussion of sediment supply, they also conclude that declining sediment concentration and the impact of CM1 will mean much lower sediment supply, these issues have no impact on the BDCP analysis and inference</u>. Yet the loss of sediment supply creates great uncertainties in the rate and potential for restoration of these habitats, while <u>only the most optimal circumstances are modeled or estimated</u>.

DSP Independent Science Review Panel Report 2014 at 58 (emphasis added).

In a related problem, any benefits of tidal marsh habitat restoration can only materialize *after* the restoration projects are implemented. The implementation schedule for CM4 indicates that less than half of the total "tidal wetland restoration will be completed by year 15 (the end of the so-called "Early Long-term" period). Draft Plan at 6-5. Thus, most of the presumed benefits provided by tidal marsh restoration actions (assuming there are net benefits) to covered species will only become apparent decades into the BDCP permit term, and the full benefits described in the Plan cannot materialize until after the permit-term is completed, assuming that the schedule is accurate and restorations are not significantly delayed. The Effects Analysis and DEIS/DEIR also tend to assume that benefits of tidal marsh restoration materialize as soon as the restoration occurs, despite the scientific consensus that such restorations evolve over long time periods. DSP Independent Science Review Panel Report 2014; Herbold et al. 2014; Delta ISB 2014. The DEIR/DEIS offers no alternative strategy for conserving and restoring covered species (such as accelerated or more aggressive implementation of other conservation measures or temporary improvements to freshwater flow regimes) during the long implementation horizon for CM4. The long delay in the Plan's effort to provide benefits to covered species is asymmetrical to the timing of actions intended to provide water supply reliability benefits. *See* Draft Plan at 6-3 (North Delta conveyance operations could begin as early as year 11). This asymmetric approach is inconsistent with the NCCPA's requirement for conservation and mitigation measures to be implemented roughly proportional in time and extent" to the impacts under the Draft Plan. *See* Cal. Fish and Game Code § 2820(b)(3)(B).

The Delta Science Program Independent Review Panel's Phase 3 review of BDCP summarizes many of our concerns with the DEIS/DEIR's analysis of food web impacts arising from the BDCP:

> An overarching assumption is that conservation measures have rapid and positive impacts. With respect to food webs, wetland and aquatic systems restoration are assumed to be effectively restored and functional immediately or in a short time frame and meet the biological objectives of the BDCP. This result is based on a number of additional assumptions, all of which contain considerable uncertainty. Similarly, while potentially negative impacts on the success of restoration are considered in passing, e.g., invasive bivalves, none of their potential effects are incorporated into their analyses or conclusions. <u>The simplest effects perspective of the BDCP is that it edits out all potential outcomes except for the most favorable one</u>.

DSP Independent Science Review Panel 2014 at 57 (emphasis added).

IV. <u>THE DRAFT PLAN AND DEIS/DEIR FAIL TO USE THE BEST AVAILABLE SCIENCE IN ASSESSING THE EFFECTS OF PROPOSED ACTIONS</u>

Given the failure to identify legally adequate restoration outcomes for BDCP, the logical shortcomings of the Conservation Strategy's design, the failure to apply the best available science to analysis of ecological stressors and problems in the Bay-Delta ecosystem, and the failure to explain or justify many of the conservation measures in terms of their contribution to success, it is not surprising that the DEIS/DEIR and Draft Plan predict that the biological outcomes anticipated from implementation will not achieve the biological goals and objectives, let alone achieve legally adequate outcomes. In addition, the Draft Plan's Effects Analysis inappropriately overlooks, de-emphasizes, or underestimates potential negative impacts to the covered species and the ecosystem attributes resulting from Plan implementation. The Draft Plan and DEIS/DEIR frequently identify high "uncertainty" surrounding projected outcomes or model predictions, but, despite this acknowledgement, they proceed to draw conclusions that are usually favorable to the BDCP – we interpret the large uncertainties as a lack of credible evidence that the hypothetical positive results of the Draft Plan are likely to arise and/or that potentially severe negative outcomes will be avoided. Furthermore, the Plan's estimation of ecosystem and species-specific benefits are routinely biased in a way that is overly optimistic about the magnitude and certainty of likely impacts. Even when scientific information demonstrates the biological objectives are unlikely to be achieved or that species or ecosystem attributes of viability will continue to decline (even to the point of potential extinction during the duration of the BDCP) the Draft Plan concludes that the BDCP will successfully contribute to the recovery of covered species.[55] Finally, the methods and results applied towards analyzing likely plan impacts are inadequate and frequently biased in a way that favors permitting of the Plan.

This is not the first time we have raised our serious concerns with the analysis or interpretation of the Plan's likely effects, and numerous independent scientific reviews have repeatedly emphasized serious deficiencies in the analysis and interpretation of Plan impacts. For instance, the Delta Science Program's Independent Review Panel found that the BDCP Effects Analysis "tends to overreach conclusions of positive benefits for covered fish species, given the inability to quantify the over-all net effects and the realization of high uncertainty," DSP Independent Science Review Panel Report at 25, and that it:

> … does not adequately acknowledge the extensive uncertainty associated with the BDCP's assumptions and predictions. In its current form, at the level of detail conveyed, in the models used, and in the verbal assessments and conclusions, <u>the level of uncertainty is often downplayed</u>. Within appendices sometimes more explicit discussion of uncertainties can be found, but <u>there is a disconnect between the summary pages with the conclusions drawn in Chapter 5. In situations in which an array of outcomes may be possible, only the more beneficial outcomes are used in conclusions about the BDCP</u>. Communication of uncertainty would be improved by consideration of a range of potential outcome values in models."

Id. at 8 (emphasis added). The Delta Independent Science Board concurred with the Independent Review Panel's conclusions regarding the Effects Analysis and had a similarly harsh critique of the DEIS/DEIR, concluding that, "We find, however, that the science in this BDCP effort falls short of what the project requires," Delta ISB 2014 at 1, and they also find that, "the DEIS/DEIR currently falls short of meeting this 'good enough' scientific standard" of the best available science," Delta ISB 2014 at 3. In particular, they concluded that:

> 1. Many of the impact assessments hinge on overly optimistic expectations about the feasibility, effectiveness, or timing of the proposed conservation actions, especially habitat restoration.
> 2. The project is encumbered by uncertainties that are considered inconsistently and incompletely; modeling has not been used effectively to bracket a range of uncertainties or to explore how uncertainties may propagate.

[55] As we emphasize elsewhere, this is not the correct legal standard under the NCCPA.

> 3. The potential effects of climate change and sea-level rise on the implementation and outcomes of BDCP actions are not adequately evaluated.
> 4. Insufficient attention is given to linkages and interactions among species, landscapes, and the proposed actions themselves.
> 5. The analyses largely neglect the influences of downstream effects on San Francisco Bay, levee failures, and environmental effects of increased water availability for agriculture and its environmental impacts in the San Joaquin Valley and downstream.
> 6. Details of how adaptive management will be implemented are left to a future management team without explicit prior consideration of (a) situations where adaptive management may be inappropriate or impossible to use, (b) contingency plans in case things do not work as planned, or (c) specific thresholds for action.
> 7. Available tools of risk assessment and decision support have not been used to assess the individual and combined risks associated with BDCP actions.
> 8. The presentation … makes it difficult to compare alternatives and evaluate the critical underlying assumptions.

Id. at 3. We concur with and reiterate these conclusions of both the Delta Independent Science Board and the Independent Science Review Panel's assessments of the Draft Plan and DEIS/DEIR. In addition, we find that both documents repeatedly fail at the analytical level, in multiple other ways, including:

- Failing to analyze impacts with regard to each attribute of viability (i.e. abundance, productivity (survival), spatial extent of spawning habitat, and life history diversity; McElhany et al. 2000 *and described above*) for each covered species;
- Selectively presenting positive results of analyses when the same analyses also reveal negative outcomes;
- Dismissing modeling results (or entire models) that indicate the Draft Plan and operational alternatives are likely to have negative outcomes relative to baseline conditions (as modeled in the future under the assumption of climate change);
- Selectively applying "uncertainty" as an excuse to dismiss modeling outcomes that reflect negatively on the Draft Plan and operational Alternatives, but ignoring model variance wherever modeling results are deemed to reflect positively on the Draft Plan and Operational Alternatives;
- Incorrectly measuring uncertainty (when it is addressed at all) to reach conclusions of "no difference" between Alternatives and the appropriate baseline, when a valid comparison of results would likely reveal significant differences between Alternatives and NAA;

- Failing to demonstrate that the Draft Plan is likely to achieve its biological objectives, and that the modeling and other analyses show that the Draft Plan is unlikely to achieve these goals and objectives;
- Failing to demonstrate that the Draft Plan would improve upon or even maintain current conditions for covered species, many of which are designated as threatened or endangered;
- Using average values (and, worse "mean" values) across all years to reflect likely effects of modeled alternatives rather than analyzing the range (maximum and minimum) and median of effects modeled within different year-types – the modeling outputs results are far more reflective of the conditions that will affect conservation and restoration outcomes (i.e. the "mean" condition will not occur uniformly, rather different year-type conditions will occur in unpredictable sequences);
- Dismissing the importance of a negative impact by applying arbitrary, capricious, and opaque standards regarding the threshold magnitude at which an effect would be considered important (often the Draft Plan accepts a positive result as having a beneficial "effect" while dismissing as unimportant, or "small", an analogous negative result of greater magnitude);
- Dismissing entire stressors (including those identified by the Draft Plan and/or in agency management documents and those managed in current regulations) as unimportant whenever analyses show that the Draft Plan and operational alternatives will cause and increase in this stressor;
- Discounting its own modeling of inputs (e.g. flows, temperatures, reservoir storage) and outputs (population responses to modeled changes in condition) such that it is impossible to tell which, if any, analyses in the Draft Plan and DEIS/DEIR the reader is expected to believe.

Below, we illustrate the Draft Plan's shortcomings on a species-by-species and ecosystem-as-a-whole basis. To standardize and streamline our synthesis of inadequacies in the Draft Plan and DEIS/DEIR, we describe how deficiencies in the logic chain for each species, and the ecosystem-as-a-whole lead to inadequate protections for biological resources and also identify where the analysis and interpretation of BDCP outcomes found in the Effects Analysis and/or DEIS/DEIR are deficient, fail to incorporate the best available science, or are internally inconsistent with the modeling prepared for these documents. Some of this material will be covered with reference to examples given above; such redundancy is necessary in order to describe systematic problems with the Draft Plan and DEIR/DEIS (above) and their consequences for specific ecological resources (below).

A. Longfin smelt

1. Draft Plan Objectives for Longfin Smelt are Inadequate to Attain the NCCPA (and ESA) Standard for this Species

The Draft Plan's Biological objectives for longfin smelt as outlined in the Conservation Strategy are inadequate. The Draft Plan offers no targets for improvement (objectives) or actions to alleviate the threat this population experiences from human activities that lead to reduced spatial distribution, curtailment of life history diversity, or reduced absolute abundance, all of which are major concerns for this species (Rosenfield 2010). And, as described above, The Draft Plan's targets for longfin smelt productivity plainly do not guide the BDCP towards recovery of this species. One objective for longfin smelt productivity (LFSM1.1) assumes, without a specific rationale, that only a small fraction of the global goal and objective for longfin smelt will be attained via BDCP actions, even though the bulk of this population spends most of its life cycle in areas that are affected by freshwater flow through and out of the Plan Area and the species population displays long-term, statistically significant, high magnitude positive correlation with Delta outflow, which the BDCP will alter. The other objective for longfin smelt productivity –a proposed limit on entrainment mortality (LFSM1.2) -- is inadequate as it permits potentially catastrophic rates of entrainment mortality in any one year and does not specify how entrainment impacts to life history diversity in this species will be limited.

2. The Draft Plan Fails to Accurately Identify and Address the Correct Stressors on this Species

The Draft Plan is ultimately confused and inconsistent as to its strategy for restoring longfin smelt productivity and abundance as revealed by its inconsistent and inaccurate identification of stressors that currently affect this population. The Draft Plan claims that "The conservation strategy for longfin smelt focuses on the same three primary stressors discussed for delta smelt (food, predators, and entrainment)." Draft Plan at 3.3-115. But, "lack of food resources" is the only stressor listed in the table describing species-specific objectives and stressor reduction targets for longfin smelt. *Id*. at 3.3-120. Commenting on a stressor (limited spawning habitat) that was identified in an earlier version of the Draft Plan, USFWS recommended that the BDCP "…provide a plausible prediction of marginal longfin smelt benefits that will be realized by enhancing extent of spawning habitat or delete the corresponding stressor reduction target. USFWS 2013 Progress Assessment at 10. Apparently, that advice was accepted as there is no mention of a spawning habitat limitation for longfin smelt in the current draft Conservation Strategy (Chapter 3) and the Draft Plan's Effects Analysis tersely and accurately states that: "spawning habitat for longfin smelt in the Delta is unknown." Draft Plan at 5.5.2-8. It is therefore surprising that the Draft Plan's Effects Analysis proceeds to analyze potential benefits to longfin smelt spawning anticipated to arise from the construction of new tidal habitats. The

Effects Analysis presents results of a "Habitat Suitability Index", despite its admission that there is no information on longfin smelt spawning micro-habitat requirements. The Effects Analysis claims that there would be "considerably more" tidal habitat available for longfin smelt egg deposition (10% more in the Late Long Term) and that tidal marsh habitat restoration will be of "high" benefit to longfin smelt. Given the lack of knowledge about the extent of spawning habitat, the lack of evidence that longfin smelt spawning habitat limits population abundance or productivity (*see* Rosenfield 2010; USFWS 2013 Progress Assessment), and the Draft Plan's own statements, the finding of benefit from the estimate of BDCP's creation of "new" spawning habitat simply lacks scientific support. Even if that projected increase in spawning habitat were somehow correct, it likely would have little or no impact on the population since there is no reason to believe (and the Draft Plan does not contend) that spawning habitat limitation limits the population currently.

In contrast, the Conservation Strategy does not identify as a stressor on longfin smelt either "altered migration flows" (as it does for each covered salmonid species) or "flow operations" (as it does for sturgeon species. *See* Draft Plan at 3.3-183, 3.3-197. The failure to identify Delta outflow as a significant stressor on longfin smelt abundance is inexplicable given the fact that the relationship between longfin smelt abundance and freshwater outflow from the Delta has been strong, statistically significant, and durable over the past four decades of fish community sampling in this ecosystem. Jassby et al. 1995; Kimmerer 2002; Rosenfield and Baxter 2007; Sommer et al. 2007; Kimmerer et al. 2009; Rosenfield 2010; Thomson et al. 2010; Mac Nally et al. 2010. Through Delta flow and Delta outflow are also believed to drive longfin smelt distribution, Dege and Brown 2004, in ways that affect longfin smelt entrainment, Grimaldo et al. 2009; Rosenfield 2010, and to stimulate production of key longfin smelt food items, *see* Jassby et al. 1995; Kimmerer 2002; Rosenfield 2010. Elsewhere in its Effects Analysis, the Draft Plan appears to agree that freshwater flows are important to this species, stating that, "Current science indicates that the decline in longfin smelt relative abundance observed from monitoring has been a result of foodweb changes, and that longfin smelt relative abundance is strongly correlated with winter-spring outflow from the Delta." Draft Plan at 5.5.2-7. Indeed, the method used by both the Draft Plan and the DEIS/DEIR to estimate changes in longfin smelt populations in the future relies entirely on changes in the position of X2 (an indicator of freshwater flows). It is therefore inexplicable that the Draft Plan does not identify the driving effect of low freshwater flows on longfin smelt and take direct action to ameliorate this important stressor to this species and the ecosystem as a whole.

Similarly, the Plan does not identify entrainment-related impacts as a known stressor for longfin smelt despite the facts that (a) the Conservation Strategy identifies an entrainment reduction objective for longfin smelt, (b) the CDFW conceptual model of longfin smelt life history (Rosenfield 2010) identifies entrainment as a stressor to this population (in certain year types), and (c) the California Department of Fish and Wildlife has issued an incidental take permit to the

State Water Project (CDFW 2009) with terms that are intended to limit entrainment mortality for this species.

These statements and omissions are inconsistent with the best available science. As described above, the Conservation Strategy, Effects Analysis, and DEIS/DEIR are inconsistent in their evaluation and weighting of stressors, stating that certain stressors are important in one place, but then reaching a different conclusion regarding the importance of the same stressors elsewhere. Thus, despite the overwhelming wealth of scientific evidence regarding the impact of freshwater flows on the productivity of longfin smelt, the Effects Analysis says there is uncertainty regarding the role of outflow. *See, e.g.*, Draft Plan at 5.5.2-29. And, disregarding the fact that the Conservation Strategy sets a target intended to limit entrainment-related mortality, the Effects Analysis claims: "… entrainment of adult longfin smelt is no longer considered to be an attribute of importance as a constraint to the longfin smelt population." Draft Plan at 5.5.2-19. This failure to identify and evaluate two of the most important stressors on the longfin smelt leads to the Plan's failure to design adequate conservation measures for this species and the failure to properly interpret clear impacts to the longfin smelt population that will arise from implementation of the Draft Plan.

3. <u>Conservation Measures do not Adequately Address Known Stressors for this Species and/or their Impacts are Overstated</u>

i. The Failure to Provide for Adequate Winter-Spring Freshwater Flows in the Conservation Strategy for Longfin Smelt is Unacceptable and Leads to the DEIS/DEIR's Projection of Declining Longfin Smelt Populations Under the Draft Plan and the Inability to Attain Necessary Conservation Targets

We have repeatedly emphasized the need for the BDCP to consider operational alternatives that result in increased Delta outflows in the winter and spring months as a means to improve the abundance and productivity of longfin smelt. *See, e.g.,* Letter from five conservation NGOs to John Laird and David Hayes, September 30, 2011; Memorandum to Jerry Meral from The Bay Institute, Environmental Defense Fund and Contra Costa Water District, December 21, 2011, RE: "Review of Appendices C and D"; Letter from six conservation NGOs to Gerald Meral, March 1, 2012, RE: "BDCP Draft Effects Analysis"; Memorandum to J. Meral et al. from J. Rosenfield re: "Preliminary Review of BDCP Effects Analysis Appendix F," February 9, 2012. Despite the extremely strong and long-lasting correlations between longfin smelt abundance and winter-spring freshwater outflow from the Delta (a relationship that the Draft Plan and DEIR/DEIS repeatedly acknowledge implicitly), the Draft Plan does not contemplate increases to freshwater flow as a conservation measure for longfin smelt or other species and most of the operational alternatives considered in the DEIS/DEIR actually reduce Delta outflows below current, unacceptably low levels. The SWRCB criticized a previous version of the DEIS/DEIR for its failure to consider alternatives that resulted in increased Delta outflows, stating:

> Compared to the no-project alternative … it appears that all of these operational scenarios decrease total Delta outflow (see Attachment 1: State Water Board analysis) in the late-long term. The justification for this limited range of Delta outflow scenarios is not clear given that there is strong information on the possible need for more Delta outflow for the protection of aquatic resources and the uncertainty that other conservation measures will be effective in reducing the need for flow. Specifically, recent research indicates that restoration of tidal marsh may not be feasible, possible, or effective. Accordingly, it appears appropriate to include a broader range of Delta outflows under the decision tree process.

SWRCB 7/5/13 BDCP Comments at 5. Similarly, the USFWS recommended that the previous version of the BDCP "… acknowledge that spring Delta outflow is a well-established driver of longfin smelt abundance, and formulate a stressor reduction target that provides spring Delta outflow in accordance with the Service's standing recommendation." USFWS 2013 Progress Assessment at 10. Despite these powerful and direct recommendations that the BDCP provide improved Delta outflows for covered species like longfin smelt and for improved estuarine functions, the problem remains unaddressed in the current Draft Plan.[56]

Speaking to the utility of increasing Delta freshwater flows rates to protect estuarine fish (like longfin smelt), fish habitat, and other ecosystem processes, a recent independent science review panel wrote:

> There is <u>very strong (even unequivocal) evidence that specifying outflow requirements and objectives specific to seasons (specific months) is a rational and scientifically justified approach</u>. As summarized in SWRCB (2010 – Development of Flow Criteria), <u>there is solid evidence that high outflows during various combinations of winter-spring months benefit a variety of species</u>. … High winter-spring flows into the Bay-Delta (low X2) have been shown or argued to act as cues for fish spawning migrations, to improve reproductive success, and to increase survival of juvenile anadromous species migrating seaward. <u>High</u>

[56] Alternative 8 in the DEIS/DEIR does provide an increase in winter/spring Delta outflow as recommended by the SWRCB, but the State's proposed project fails to provide increased winter/spring Delta outflow, despite the comments from the SWRCB and other agencies. The so called "high outflow scenario" (HOS) largely maintains the status quo of winter/spring outflow, and the both the Draft Plan and DEIS/DEIR fails to analyze the "CS5" operations developed by the fishery agencies in 2012 to provide increased outflow and improve other flow conditions for fish and wildlife.

> winter-spring outflows also benefit a variety of species through early-life-stage dispersal, access to floodplain habitat, and reduced entrainment.

DSP Outflows Review Panel Report 2014 at 62 (emphasis added).

ii. The Draft Plan and DEIS/DEIR's Expectation of Large Benefits to the Longfin Smelt Population Resulting from the Restoration of Shallow Sub-Tidal Habitats is Scientifically Unsupported, as Numerous Independent Scientific Reviews have Found

Rather than take action to address the primary documented stressor (and driver of other stressors) with known, high-order effects on longfin smelt (Delta fresh water outflows), for which scientifically credible and feasible measures exist to address the stressor (improve outflows during winter/spring months) the Draft Plan proposes to reduce (or maintain currently inadequate) Delta outflows during key seasons and year-types,[57] and relies on completely speculative habitat restoration measures under the theory that these will bolster food supplies for longfin smelt and that improved food supplies can counter the negative effects of reduced Delta outflows. Although many reviews refer to the potential benefits of habitat restoration in general as "highly uncertain", with regard to their potential to bolster longfin smelt abundance or productivity, these measures are actual quite certain to produce negligible benefits to longfin smelt. The Conservation Strategy and DEIS/DEIR repeatedly assert BDCP benefits to longfin smelt from increased prey production that is supposed to occur as a result of habitat restoration. *See, e.g.,* DEIS/DEIR at 11-34; Draft Plan at 5.5.2-25, -29. In the BDCP's own 2009 review of tidal marsh restoration proposals (which are quite similar to the proposals in the Draft Plan), a team of experts on local fish ecology and estuarine dynamics rated the potential for these measures to benefit longfin smelt as "low" to "marginal" (at best), with "low" to "marginal" certainty (at best), in every case but one. For all but one proposed tidal marsh restoration area, at least one foreseeable negative impact to this species was rated "high", with "low" to "medium" certainty; for example, shallow sub-tidal habitat restoration in the West Delta ROA was judged to run the risk of "establishment of undesirable species" (such as Centrarchid bass (predators) or *Corbula* clam (competitors), which would be a "high" negative impact. Essex Partnership 2009 (2009 DRERIP Evaluation, Appendix D). The recent Delta Science Program Independent Review Panel identified the same two potential negative outcomes of habitat restoration measures and suggested that they were relatively certain to arise, questioning only whether they could be controlled when they did arise. DSP Independent Science Review Panel Report 2014. On page 11-20, the DEIS/DEIR mentions the potential for invasion by *Corbula* clams of habitats restored under CM4 as a potential negative impact to Delta smelt (but not to longfin smelt), but

[57] *See* Draft Plan, Appendix 5C at 5C.5.3-348 (Table 5C.5.3-189); *id*. at 5C.5.3-350 (Table 5C.5.3-190). This is also true with respect to the cumulative impacts of BDCP and climate change.

does not mention the potential for invasion/foraging by invasive piscivorous fish (e.g., Centrarchids). Similarly, the Draft Plan's appendix on habitat restoration (Appendix 5E) barely acknowledges the potential risks associated with colonization of restored habitats by non-native species, including predatory fish, simply declaring that "Marsh channels and levee breaches will be designed to maintain flow velocities that <u>minimize conditions</u> favorable to the establishment of nonnative submerged aquatic vegetation (SAV) and floating aquatic vegetation (FAV) and habitat for nonnative predatory fish." Draft Plan, Appendix 5E at 5.E-47 (emphasis added). The Draft Plan's appendix on fish stressors (5F) does identify the risk of predation on covered species in the restored habitats described by the Draft Plan, but it is similarly non-specific regarding control or prevention of this problem (relying on vaguely-described removal of invasive aquatic vegetation, which would not guarantee elimination of the problem) and non-committal regarding the likely outcome of this response. Draft Plan Appendix 5F at 5.F-iv.

Since the publication of the 2009 DRERIP Review, additional independent reviews have assessed the potential for habitat restorations to benefit pelagic fish species, like longfin smelt, in the manner anticipated by the Draft Plan. As described in detail above, the overwhelming consensus of independent scientists is that BDCP's assumption of benefits are vastly overstated and unlikely to materialize. DSP Independent Science Review Panel Report 2014; Delta ISB 2014; Herbold et al. 2014; Mount and Saracino et al. 2013; NRC 2010. The assumption that restored habitats will enhance prey production, to the extent necessary to support species' global biological objectives is particularly poorly supported for longfin smelt. This is because longfin smelt occupy pelagic environments, typically in or near deep-water channels. Rosenfield and Baxter 2007; Rosenfield 2010. These habitats are furthest from the location of proposed shallow water habitat restoration meaning the benefit of any food web export from restoration sites will be attenuated (via dispersal and consumption by other species) before it can reach longfin smelt. Reviewing the specific question ("Is the analysis of food web benefits to longfin smelt from habitat restoration appropriate?"), the Delta Science Program's Independent Review Panel concluded that both the mechanism and magnitude described for increased production of longfin smelt prey resulting from habitat restoration was "highly uncertain" and that the contribution to increased plankton abundance available for longfin smelt was "basically hypothetical because of the uncertainties of primary consumption within the restoring ecosystems, especially by non-indigenous clams, and whether these systems would be sources or sinks for any increased production." DSP Independent Science Review Report 2014 at 60-61.

Despite the consensus of the scientific community that this effect is tenuous and extremely small at best,[58] Figure 5.5.2-5 reveals that the Draft Plan assumes "moderate" benefit (with low

---

[58] However, as we have noted repeatedly, there are likely to be benefits to some other species and ecosystem processes from tidal marsh habitat restoration projects, and we encourage implementation of restoration projects in an adaptive management process. *See also* footnote 80, *infra*.

certainty) from enhanced zooplankton production for juvenile longfin smelt. The figure is contradicted by the Draft Plan's accompanying text, which indicates a "low" benefit of enhanced zooplankton production from its restoration projects. Draft Plan at 5.5.2-13. There is very little, if any, empirical support for a finding of even "low" benefit. And, even if the benefits of habitat restoration for longfin smelt were as "low" or "moderate" as the Draft Plan alternately claims, there is no way for such benefits to materialize until well into the Plan's Late Long Term (LLT) because most restoration activity will not be complete until that time and benefits of marsh restoration typically require substantial time to evolve post-restoration. *See, e.g*., Herbold et al. 2014.

iii. The Conservation Hatchery Proposal is Unacceptable as part of a Conservation Strategy for Longfin Smelt under an HCP/NCCP

Certain conservation measures described in the Plan and DEIS/DEIR as beneficial to longfin smelt are inadequate and/or irrelevant to the conservation standard for this species. For example, a hatchery's function is to increase the number of larvae that survive per female spawner. Providing a hatchery for longfin smelt would not address the problems the Draft Plan or other sources identify as stressors for longfin smelt. Food limitations, inadequate transport flows, etc. all arise *after* the egg incubation/early larval stage – producing and releasing more small longfin smelt into an environment that is not expected to support them does not address or circumvent the problems facing longfin smelt and is not likely to achieve conservation of this species in the Plan Area. Furthermore, the Draft Plan does not identify or address any of the myriad known problems with hatchery production of other fish species (e.g. salmon) as a conservation method. We have raised this issues numerous times. *See* Letter from TBI, EDF, DOW to BDCP Steering Committee December 20, 2009; J. Rosenfield letter to Meral et al. dated February 9, 2012. Conservation hatcheries for smelt (CM18) do not address the primary stressors on longfin smelt. The Fish and Wildlife Service has commented that "CM18 is linked to wild population goals and objectives for delta and longfin smelts. This is inappropriate and contrary to the Service's present policy for these species." USFWS 2013 Progress Assessment at 10.

Also, as described above, removal of invasive submerged aquatic vegetation to "increase the availability of freshwater spawning habitat for longfin smelt in the Delta," *see* Draft Plan Appendix 5F at 5.F-iii, does not address threats to longfin smelt abundance because (a) there is no indication that the abundance of longfin smelt spawning habitat limits abundance or productivity of this species (though it may be limiting a different attribute of longfin smelt viability: spatial distribution) and (b) there is no indication that longfin smelt will spawn in areas where SAV has been removed – very little is known about longfin smelt preferred micro-habitats for spawning. Rosenfield 2010.

4. <u>The Draft Plan and DEIS/DEIR's Assessment of Effects on Longfin Smelt are Inaccurate and do not Attain the Conservation Standard for this Species. In addition, Presentation of these Results is Biased, Internally Inconsistent, and Confusing</u>

Despite the Draft Plan's claims that it would contribute to recovery of longfin smelt and would have beneficial effects on the species, and the Draft Plan's objectives that (though inadequate) attempt to define improved biological outcomes, the Draft Plan and DEIR/DEIS both demonstrate that BDCP is likely to result in large declines in longfin smelt abundance, is unlikely to achieve the biological objectives for the species, and that the proposed project would cause additional negative impacts on the species. These declines are due, in large part, to the projected declines in the winter-spring Delta outflows under the BDCP as compared to the environmental baseline, shown in Table 11-4-7 and Table 11-4-9, that tend to drive longfin smelt population abundance. The Draft Plan and DEIS/DEIR portray these large declines as benefits because their modeling suggests that populations under BDCP will be slightly larger than without BDCP (though the magnitude of modeled change is likely not statistically significant and therefore unlikely to materialize). As we discuss elsewhere the DEIS/DEIR uses the wrong baseline and the significant reduction in outflow under the Draft Plan as a result of BDCP and other projects and effects cumulatively (including the effects of climate change) will cause significant environmental impacts, including cumulative impacts.

i. Draft Plan and DEIS/DEIR Misuse and Misinterpret Models to Project Longfin Smelt Abundance and Fail to use the Best Available Scientific Information

Despite the Draft Plan's claim of "uncertainty" that Delta freshwater outflows drive longfin smelt abundance (*see, e.g.,* Draft Plan at 5.5.2-29), the DEIS/DEIR project future longfin smelt abundance based solely on a model derived from the well-documented relationship between X2 (an indicator of Delta fresh water outflow rates) and longfin smelt abundance indices (i.e., Kimmerer et al. 2009). The fact that no other quantitative tools are used to provide a robust estimate of the effect of BDCP on longfin smelt population size reveals the differential strength of evidence underlying the Draft Plan's two conceptual models for longfin smelt: one that attributes population size to levels of Delta freshwater flow (as identified in numerous peer reviewed papers and quantitative models, including that used in the DEIS/DEIR) and the second that attributes population size to unidentified levels of prey abundance.

As discussed elsewhere, the relationship between Delta outflows (or X2) and longfin smelt abundance is among the best-documented, durable, statistically significant ecological relationships in this Estuary. *See, e.g.*, SWRCB 2010 Flow Report; DSP Outflows Review Panel Report 2014. Kimmerer et al. 2009, like numerous other research papers, clearly demonstrates that freshwater flows (as represented by X2) remain strongly and significantly correlated with longfin smelt abundance. However, additional, more recent models should be used for projecting longfin smelt populations in futures with and without BDCP, because:

1) The model used by BDCP does not incorporate any effect of previous population size; thus, any given X2 value always predicts the same longfin smelt abundance index, regardless of whether the previous (parental) generation had high abundance or low abundances. Models that incorporate historical longfin smelt population size (or "stock") have been developed. TBI/NRDC 2010 Exhibit 2; USFWS Progress Assessment April 3, 2013. These models show a significant effect of historical population size on current population size (i.e., models with both Delta outflow and recent population size predict current population size better than models with flow alone). Indeed, the Draft Plan claims to analyze BDCP effects on longfin smelt abundance using a model that incorporates stock, *see* Draft Plan at 5.C.0-5, but such a model is not present in the Effects Analysis or the DEIS/DEIR. The DEIS/DEIR should utilize one of the recent models that incorporates both flow and prior-abundance to estimate future abundance of longfin smelt. As a result of applying the very simple Kimmerer et al. (2009) relationships without accounting for the effect of current population sizes that are close to their historic lows, the DEIS/DEIR likely overestimates the size of future longfin smelt populations;
2) The model will only predict population extinction when X2 is such that the equation solves for "y" (longfin smelt index value) = 0. Any X2 that is marginally below (better than) this critical threshold will predict retention of the population and, even if the critical value of X2 is reached in one generation, the equation will predict a "resurrection" of the population the next time X2 is better than the critical value (*see* issue #1 above). This is a critical flaw in a model that is being used to evaluate the conservation status of a population in the future as it is quite blind to the risk of persistently low populations and the fact that, if the longfin smelt population is locally extirpated, it will be very difficult or impossible to restore;
3) The Kimmerer et al. 2009 relationship accounts for two different flow-abundance relationships corresponding to periods pre- and post-1987; it is not clear which time period the analyses uses to project longfin smelt abundance into the future. However, there is evidence to indicate that a second decline in the flow-abundance relationship may have occurred, creating a third relationship from the early-2000's to the present. Thomson et al. 2010. Thus, the relationship between flow and abundance used in the DEIR/DEIS likely overstates the longfin smelt abundances that will result from Delta outflows under the BDCP.

In addition, the way the Draft Plan and DEIS/DEIR apply modeled Delta outflow results as inputs to the longfin smelt abundance-X2 relationship is inappropriate. The numerous inadequacies with the flow modeling employed by the Draft Plan and DEIS/DEIR are documented elsewhere in this comment letter. All of the biases and uncertainty associated with the Draft Plan and DEIR/DEIS flow model outputs are relevant here and many are magnified in the longfin smelt analysis by the addition of uncertainties and biases inherent in the approach to modeling longfin smelt impacts. And as discussed in our comments on the flow modeling, it is not clear that the HOS flows are likely to actually occur.[59]

Furthermore, it is not clear that the analyses reflect accurately the Kimmerer et al. 2009 methodology or that the analyses reflect the Draft Plan's own conceptual model relating Delta outflows (and/or X2) on longfin smelt abundance. The Kimmerer et al. 2009 model uses X2 values averaged over the January-June period. But the Draft Plan states its belief that flows in the March-May period affect longfin smelt abundance. Draft Plan at 5.5.2-8. But then the DEIS/DEIR states, "Relationships between December through May X2 position and log longfin smelt abundance … were used to determine how the changes in winter-spring X2 position described above might influence longfin smelt abundance the following fall." DEIS/DEIR at 11-1305. There is no explanation for the mismatch of months used in the analysis and those used by Kimmerer et al. 2009 or those assumed to be important in the BDCP conceptual model.

Using the average X2 position from December through May means that the analysis ignores variations within that 6-month period as they are eliminated by averaging. In 2013 USFWS stated that, "The effects analysis did not use the best available longfin smelt statistical models to support its net effects conclusion." USFWS 2013 Progress Assessment at 18. It then quotes the USFWS 2012 Red Flags as follows:

> The older regression models that were used in the effects analysis are published, but can easily be shown not to perform as well as the newer models. The older models also average the flow influence on longfin smelt across half a calendar year, which likely affects conclusions about the reduction in springtime outflow seen in modeling outputs for the Preliminary Proposal.

Id. Kimmerer et al. 2009 averaged X2 values over winter-spring because that is generally when longfin smelt are spawning and rearing in or near the Delta; they had no *a priori* or statistical reason to consider smaller time periods for X2, and they were not trying to model differential

[59] In addition, the Projects' frequent practice of requesting and receiving Temporary Urgency Changes to Delta outflow requirements under Dry and Critically Dry conditions (such as those that were requested and granted in WY 2014) strongly suggests that flow conditions projected in the Draft Plan and DEIS/DEIR for Dry and Critically Dry years overestimate the actual amount of flow that will occur in some of those years and that the analysis thus overestimates the indices of longfin smelt during drier years.

impacts to longfin smelt resulting from alterations to the historical hydrological relationships among months in the winter and spring (flows in those months are strongly correlated). However, for many of the potential mechanisms by which X2 might control longfin smelt productivity (population growth or decline; *see* Kimmerer 2002b), changes in X2 or flow within the winter-spring period would be as or more important than the "average" value for the whole period.

Kimmerer et al. 2009 do not suggest and certainly do not demonstrate that mean X2 position for the 6-month winter-spring period is the best indicator of flow related effects on longfin smelt abundance – their results could also mean that a critical flow related effects occur in a shorter time window within the January-June time frame or that minimum or maximum flows in that period controlled the population response. For example, the Draft Plan suggests that March-May may represent the critical period for flows – so why not study flows and X2 in the March-May period? Even within that smaller time window, the analyses should focus on the potential for extreme flows (high or low) and corresponding X2's to drive outcomes for longfin smelt rather than the mean flow. It is at least as likely that the largest or smallest value of X2 in the winter-spring drives the population response of longfin smelt as it is that the mean value of X2 controls population levels.

It is also possible that flows (or X2) in a narrower time window than January-June have the greatest influence on the population, as more recent models suggest. Just because Kimmerer 2009 uses a six month average does not mean that average flows over that entire period are driving the effect. Flows in a narrower window, or maximum or minimum flows during that period, are likely to be the variable that longfin smelt populations respond to. The Draft Plan and DEIS/DEIR should be aware of these possibilities (we and others have made this comment before) and should present, in addition to effects based on mean winter-spring flow, estimates of effect on the longfin smelt population if flows in a narrower window or maximum or minimum flows during winter-spring actually drive the population. If mean X2 is not the most relevant flow variable for predicting longfin smelt population (as opposed to a maximum or minimum) or the most important time frame for X2 position is a subset of the months used in the Kimmerer et al. 2009 relationship, then the usefulness of the Kimmerer et al. 2009 relationship for predicting longfin smelt populations in the future would be reduced in a situation where the timing of flows across months is different than it has been historically (as would occur under BDCP and climate change). Since extreme values (high or low X2) may be what actually controls the overall pattern described by Kimmerer et al. 2009 and, because the BDCP will change the relative distribution of those flows in months within the Jan-June period (*see* DEIS/DEIR at Table 11-4-7, Table 11-4-9), the Kimmerer et al. 2009 relationship may not be the most sensitive to the real effects on longfin smelt populations represented by the altered hydrograph anticipated under the Draft Plan and DEIS/DEIR. This is not the first time we have warned that BDCP draft documents: "…presents the flow-abundance relationships for the longfin smelt population in this Estuary in a way that will tend to lead to underestimation of potential impacts to this species." Memorandum to J. Meral from TBI, EDF, and Contra Costa Water District re: Review of Appendices C and D December 21, 2011. Fortunately, having calculated X2 for January-June and, using the Kimmerer et al. relationship, the associated longfin smelt abundance index for each year in the record, the Effects Analysis and the DEIS/DEIR must have the data necessary to calculate the alternate outputs we suggest (i.e. maximum and minimum longfin smelt estimates based on max and min X2 for any month in the January-June period). We have requested this analytical approach before. The Bay Institute, 2013 comments on Administrative Draft Appendices C and D, at 7-8.

ii. Even with the Flawed Modeling Biased Towards more Positive Outcomes, the DEIS/DEIR Projects Substantial Declines in the Abundance of Longfin Smelt from Recent Unacceptably low Levels under most Alternatives

Relative to longfin smelt abundances seen in recent years (abundances that are lower than those that warranted listing under the California and federal Endangered Species Acts), the Draft Plan and DEIS/DEIR project significant declines in longfin smelt abundance in the future. The alleged benefits to longfin smelt abundance claimed in the Draft Plan (*see* Table 5.5.2-2) and DEIS/DEIR (*see* Table 11-4-8.) are meager and result reflect only a comparison to a modeled future baseline in which spring outflows (and longfin smelt) decline significantly.

With respect to longfin smelt abundance, the relevant question is: "Will the longfin smelt population increase (display higher abundance indices) from current levels to levels that are consistent with conservation of this species in the Plan Area?" The Draft Plan Technical Appendix 5C addresses these questions in tables such as 5C.5.4-39 where it compares EBC2 modelled in the present day ("EBC2") to conditions under the BDCP in the late long term (ESO_LLT). This comparison shows that longfin smelt populations are expected to decline 22%-33% from current levels (as predicted by the Draft Plan's modification of the Kimmerer et al. 2009 relationship). *See* Draft Plan Appendix 5C at Table 5C.5.4-39. Table 5C.5.4-41 and Table 5C.5.4-43 provide a similar comparison, for two different sampling programs, and they show slightly larger declines. Thus, the BDCP's Technical Appendix anticipates very significant proportional declines in longfin smelt abundance over the BDCP permit term. The CEQA/NEPA conclusions in AQUA-23 and AQUA-24 that there will not be significant impacts are not supported by the substantial evidence, and the modeling shows that Alternative 4 and other alternatives will cause significant impacts and cumulatively significant impacts.

The DEIS/DEIR (Table 11-4-8) and Draft Plan (Table 5.5.2-2) rely on a misleading and erroneous comparisons to claim that BDCP will improve longfin smelt abundance. In addition to showing the large relative and absolute declines in longfin smelt abundance projected to arise under the Draft Plan, these tables present a comparison of ESO_LLT to EBC2_LLT, which suggests that conditions under the BDCP will be marginally better than under current operations applied to modeled future conditions. It is unclear whether any of the reported differences are statistically significant because the error bounds of the Draft Plan or DEIS/DEIR estimates (i.e., the variance associated with the Kimmerer et al. 2009 model combined with those related to modeled Delta outflow) are not reported. This comparison is misleading because it assumes that operations do not adapt to climate change. However, given that these assumptions regarding changing environmental conditions lead to projections of very significant declines in longfin smelt abundance, the Draft Plan should not assume that either current operating rules or those envisioned in the BDCP alternative will be permissible. So, while the modeling seems to indicate some very small benefits to longfin smelt abundance of BDCP operations compared to status quo operations, there is no reason to expect that either operation will result in conservation or restoration of longfin smelt.

There are feasible measures to address anticipated baseline freshwater flow rates that are under control of the Projects, in order to avoid or reduce the negative impacts that threaten the continued existence of covered species. We – and many other agency and independent scientific reviewers – have repeatedly recommended substantial increases in Delta outflow to avoid these predicted outcomes. For instance, Alternative 8 in the DEIS/DEIR includes increases in spring outflow as recommended by the SWRCB.

With regard to its own productivity objectives, which are inadequate (*see* above), the relevant question for evaluating the Draft Plan's progress towards attaining the co-equal goals is: "Will abundance relative to winter-spring hydrology (i.e., flow corrected abundance, or "productivity") increase to levels consistent with conservation and restoration of the species?" The DEIS/DEIR does not compare outcomes projected under the Plan to those targeted by its productivity objectives. And, because the productivity objectives are "flow corrected," the DEIS/DEIR has not developed information that would allow evaluation of whether non-flow related activities (such as CM4, CM6, etc.) will produce improvements in flow corrected abundance. However, it is abundantly clear from the results in the Draft Plan's Technical Appendix and Effects Analysis that the BDCP is not likely to "restore" flow corrected abundance to 1980-2011 levels (the Conservation Strategy's inadequate target) or 1967-1984 levels (the USFWS 1995 Draft Recovery Plan target) because absolute abundances are predicted to decline substantially from current levels (which are already below those implied by the productivity objective) in each water-year type category. Thus, even the flawed and biased analyses in the DEIS/DEIR and Draft Plan demonstrate that BDCP likely will not attain critical conservation targets for this covered species.

iii. Draft Plan and DEIS/DEIR Rely on "Average" Results for Longfin Smelt Populations in Different Year Types, Which Understates Likely Environmental Impacts to the Species

Similarly, the DEIS/DEIR rely on "average" projected flow conditions (and changes in flow conditions) to predict longfin smelt outcomes in the future. The analysis does incorporate reasonably foreseeable changes in the frequency of year-types experienced by the longfin smelt or magnitude of flows in different year types, in the future. The use of average flows is particularly inappropriate for analyses of semelparous organisms with discrete generations; longfin smelt will respond to actual conditions within a given year, not to the long-term average, so if several low outflow years occur in sequence, then population will decline and may be extirpated. The use of the long-term average conditions to gauge longfin smelt response is also misleading because the average depends on the frequency distribution of different hydrological year types (and conditions in each year type) and this distribution is likely to change (i.e. due to normal or human induced climate changes).

Like Delta smelt, longfin smelt are believed to be semelparous (die soon after spawning the first time) and have largely distinct spawning classes. This means that the population response to any set of annual conditions is not tempered by overlapping generations or the capacity for mature fish to delay spawning in bad years. Thus, for the BDCP analysis, conditions in individual years and the frequency of good and bad conditions are more important than are "average" conditions over many years. The Draft Plan and DEIS/DEIR's presentation of "average" change in the population (depicted under the heading "All") is deceptive and confusing in a way that paints an inappropriately optimistic view of aggregate effects on longfin smelt populations. For example, if conditions in a particular year were such that a population experienced a 100% decline ("extinction"), it would not matter what the "average" condition was in a given year type or across all year types. The Draft Plan and DEIS/DEIR should present results and comparisons between scenarios that anticipate a series of years with poor environmental conditions in a row (as in the 1987-1994 drought or the 2012-current drought) because those are conditions that the covered species actually experience; at a minimum, the Draft Plan and DEIS/DEIR should compare the worst case conditions in each year-type between modeled scenarios – differences in the worse-case conditions will better reflect the likelihood of conserving the population in the Plan Area. As a result of modeling "average" conditions, the Draft Plan likely understates the potential environmental impacts to the species, and overstates likely abundance.

The Draft Plan misrepresents its likely impact on freshwater flow rates in a manner similar to those made in its presentation of longfin smelt population impacts. In addition to the fact that "average" conditions are not as relevant to conservation efforts as the frequency and magnitude of extreme conditions (*see* above), presenting flows in the "average" year assumes some distribution of water year types (here, flow conditions) affecting the population which may or may not occur – if the future brings a long series of "dry" years, all that will matter is how the fish populations perform under BDCP during "dry" years compared to how they would perform in "dry" years without a BDCP. With regard to Delta outflow, the Plan assumes that Wet, Above Normal, Below Normal, Dry, and Critical years types occur in 32%, 15%, 17%, 22%, and 15% of years respectively. Draft Plan at 5.2-16. If these conditions do not hold in the future, then the "average" result of that hydrological distribution will not occur either. This could occur under climate change, *see* Null and Viers 2013, and would also occur when/if human water management changes the frequency or "wetness", as experienced by the Bay-Delta ecosystem, of different year types. For example, as we discuss with respect to cumulative impacts, if water users develop greater water storage capacity (e.g., greater reservoir capacity, on or off-river, or greater groundwater storage) then humans will capture more of the available runoff in wetter year types. This will make the wetter year types less frequent and likely make all year types less wet from the perspective of organisms and processes that rely on Delta outflow.

The Draft Plan and operational alternatives modeled in the DEIS/DEIR clearly produce low flows in many years. Even under the "High Outflow Scenario", outflows lower than the status quo are expected in drier years. These are years when the longfin smelt population is particularly vulnerable. *See* Rosenfield 2010. According to our calculations, the "low outflow scenario" (LOS) will result in Delta outflows during March through May that are lower than recent historic (1970-2003) outflows in approximately 70% of years. The "high outflow scenario" (HOS) will only generate Delta outflows that are higher than recent historic flows (between Jan and June) during the Below Normal Year-type in the late long term. All other year-type average display a 0.4% to 1.8% decrease in NDO compared to the No Action Alternative. As a result of these projected declines (or minor increases) in Delta outflow, longfin smelt abundances are projected to decline significantly in the early and late-long term of the BDCP compared to current conditions.

iv. The Draft Plan's Presentation of Projected Outcomes for Longfin Smelt Abundance and Productivity is Confusing and Prevents the Average Reader from Comprehending the Impact of BDCP

The Draft Plan creates unnecessary confusion by presenting model outcomes based on input of three different longfin smelt sampling programs. The Effects Analysis technical appendix alone presents at least 11 different tables showing projected changes in longfin smelt abundance. The Draft Plan's technical appendix (Appendix 5.C.) demonstrates that each of the three longfin smelt sampling programs it employs to model projected outcomes produces nearly the same results. The most relevant sampling program for projecting the relationship between longfin smelt abundance and X2 is the Fall Midwater Trawl (FMWT) sampling program as (a) that is data set used by Kimmerer et al. 2009 to develop the model the Draft Plan relies on for forecasting longfin smelt populations; (b) the FMWT program samples intensively in the areas most immediately affected by BDCP, whereas the other sampling programs sample the entire Bay Estuary diffusely; and (c) the FMWT sampling program data series is substantially longer than the record for the other sampling programs. Kimmerer et al. 2009 and Rosenfield and Baxter 2007 both found substantial concurrence among the different data sets of longfin smelt sampling that are used in the Draft Plan and DEIS/DEIR analyses. Thus, while presentation of separate results for three different sampling programs compounds the confusion for readers, it is not clear that any additional information is gained by presenting separate analysis of the data from three different longfin smelt sampling programs.

Furthermore, the projected outcomes of BDCP on longfin smelt abundance presented in the DEIS/DEIR do not match those found in the Draft Plan's technical appendix. The DEIS/DEIR summary is inconsistent with the Draft Plan's associated technical appendix. *Compare* DEIS/DEIR at 11-1308 (Table 11-4-8) *with* Draft Plan at 5C.5.4-104 to –109. Many of the results presented in the DEIS/DEIR are not displayed in the technical appendix, and the DEIS/DEIR does not reveal how it arrived at estimates that differ from those found in the technical appendix; thus, it is challenging to review and compare the two documents and to evaluate the DEIS/DEIR.

v. The Draft Plan is Unlikely to Achieve the Entrainment Objective for Longfin Smelt, and Entrainment will Continue to Harm the Species. The Presentation of Results is Confusing, Biased Towards Positive Outcomes, and Internally Inconsistent

The presentation of entrainment impacts on longfin smelt within and across the Draft Plan's Effects Analysis, Entrainment Appendix (Appendix 5B), DEIS/DEIR, and the DEIS/DEIR Summary of Effects are confused and contradictory, and the conclusion of no significant impacts (AQUA-21) is not scientifically justified. As described above, the Draft Plan clearly identifies an objective intended to reduce entrainment of longfin smelt (though it is not written in a manner that will necessarily accomplish such a reduction) and to distribute entrainment evenly across the winter-spring in order to eliminate differential impacts to longfin smelt life history variants (though, again, it is inadequate to affect that intent). Contrary to the intent of the entrainment-related objective for longfin smelt, entrainment of longfin smelt is projected to remain unchanged or even increase during dry years, when most longfin smelt entrainment occurs. For example, during Dry and Critically Dry water year types, entrainment of juvenile longfin smelt is expected to increase or remain unchanged during the early and late long term in April. Draft Plan at Table 5.B.6-163 and Table 5.B.6-164. The Draft Plan acknowledges that during Dry water year types, when most entrainment of juvenile longfin smelt would occur, entrainment loss under evaluated starting operations (ESO) compared to current conditions would increase by 4% in the early long term. Draft Plan at 5.B-231.

Despite the Effects Analysis' findings that juvenile longfin smelt entrainment will increase from current levels in drier years (years when the population already suffers poor recruitment) during the early long-term, it concludes that the BDCP will generate a "low" *positive* effect on juvenile longfin smelt entrainment and "very low" positive effects on larval longfin smelt. Draft Plan at Figure 5.5.2-5. The DEIS/DEIR does not convey changes in entrainment rates in the early long term, *see, e.g.,* DEIS/DEIR at Table 11-4-5, but increased entrainment in drier years is a negative effect in the early long term. Given the precarious state of the longfin smelt population, this may translate to a long-term effect that impacts any anticipated benefit in the late long term. Again, we note that average changes in entrainment rates modeled over many years are immaterial to fish that are semelparous (have only one chance to reproduce) and live for only two years – multiple generations of longfin smelt may experience only the higher entrainment expected under drier years and an extended period (i.e. a drought) of such high entrainment could do significant and possibly irreparable damage to the population.

The Draft Plan does not directly compare the predicted changes in longfin smelt entrainment to the Draft Plan objective of limiting longfin smelt entrainment. However, neither the Effects Analysis nor the DEIS/DEIR indicate that longfin smelt entrainment will be reduced to levels less than 5% of the population per year, as required by objective LFSM1.2. Entrainment rates for each life stage of longfin smelt vary substantially based on water-year type; it is well-known that entrainment rates for this species increase dramatically in drier year types and can be negligible in wetter year types. Sommer 2007; CDFW 2009; Grimaldo et al. 2009; Rosenfield 2010. Entrainment rates also vary based on the assumed distribution of longfin smelt spawning (when more longfin spawn closer to the pumps, more of the subsequent larval population is entrained). For example, the Effects Analysis projects that in drier year types, if 15% of longfin smelt spawn in the South Delta, then up to 19.1% of the larval longfin smelt population may be entrained under BDCP operations. Under these conditions, projected entrainment of larval longfin smelt exceeds the 5% *total* entrainment maximum set in objective LFSM1.2 in more than one quarter of the years analyzed in the Early Long Term period. Draft Plan at Table 5.B.6-151. This analysis does not account for cumulative effects of entraining other life history stages (juvenile or adult).[60]

These findings reveal that:

[60] Modeling of the entrainment risk for longfin smelt and other species is highly reliant on the modeling of Delta flows and in-Delta hydrodynamics and is thus subject to the quality of the assumptions used to perform that modeling and the uncertainty inherent in such modeling. Flaws and high uncertainties associated with the BDCP's hydrological and hydrodynamic modeling are described, at length, in our comments. Here, it is important that the reader understand that the modeled entrainment risks are extremely uncertain and may be higher than modeled in some cases and that the modeling itself lends itself to an underestimation of entrainment risks.

- entrainment of juvenile longfin smelt is expected to be quite high now under certain conditions (the BDCP cannot achieve large reductions in longfin smelt entrainment if entrainment is not high to begin with)
- entrainment is expected to increase in certain year types under BDCP operations in the early long term; and,
- the risk of entrainment will not be "evenly distributed over the adult migration and larval-juvenile rearing periods" as required by objective LFSM1.2.

The DEIS/DEIR treatment of entrainment as a stressor to longfin smelt is inconsistent and internally contradictory. For example, in reporting higher entrainment levels that would be expected under Alternative 1A, the DEIS/DEIR declares:

> The salvage density approach for March-June entrainment suggested that overall entrainment loss would be similar or slightly increased (by up to 25%) under Alternative 1A. Although there were considerable increases in entrainment rate (over 100% in some cases) under Alternative 1A in below-normal years, the actual number of fish involved were very low… Higher numbers of entrained fish were estimated in dry water years. In these years, entrainment under alternative 1A was 14-44% higher than NAA. In critical years, there were modest decreases of 5-20% in entrainment under Alternative 1A relative to NAA"

DEIS/DEIR at 11-200.

The DEIS/DER does not explain why an increase of "up to 25%" in longfin smelt entrainment would be considered a "slight" increase, or why, in the same paragraph a smaller decrease in entrainment of 5-20% would be considered a "modest" improvement (which implies an impact that is greater than "slight"). It is also not clear how the 25% increase in entrainment statement squares with those that follow, predicting increases in entrainment of "over 100%" or "14-44%" in some cases. Rather than acknowledge and address the failure of Alternative 1 operations to reduce entrainment as the Draft Plan intends, the DEIS/DEIR undermines the rationale for declaring that objective at all, stating: "Entrainment at the SWP and CVP facilities is not believed to be an important stressor influencing survival of longfin smelt larvae, as they are generally encountered in substantial numbers at the south Delta facilities only in dry years (approximately one-third of all water years). Consequently the population-level impact of this stressor on longfin smelt larvae is believed to be low." DEIS/DEIR at 11-200.[61] The DEIS/DEIR

[61] It is entirely unclear how the DEIS/DEIR can downplay the importance of entrainment as an impact based on the frequency of encountering "substantial numbers" of larval longfin smelt at the south Delta facilities since larval smelt were not identified (much less enumerated) at the salvage facilities prior to 2008. CDFW 2009 Incidental Take Permit for the SWP at 6.

goes on to state that, "Based on the limited potential for a population-level effect on longfin smelt and the minor to moderate change in the entrainment expected under Alternative 1A, the effect of entrainment would not substantially change for juvenile longfin smelt." DEIS/DEIR at 11-200 (emphasis added). This analysis of potential negative effects for one set of BDCP operations (Alternative 1) stands in contrast to its interpretation of alleged positive effects for another operational alternative 4. Although the proportional magnitude of positive effects are similar, the positive effects anticipated under Alternative 4 operations are judged to be "substantial," DEIS/DEIR at 11-1304, while the negative effects under Alternative 1 are termed "low." The DEIS/DEIR rationale for downplaying negative effects to longfin smelt entrainment under Alternative 1 exemplifies its flawed approach to evaluating impacts. The DEIS/DEIR argues that the anticipated negative entrainment effects to longfin smelt are minor because such impacts "only" occur in about 1 of every 3 years. This is scientifically unjustified. As we have described before, longfin smelt are short-lived (~2 years) and semelparous; as a result the longfin smelt population is very sensitive to conditions that occur in individual years and less sensitive to "average" conditions. Thus, an action that increases a known impact to the population by 14-100% (the range of increases identified in the DEIS/DEIR) should be modified, even if the effect occurs "only" in a fraction of years. Moreover, the impact of high entrainment rates on longfin smelt in drier years is important because longfin smelt experience lower recruitment in dry years; to quote the CDFW's incidental take permit for the SWP, "the mortality associated with entrainment would be highest when the population already faces adverse recruitment conditions attributable to low outflow." CDFW 2009 at 7.

In general, the Draft Plan and DEIS/DEIR take the inaccurate position that the impact of entrainment on longfin smelt have been reduced in recent years, though the Entrainment Appendix acknowledges that longfin smelt salvage has been high "in some years." Draft Plan at 5.B-1. The Draft Plan and DEIS/DEIR presumably refer to implementation of SWP/CVP export controls under the biological opinion for Delta Smelt as reducing salvage of longfin smelt. Yet, entrainment is a known stressor on, and threat to the Bay-Delta's longfin smelt population. Rosenfield 2010; CDFW 2009. In addition, the documents' assumption regarding recent reductions in this impact are not supported by recent entrainment levels; relative to the measured index of longfin smelt abundance, entrainment rates of longfin smelt have been higher since the species' 2009 listing under the state Endangered Species Act than they were before the listing. The Bay Institute and Center for Biological Diversity letter to C. Bonham, CDFW April 27, 2012; *see* The Bay Institute, Center for Biological Diversity, NRDC, and Defenders of Wildlife letter to C. Bonham, CDFW July 10, 2013.

vi. The Draft Plan Fails to Adequately Model Likely Entrainment Rates, Underestimating Likely Entrainment

The Effects Analysis obscures the impact of entrainment on longfin smelt by reporting longfin smelt entrainment rates separately for different life stages: larval, juvenile, and adult. Even if data availability requires different modeling approaches for different life stages, there is only one longfin smelt population and thus, the effects of stressors on multiple life stages must be summarized into a single cumulative impact. A summation of this type would be aided by a numerical life cycle model for the species, but such a model is not required to accurately report the relative impacts of entrainment (or other stressors) on the population as a whole. Also, in a population that is not limited by density-dependent interactions, the proportional loss of any life stage would be directly translated to subsequent life stages and eventual egg production.

Here again, the DEIS/DEIR applies a different standard of impact when results appear to favor the BDCP alternative. When the DEIS/DEIR asserts net benefits of reduced adult entrainment, it no longer questions whether entrainment is a meaningful stressor on the population. *See* DEIS/DEIR at 11-201.

The Draft Plan entrainment index and DEIS/DEIR fail to use known relationships between OMR flow rates and longfin smelt entrainment. Entrainment rates of longfin smelt and other pelagic fish species are known to correlate with impaired hydrodynamic patterns in the South Delta caused by the relationship between Delta export rates and Delta outflows. CDFW 2009; Rosenfield 2010. In particular, entrainment of longfin smelt and other species is significantly and negatively correlated with flow rates in the Old River and Middle River distributaries of the San Joaquin River; entrainment rates accelerate rapidly as Old and Middle River (OMR) flows become increasingly negative (flow towards the South Delta export facilities on a tidally averaged basis). Grimaldo et al. 2009. The Draft Plan fails to use OMR as an indicator of entrainment risk despite this known relationship. *See* Draft Plan at Table 5B.5-2. The Draft Plan's analysis of OMR flow rates under the BDCP indicate that they will be nearly unchanged or more negative in all year-types during April and May in both the Early Long Term, *see* Draft Plan at Figures 5B.4-15 to 4-19, and Late Long Term, *see* Draft Plan at Figures 5B.4-20 to 4-24. These are the months in which longfin smelt are most susceptible to entrainment. Rosenfield 2010. As a result, the Draft Plan fails to accurately analyze a potentially significant impact and/or the ability or failure of the BDCP to alleviate a known, periodic stressor on the longfin smelt population.

B. <u>Chinook Salmon</u>

1. <u>Draft Plan Objectives for Chinook Salmon and Steelhead Populations are Inadequate</u>

i. The Proposed Objectives are Not Consistent with the CVPIA/AFRP, ESA, and Other Laws

Unfortunately, the Draft Plan's objectives for Chinook salmon and steelhead productivity are inadequate. The Draft Plan sets thresholds for Chinook salmon and steelhead survival based on population growth rates necessary to attain Chinook salmon and steelhead abundance targets within 40-50 years after BDCP is adopted. Draft Plan Appendix 3G. There are at least two problems with setting survival rate objectives as proposed in the technical appendix. First, there is no scientific justification or rationale for survival rates that produce such anemic growth rates for Chinook salmon; Chinook salmon typically display much higher freshwater survival rates than are described in the Appendix, particularly in the first half of the BDCP permit term. Quinn 2005; Healy 1995; Bradford 1995. Thus, setting the date for attaining abundance targets 40-50 year in the future is arbitrary and inadequate.

Second, the abundance targets the Draft Plan uses to set growth rate (and thus, through-Delta survival) are not those specified by the CVPIA Anadromous Fish Restoration Program (AFRP) or the NMFS 2014 Final Recovery Plan for Central Valley salmonids (or for that matter, in the 2009 Draft Recovery Plan). For example, the BDCP Draft Plan identifies a global goal (a target to be attained by restoration efforts throughout this fish's life cycle, including upstream spawning areas, the BDCP Plan Area, and the ocean) for winter-run Chinook salmon escapement of 23,800 fish. However, this is a small fraction of the AFRP target for this species (110,000 2-yr+ fish in the ocean). AFRP 2001, Appendix B at B-1.[62] Setting survival rates based on the growth rates needed to attain an inadequate and arbitrary abundance target over an inadequate and arbitrarily long timeframe is unacceptable. Similarly, the Draft Plan's target for Sacramento River steelhead abundance is less than that specified in the AFRP. *See* AFRP 2001, Table 1. There is no explanation of the abundance target for Central Valley steelhead returning to the San Joaquin basin (1,700 per year), though this number is clearly less than that required to meet the draft recovery standards for steelhead in the San Joaquin basin. The NMFS 2014 Final Recovery Plan requires two populations in the Southern Sierra diversity group (the San Joaquin drainage basin) to be maintained at low risk of extinction and multiple "Core 2" populations maintained at

[62] Although escapement (the BDCP metric) is always lower than production (the AFRP metric) because fish die of natural causes and human fishing post-"production," the discrepancy either assumes an unreasonably high harvest rate (the California commercial fishing season is currently timed to minimize and avoid fishing-related mortality to winter-run Chinook salmon) or non-attainment of the AFRP target for winter-run Chinook salmon.

"moderate risk of extinction" or better. NMFS 2014 Final Recovery Plan at 98. The Recovery Plan defines populations at "low risk" as displaying, among other criteria, a census population abundance of 2,500 fish (or ~833 returning spawners per year). *Id*. at 97. Two such populations with 833 returning steelhead/year would be a minimum of 1,666 returning steelhead each year. The Recovery Plan defines populations at moderate risk to constitute returns of no less than 250 fish (or ~83 spawning steelhead per year). *Id*. Three such populations would be a minimum of 249 spawning steelhead. Thus to achieve recovery targets for steelhead in the San Joaquin Basin, it appears that the Delta must provide survival rates that can support the return of no less than 1,916 steelhead each year (two populations at low risk of extinction with at least 833 returning spawners per year, plus three populations at moderate risk of extinction or better, with at least 83 spawners per year) – this target is more than 12% higher than that used in the Draft Plan's technical appendix.

Finally, even with faulty abundance assumptions and unacceptably protracted period assumed for attainment of its abundance targets for the Central Valley salmonids, the Draft Plan's technical appendix reveals that its survival rate targets are likely insufficient to achieve those abundance targets. Specifically, neither spring-run or fall-run Chinook salmon from the San Joaquin basin are projected to reach the abundance targets that the Draft Plan relies on to set Delta survival targets, indicating that these through-Delta survival targets are insufficient to meet salmonid abundance targets for the San Joaquin Valley. In the case of fall-run Chinook salmon, the projected survivals are insufficient to support populations consistent with the CVPIA/AFRP and analogous state law (Cal. Fish and Game Code § 6902) for the San Joaquin River's tributaries. Draft Plan Appendix 3G at 20-21 (Table 4).

Furthermore, the Draft Plan assumes maintenance of status quo through Delta survival rates for the first 10 years of a BDCP followed by a very slow incremental improvement in survival rates for various Chinook salmon and steelhead populations. The resulting survival targets would lead to substantial declines in all Central Valley salmonid populations and steelhead, including extirpation of all San Joaquin salmonids in the first 10 years and near eradication of the endangered winter-run Chinook salmon population. Draft Plan Appendix 3G at 20-21 (Table 4).[63] This is a clearly unacceptable outcome and significant impact, and there are feasible alternatives and mitigation measures to reduce or eliminate this impact.

The Draft Plan identifies the need to conserve the life-history attribute of salmonid viability. *See, e.g.,* Draft Plan at 3.3-140 (Objective WRCS3.2); *id*. at 3.3-148 (SRCS3.2); *id*. at 3.3-156 (FRCS3.2). However, the stated objectives ("Operate water facilities to support a wide range of

[63] Also, it is not clear why the winter run population mysteriously increases from a predicted low of 565 fish in year 10 to 709 fish in year 11 of the BDCP. If this increase is an error as it seems, it will produce erroneous results that overstate the final estimated populations.

life history strategies … without favoring any one life history strategy or trait over another") is inadequately defined, so it is not possible to tell whether the objective is sufficient, whether the Draft Plan will attain the target (prior to adoption of the BDCP), or under what circumstances adaptive management actions will be triggered to attain the objective (post-implementation). As with similarly ill-defined objectives (such as those described above for longfin smelt and Delta smelt), the Draft Plan identifies export operations and associated fish entrainment as a potential stressor on salmonid life history, but the Conservation Strategy offers no guidance as to what constitutes acceptable homogeneity in entrainment risk and how to address it. As described for other species, one approach to quantifying this objective would be to identify entrainment limits on short time steps (e.g., weekly) to assure that no particular temporal component of a migrating cohort of juvenile salmon is disproportionately affected by entrainment; these weekly entrainment limits can be combined with annual and multi-year average entrainment rates in a way that allows for management flexibility and increased protection for covered fish species. Furthermore, the Draft Plan fails to identify targets and actions to limit life-history impacts due to high temperatures or low flows upstream as these impacts tend to be asymmetrical in time (i.e., affecting early or late ends of the diversity spectrum) and are largely under the control of Project operators.

ii. The Draft Plan Fails to Identify any Objective for Key Attributes of Viability that are Necessary to Achieve Conservation and Recovery of Central Valley Salmonid Species

The Draft Plan fails to establish objectives for other key attributes of viability that are necessary for recovery, such as spatial diversity. As discussed above, the Draft Plan sets survival objectives for both spring-run and fall-run Chinook salmon and Central Valley steelhead that: (a) likely lead to their extirpation of in the San Joaquin Basin during the first 10 years of the BDCP; (b) provide for no population growth and low abundance for years 10-19; and, (c) <u>never</u> support the abundance target identified as the global goals for the Chinook salmon populations. Draft Plan Appendix 3G at 20-21 (Table 4). If the Draft Plan established an adequate objective for spatial diversity for spring-run and fall-run Chinook salmon and steelhead then it would have focused on identifying stressors (e.g., high through-Delta mortality) and conservation measures (including but not limited to improved flow regimes) that would support conservation and recovery of these covered populations. But because it fails to set adequate objectives, the Draft Plan seems oblivious to the extirpation of existing salmon populations.

2. The Draft Plan Fails to Identify and Address the Correct Stressors on these Species

i. The Draft Plan and DEIS/DEIR Mischaracterize and Understate the Impact of Reservoir Operations on Chinook Salmon and Steelhead

The Draft Plan and DEIS/DEIR's presentation of stressors on Central Valley Chinook salmon ignores the proverbial elephant in the room – poor water quality, temperatures, and freshwater flow conditions related to CVP and SWP reservoir operations. Although the Draft Plan correctly acknowledges the historical role of dams in restricting Chinook salmon access to high elevation spawning habitats, *see* Draft Plan at 3.3-122, it ignores or downplays the impact of current dam operations on available spawning habitat, rearing, and migration habitat. Because the geographic range of Chinook salmon and steelhead spawning in the Central Valley is constrained by the presence of impassable dams (*see* Yoshiyama et al. 2001; Lindley et al. 2004), conditions below those dams have tremendous influence on the viability of these populations, including their abundance (total carrying capacity), productivity (survival rates), life history diversity (e.g. size and condition of juveniles, timing of upstream and downstream migration), and geographic range (extent of available spawning habitat). High temperatures have multiple deleterious effects on Chinook salmon, the type, severity and frequency of which vary with population spawning time and location. Quinn 2005; Myrick and Cech 2004, 2005; Richter and Kolmes 2005; NMFS 2014 Final Recovery Plan. Central Valley dams and reservoir operations exert great control on water temperature conditions in Chinook salmon spawning and rearing habitat. Nickel et al. 2004; NMFS 2009 Biological Opinion. However, the Draft Plan mentions reservoir operations only tangentially in its discussion of water temperature as a stressor on Chinook salmon. In describing the impact of temperatures, the Draft Plan credits a temperature control device (TCD) on Shasta Dam and "improved reservoir management" as "important factors contributing to the increase in adult winter-run Chinook salmon abundance in recent years." Draft Plan at 3.3-123. Yet the biological opinion indicates that upstream water temperatures have exceeded requirements in recent years, despite the TCD. *See* NMFS 2009 Biological Opinion at 263.

In addition to temperature impacts caused by operations of the Project reservoirs, flows below those dams severely constrain the abundance, productivity, spatial distribution, and life history diversity of numerous Central Valley salmonid populations. For example, following the end of the winter-run Chinook salmon incubation season releases from Shasta/Keswick are often reduced, often resulting in dewatering of fall-run Chinook salmon redds on the Sacramento River, even in recent years. SRTTG 2013; CDFW 2013. Dewatering of early spawning fall-run Chinook salmon on the Sacramento River reduces the life history diversity of this population (by eliminating the fraction that spawn, hatch, and migrate early) as well as its productivity (average survival rate) and overall abundance (carrying capacity). Redd dewatering presents similar problem for steelhead on the American River. NMFS 2009 Biological Opinion at 279 (Table 6-18). Negative impacts resulting from variations in reservoir release have been known to impact steelhead and Chinook salmon on other Sacramento River tributaries as well. *See, e.g.,* Williams 2006 (citing Kurth 2003); DWR 2003.

The Draft Plan does appear to acknowledge the potential for water project operations on temperatures and flow conditions upstream as it sets objectives that require that the BDCP will not reduce the primary constituent elements of winter-run Chinook salmon critical habitat upstream. Draft Plan at 3.3-139 (Objective WRCS3.1). However, this target is misidentified as an objective. Objectives are statements of desired biological outcomes (e.g., a covered species' spawning extent), not drivers of those outcomes (e.g., habitat availability). The point of identifying desired outcomes separately from stressors that will be addressed to achieve those outcomes is to make transparent the Draft Plan's assessment of factors that currently impede attainment of its goals and objectives; such transparency allows reviewers to understand and evaluate the rationale for various elements of the Conservation Strategy. In any case, by setting an "objective" that is already a requirement of the status quo, the Draft Plan ignores potential feasible operational actions that would *improve* the Projects' ability to provide adequate upstream habitat for covered salmonids. *See, e.g.*, Nickel et al. 2004.

The Draft Plan is inconsistent and incomplete in its treatment of the impact of flow modification as a stressor on different runs of Chinook salmon. Flow modifications resulting from CVP and SWP operations are widely understood to affect survival (productivity), abundance (carrying capacity), spatial distribution, and life history diversity of all Central Valley Chinook salmon populations. Moyle 2002; Williams 2006; Williams 2010; NMFS 2009 Biological Opinion; NMFS 2014 Final Recovery Plan. Furthermore, several recent papers have improved our understanding of the relationship between freshwater flow rates, migratory corridor selection within the Delta, and Delta survival rates. *See* Perry et al. 2010; Michele et al. 2012. Even where the Draft Plan acknowledges the need for adequate freshwater flow rates, it largely fails to identify specific flow targets in different locations (in terms of volume, timing, duration, and frequency) that are needed to conserve and restore the different populations of Chinook salmon from the San Joaquin or Sacramento sides of the Central Valley. For example, in the same table where it sets forth the species-specific objectives for Chinook salmon, the Draft Plan lists "altered migration flows" as a stressor to Chinook salmon. Draft Plan at 3.3-134. However, its target for this stressor is only to "ensure that north Delta intake operations do not increase the incidence of upstream flows in the Sacramento River at the Georgiana Slough junction." *Id*. This target mistakes ameliorating current stressors on the population with preventing further harm from implementation of one of the Plan's own "conservation measures." In so doing, the Draft Plan ignores the fact that current flow levels are inadequate upstream, into the Delta, through the Delta, and out of the Delta into Suisun Bay. *See, e.g.*, NMFS 2009 Biological Opinion; NMFS 2014 Final Recovery Plan; SWRCB 2010 Flow Report; CDFW 2013 Letter to the SWRCB. In addition, one of the landscape level objectives for Chinook salmon that speaks to the need for adequate transport flows for larval and juvenile fish. Draft Plan at 3.3-127 (Objective L3.3). However, this objective is not specific with regard to the magnitude, seasonal timing, or duration of flows (how much water? at what time of year? for how long?), the locations where such flows play an important role (and should be measured), or the percentage of years (frequency) in which they should occur, nor does the Draft Plan identify a time-bound for when these necessary flows will occur under the BDCP. The objective is deficient and unacceptable.

The Draft Plan and DEIS/DEIR analyze the effect of in-Delta flows on Chinook salmon and steelhead survival almost exclusively in terms of how OMR flows drive salmon entrainment. The Draft Plan and DEIS/DEIR ignore the effect of changes in freshwater flows into, through, and out of the Delta on other stressors the BDCP attempts to address and on improved survival rates of salmonids in this system. Kjelson et al. 1982; Stevens and Miller 1983; Kjelson and Brandes 1989; Brandes and McLain 2001; Newman and Rice 2002; NMFS 2009 Biological Opinion; NMFS 2010 Exhibit 7; NMFS 2014 Final Recovery Plan. For example, in the presentation and evaluation of CM14 (Aeration of the Stockton Deep Water Ship Channel to prevent violations of the dissolved oxygen standard), there is no analysis of the beneficial effect of freshwater flow rates in the lower San Joaquin River on dissolved oxygen rates, despite the fact that this effect is well-studied. Jassby and Van Nieuwenhuyse 2005.

Also, neither the Draft Plan nor the DEIS/DEIR alternatives consider provision of increased flow rates from CVP facilities on the San Joaquin River into the Delta as a means of transporting juveniles of covered fish species, attracting adults during spawning migrations, reducing negative OMR rates, alleviating dissolved oxygen problems, or increasing estuary-wide productivity. Increased flow rates also have been shown to decrease predatory efficiency on salmonids. DOI 2011 at 35 -36; USFWS Comments to SWRCB 2012; Cavallo et al. 2012. Decreased flow rates combined with increased Delta export pumping may facilitate high predator abundance in the Delta. *See* Moyle 2002, Moyle and Bennett 2008. Yet the Draft Plan and DEIS/DEIR do not consider the potential benefits of reducing predation pressure via increased flow rates into, through, and out of the Delta. Also, there is no analysis of the relationship between Delta outflow conditions and salmonid survival, distribution, and travel rates, though there is strong conceptual support for such an effect.

ii. The Draft Plan Overstates the Magnitude and/or Certainty of Stressors on Chinook Salmon Population and Incorrectly Treats these Stressors as if they have the same Impact on all Chinook Salmon Populations

In contrast to its uneven, weak, and/or missing treatment of critical flow-related stressors on Central Valley salmonid populations, the Draft Plan is overconfident about the magnitude of other stressors on Chinook salmon and steelhead. The Draft Plan frequently accepts any suggestion of a negative outcome for one salmonid population as solid evidence that (a) the factor is a stressor (as opposed to an outcome of other stressors) and (b) that the stressor effects other salmonid populations to the same degree. For example, the Draft Plan confidently states that predation is an important threat to each Chinook salmon population. *See, e.g.*, Draft Plan at 3.3-147 (spring-run); id. at 3.3-154 (fall-run and late fall-run). However, the Draft Plan only cites to a modeling study of predation on winter-run Chinook salmon to support this assertion. *Id*. at 3.3-122. Juvenile Chinook salmon and steelhead are certainly eaten in the Delta, and always have been; merely demonstrating that predation occurs, or even that predation rates are high relative to other sources of mortality is not evidence that predation is a "problem." Williams 2010 at 53. Furthermore, evidence of predation does not indicate that predation is a "stressor" per se, because any struggling fish is vulnerable to predation (whether it is undernourished, sick, suffering from toxic exposure, struggling with high temperatures, disoriented by poor flow conditions, etc.) – in other words, even high predation rates may be a only a symptom, rather than a cause, of salmon decline. Grossman et al. 2013. To support its assertion that predation rates may affect productivity of winter-run Chinook salmon, the Draft Plan relies on a modeling exercise, which showed that artificial stocking of predators could impact the recovery prospects of winter-run Chinook salmon. Lindley and Mohr 2003. The Draft Plan fails to address how stressors it identifies (lack of cover, toxins, temperatures) and those it does not (i.e., flow rates) affect predation rates and so fails to establish that controlling predation rates (by controlling predators directly) will actually alleviate impediments to salmonid recovery.

In addition, the modeling paper that the Draft Plan relies on (Lindley and Mohr 2003) to suggest that predation is a problem for winter-run Chinook salmon did not assess potential impacts of predators on other Central Valley salmonid populations and the Draft Plan provides no evidence that predation is an important outcome (much less, a stressor) on these other salmonid populations. Any population-level effect of predation is likely to differ across salmonid populations because these different fish enter the Delta at different times, from different locations, and at different sizes (i.e., they have different exposure and susceptibility to predation). For example, there are far more fall-run Chinook salmon juveniles than winter-run Chinook salmon migrants entering the Delta each year and they co-migrate with spring-run Chinook salmon juveniles, thus the proportional impact of predation on these populations is likely to differ from the impact on winter-run Chinook salmon. Juvenile late fall-run Chinook salmon (which the Draft Plan erroneously treats as equivalent to fall-run Chinook salmon) are larger and thus less susceptible to predation than winter-run juveniles when they enter the Delta. Similarly, the Draft Plan suggests that steelhead migrants are significantly affected by predation in the Delta, *see* Draft Plan at 3.3-158, but this seems highly unlikely as steelhead spend a relatively short amount of time in the Delta, are usually several times larger (and thus less susceptible to predation) than migrating Chinook salmon fry, and are, in fact, aggressive predators in their own right.

By contrast, the Plan selectively ignores evidence of Project-related stressors to Chinook salmon and/or fails to consider how evidence of such impacts on one Chinook salmon population may indicate negative effects on other runs. For example, the Draft Plan's description of the entrainment stressor suggests that this effect is "not well understood." Draft Plan at 3.3-123. The document makes no mention of numerous detailed studies of this stressor. *See, e.g.,* Kjelson and Brandes 1989; Kimmerer 2008; Kimmerer and Nobriga 2008; NMFS 2009 Biological Opinion. The life history conceptual model for Central Valley Chinook salmon, in its coarse assessment of stressors to all salmonid populations in the Delta, rates "project diversions" and the Delta's "modified hydrograph" as equal to or more important *and* better understood than "predation by introduced fishes." Williams 2010 at 57 (Table 8). Similarly, the Final Recovery Plan for Central Valley salmonids states:

> The primary factors causing mortality of winter-run Chinook salmon in the Delta are considered to be the diversion of juveniles from the mainstem Sacramento River into the central and southern Delta where environmental conditions are poor and reverse flow conditions exist which may move them into the lower San Joaquin River and into the south Delta waterways (NMFS 1997). Survival through central Delta migratory routes is substantially lower than through northern routes. The numbers of juveniles arriving at the export pumps is lower as river flows increase, pumping decreases, and the Delta Cross Channel gates are closed (Cramer et al. 2003).

NMFS Final Recovery Plan 2014, Appendix B at 2-31.

The Final Recovery Plan indicates that spring-run Chinook salmon probably experience the same negative impact of entrainment into the Central Delta as identified for winter-run. *Id.*, Appendix B at 3-24 to 3-25. The Final Recovery Plan's stressor matrices for winter-run Chinook salmon, steelhead, and spring-run Chinook salmon (Attachments A, B, and C to Appendix B) list both entrainment at the Projects' current diversion facilities and predation in the Delta as stressors of "Very High" magnitude. It is not credible to imply, as the Draft Plan and DEIS/DEIR repeatedly do, that predation is better understood and more important as a population level stressor on Chinook salmon and/or steelhead than the entrainment stressor.

iii. The Draft Plan Provides no Rationale or Analysis Supporting the Adequacy of its Stressor Reduction Targets.

The Draft Plan does not analyze stressor reduction targets for Central Valley salmonids in a rigorous manner and, as a result, the targets are poorly defined and/or inadequate to attain desired biological outcomes (objectives) for salmonids. The point of identifying stressors that limit attainment of the Draft Plan's biological objectives is to force clear analysis of the scale of problems facing the covered species and to ensure that meaningful reductions in stressors occur within the time bounds identified by the objectives. Stressor reduction targets thus identify the degree to which threats must be reduced and the timeframe for producing the desired reduction in stress in order to serve attainment of biological objectives.

In many cases, the Draft Plan fails to identify even a rough target for reducing stressors. The stressor reduction target for "spatial structure" specifies that it must be attained by year 15, but the description of this target provides no detail regarding how to measure "spatial structure" or how much will be enough. In the end, this target sounds as though it is simply a partial explanation of the rationale for the "lack of rearing habitat" stressor reduction target. In another example of ill-defined stressor reduction targets, "illegal harvest" of steelhead and all runs of Chinook salmon is to be reduced in both the Sacramento and San Joaquin drainages "within the Plan Area" by year 15 (*see, e.g.*, Draft Plan 3.3-169 (steelhead)), but there is no indication of how much reduction in salmon or steelhead poaching the Draft Plan is expected or how much will need to occur in order to attain biological objectives for this species.[64] Above, we describe numerous inadequacies with the Draft Plan or DEIS/DEIR's description and evaluation of the illegal harvest stressor and its related conservation measures.

The Draft Plan sets objectives for improved through-Delta survival rates of juvenile San Joaquin fall-run Chinook salmon and steelhead and survival rates for spring-run Chinook salmon that are, or will be, reestablished in the San Joaquin Basin – above, we describe why those objectives are inadequate. Stressor reduction targets for San Joaquin population are related to entrainment, predation, and rearing habitat for fall-run Chinook salmon, Draft Plan at 3.3-159, spring-run Chinook salmon, *id*. at 3.3-151, and steelhead, *id*. at 3.3-168. The stressor reduction targets for predation are specific to predation rates in the export facility infrastructure and are thus redundant of the stressor reduction target related to "survival rates at south Delta export facilities" – it too calls for reduced predation within the canals and bays of the export infrastructure). The latter stressor reduction target is not SMART as there are no specifics regarding how much or when entrainment related mortality will be reduced; thus, there is no way

[64] It is also not clear how reduction in poaching of adult fish is relevant to the biological objectives set for salmonids, as there is no productivity or abundance objective for adult salmon

of telling how reduction of this stressor will contribute to improved Delta survival rates specified in the objectives for salmonids.

The "lack of rearing habitat" stressor is specific and time-bound, but the Draft Plan's description of these attributes demonstrates how little BDCP plans to reduce this stressor, particularly as compared to the needed survival improvements in the south Delta. The Draft Plan calls for restoring migrating juvenile salmonids access to at least "1000 acres of inundated floodplain habitat, primarily within the south Delta." Draft Plan at 3.3-169. This is one seventh of the floodplain acreage the Draft Plan intends to provide in the north Delta, on the Yolo Bypass, for salmonids of the Sacramento Basin, yet there is no explanation as to why migratory fishes of the San Joaquin basin require so much less floodplain habitat than Sacramento River fish. The Draft Plan calls for this new San Joaquin floodplain habitat to be inundated for a minimum of 1 week, while similar habitat on the Sacramento River is to be inundated for at least 30 days. Again, there is no explanation of why the same fish (i.e., fall-run Chinook salmon) using the same kind of habitat (inundated floodplains) would require different amounts (extent or duration) of that habitat, though the Draft Plan acknowledges that inundation periods of less than 30 days are expected to result in a lesser benefit to juvenile growth compared to inundation that extends longer than 30 days. Draft Plan at 3.4-41. Furthermore, the stressor reduction target specifies that, "On average, 50 acres of floodplain will be inundated a minimum of every other year, 500 acres will be inundated a minimum of every 5 years, and all 1000 acres will be inundated a minimum of once every 10 years." *Id*. In other words, a negligible amount of floodplain habitat will be available in only about half of years and a tiny amount will be available at a frequency of approximately once every five years. Central Valley Chinook salmon have a generation length of approximately 3 years (Moyle 2002; Williams 2006), so it is possible that two generations of migrants out of three would not experience even 500 acres of inundated habitat. Similarly, many Chinook salmon generations could migrate down the San Joaquin River without experiencing the relatively small maximum amount of floodplain habitat expected to occur in 1 year out of 10.

Though inadequate, the Draft Plan's objectives for survival through-Delta survival rates of San Joaquin salmonids are many times the current, miserably poor, survival rates. But the stressor-reduction targets the Draft Plan identifies are simply inadequate to affect such improvements, much less to attain objectives that would actually be adequate to restore San Joaquin salmonids. The floodplain habitat stressor reduction target is expected to occur by year 15 of the Plan, therefore, even if the stressor reduction target had any meaningful effect on San Joaquin survival, it would not contribute in any way to preventing extinction of all San Joaquin Valley salmonids that the Appendix 3G of the Draft Plan expects will occur within the first 10 years of the BDCP. Had the BDCP planning process followed a logical and science-based planning process, the disconnect between the timing of biological outcomes and the stressor reduction targets and conservation measures necessary to achieve desired outcomes would have been transparent; this would have necessitated design and evaluation of actions that were appropriately scaled and timed to attain the adequate conservation and restoration objectives.

No target is identified for the "Migration Flows" stressor San Joaquin basin salmonids. This is problematic and unjustifiable given (a) the extremely impaired flows of the San Joaquin as it enters the Delta (*see, e.g.,* NMFS 2009 Biological Opinion; NMFS 2014 Final Draft Recovery Plan; SWRCB 2010 Flow Report; VAMP Panel Report 2010; NMFS March 28, 2013 Comment Letter on SWRCB 2012, Phase 1 WQCP SED), (b) the Draft Plan sets a "Migration Flow" stressor reduction target (though inadequate and ill-defined) for the Sacramento River, which has much higher spring flows (both absolute and proportional to the Basin's full-natural flow) than the San Joaquin River now and under the Draft Plan, and (c) the State Water Resources Control Board is currently contemplating water quality standards that would improve flow conditions in the lower San Joaquin. Improved flows in the lower San Joaquin are necessary to conserve and restore salmonid populations and other public trust values in that drainage and in the southern Delta. SWRCB 2010 at 119; USDOI Comments to the SWRCB 2013 at 31; NMFS 2013 Letter to the SWRCB at 1 and Enclosure 1 at 1; CDFW testimony to the SWRCB 2010b; CDFW Letter to the SWRCB 2013 at 5-6. Improved flows are also a foreseeable outcome of the State Board's update of the applicable Water Quality Control Plan, as we discuss in section I of these comments.[65]

For each Chinook salmon population and for steelhead, the Draft Plan sets a goal of reducing passage delays for adults migrating through the Delta at human-made impediments. *See, e.g.,* Draft Plan at 3.3-171 (Goal STHD2). In each case, the objective for this goal is to limit adult passage delays to less than 36 hours by year 15 of the BDCP. There is no indication of why it would not possible and desirable to remove human-made impediments to adult passage in less than 15 years or why it is not possible to restore relatively unfettered passage in less time. A key part of restoring passage for salmonids (and sturgeon and lamprey species) migrating through the Sacramento River is to modify the barriers formed by the Fremont, Lisbon, and Sacramento Weirs. Most or all of these actions are required under the 2009 NMFS biological opinion. Specifically, RPA Action I.6 and I.7 identify most of the same passage improvements described in the Draft Plan's CM2. NMFS 2009 Biological Opinion at 608-611.

The Draft Plan indicates that the passage barrier modifications will all occur within Phase 1 (years 1-5 of the BDCP) or Phase 2 (years 6-10). However, the biological opinion specifies that one half of the habitat restoration target of 17,000 to 20,000 acres of floodplain habitat must be restored by 2016. NMFS 2009 Biological Opinion at 609. There is no reason why the Draft Plan's stressor reduction objective for adult passage of salmonids, and the component projects

[65] We note that CVP facilities in the San Joaquin Basin affect the San Joaquin River inflow to the South Delta.

related to improving adult fish passage through the Yolo Bypass, should not be fully implemented in less than 15 years following adoption of BDCP. If, in fact, it is not possible to eliminate human-made barriers to fish passage in less than 15 years using the approaches described in CM2, then the Draft Plan ought to identify measures that *can produce the desired biological outcome* in less time. Again, we emphasize that the Draft Plan's own technical appendix (Appendix 3G) demonstrates that juvenile survival rates in the Delta will contribute to population declines (and perhaps extirpation for certain runs) for *all* central Valley salmonids for at least 10 years into the BDCP – the imperative to increase survival rates for salmonids (of any life stage) migrating through the Delta could not be more urgent.

3. <u>Conservation Measures do not Adequately Address Known Stressors for this Species and/or their Impacts are Inaccurately Portrayed</u>

i. Conservation Measures Identified in the Draft Plan are Deficient in Comparison with Similar Measures that are Already Required

In some cases, actions described by the Draft Plan are similar to those identified by the NMFS Biological Opinion RPA as necessary to prevent jeopardy to listed salmon species; however, the Draft Plan proposes a longer time period for implementation and/or a reduction in the magnitude of these actions as compared to what is specified in the RPA. For example, "CM2 Yolo Bypass Fisheries Enhancement" includes many of the same actions that are required by the 2009 NMFS biological opinion. The Draft Plan acknowledges the relationship between the RPA specified actions and those described in CM 2 (at 3.4-40), but the "fisheries enhancements" (largely floodplain restoration and removal of passage barriers) expected under the Draft Plan's CM2 are less than those specified by the RPA and BDCP implementation lags behind that required in the RPA.

Action I.6.1 of the RPA requires that an "initial performance objective" of 17,000-20,000 acres of inundated floodplain habitat (excluding acres under tidal influence) be restored in the Yolo Bypass, and it specifies that, "[i]n the event that less than one half of the total acreage identified in the plan's performance goal is implemented by 2016, then Reclamation and DWR shall re-initiate consultation." NMFS 2009 Biological Opinion at 608-609. In contrast, the Draft Plan targets restoration of only 7,000 acres of inundated floodplain habitat on Yolo Bypass, less than half of that required by the RPA. *See* Draft Plan at 3.3-159 (fall-run Chinook salmon); id. at 3.3-179 (Sacramento splittail). And it will not restore even this amount of habitat by 2016 as many of the "component projects" of CM2 are not scheduled to *begin* until the BDCP has been in effect for more than 5 years (i.e., Phases 2-4). The Draft Plan never identifies restoration of 17,000-20,000 acres of floodplain habitat on Yolo Bypass, as required by the RPA, as a stressor reduction target; thus, the BDCP's conservation measure for Yolo bypass fishery enhancements is less than what was required under the 2009 NMFS Biological Opinion as part of a suite of actions necessary to prevent jeopardy to the listed winter-run Chinook salmon, spring-run Chinook salmon, or steelhead.[66]

ii. Some Conservation Measures Identified for Central Valley Salmonids are Speculative and the Likelihood and Magnitude of Benefits is Unspecified, Undocumented, and Likely to be very low

As with other species, the Draft Plan's expectations of benefits to many of the covered salmonids arising from restoration of tidal wetlands are speculative and overstated. The Draft Plan asserts that juvenile salmonids migrating through the freshwater and brackish water estuary will benefit from the addition of tidal rearing habitat and increased availability of food that is assumed will result from these restoration efforts. Draft Plan at 3.4-119. The assumption that Chinook salmon will rear in newly created tidal wetlands habitats is based on work from ecosystems in the Pacific Northwest where salmon rear in the estuarine environment. *See* Simenstad et al. 1982; Healy 1982.

However, recent research from the San Francisco Bay-Delta ecosystem indicates that the assumed benefits to Central Valley salmonids of tidal marsh restorations are uncertain and may not materialize. The life history conceptual model for Central Valley salmonids states, "Spring Chinook, or at least the Butte Creek population, pass quickly through the Delta, so habitat restoration there seems unlikely to do much for them. The same is probably true for late-fall Chinook, and for steelhead." Williams 2010 at 41. Also, recent, extensive research on the growth, survival, and migration rates of fall-run Chinook salmon through the San Francisco Estuary and in the nearshore ocean demonstrates that Central Valley Chinook salmon transit the brackish portion of the estuary quickly and gain little or no weight in the process; salmon smolts from the Central Valley grow more than ten times faster in the nearshore ocean than they do in the saline portion of the San Francisco Estuary. MacFarlane and Norton 2002; MacFarlane 2010. Although this may reflect the lack of suitable and highly productive estuarine rearing habitat in the current San Francisco Estuary (which has lost the vast majority of its tidal wetlands), it is also possible that low estuarine growth rates, coupled with high growth rates in the nearshore ocean has always been the case for Central Valley salmonids, as it is in many other river-estuary systems. *See* MacFarlane 2010 (providing examples). If this is the case, then restoration of complex "rearing" habitats in the Delta may serve to trap or delay small Chinook salmon migrants (exposing them to predators and potentially high Delta temperatures) more than they serve to increase growth and survival of these fish.

[66] In addition, other reviewers have emphasized the need for Yolo Bypass restoration to be completed prior to initial operations of the north Delta intakes, because of the additional impacts to migrating salmon from operation of new intakes. Mount & Saracino et al.2013. This further demonstrates the need to exceed the requirements of the 2009 biological opinion.

Second, as described above, actions to reduce illegal harvest of salmon are not sufficiently described to determine their potential to benefit adults of any of the migrating Central Valley salmonid populations. It seems very unlikely that the improved enforcement of fishing regulations would be sufficient to contribute meaningfully to restoration of all salmonid populations in both the Sacramento and San Joaquin River watersheds. Our skepticism regarding the efficacy of the Illegal Harvest Reduction conservation measure (CM17) for salmonids stems from the fact illegal harvest is not likely to be a major conservation threat to all salmonid populations of the Central Valley, not likely to be equally distributed across the Sacramento and San Joaquin basins, and not likely to be best addressed in the Delta (as specified in the stressor reduction measure). Thus, the increased enforcement identified in this conservation measures seems completely inadequate to the task of limiting illegal harvest of the number of species (two sturgeon species, five Sacramento River salmonid populations and three San Joaquin River salmonid populations) and in the geographic area covered by this action.

4. Projected Outcomes for Chinook Salmon do not Attain the Conservation Standard for these Species. In addition, the Presentation of these Results is Inaccurate, Biased, and Unacceptably Confusing.

The Draft Plan and DEIR/DEIS both demonstrate that BDCP, alone as well as in combination with climate change and other cumulative impacts, is likely to result in negative outcomes for the abundance, productivity (survival), life history diversity, and spatial distribution of several Chinook salmon and steelhead populations. The best available science demonstrates that: the three ESA-listed salmonids will experience reduced survival through the Delta, reduced abundance, and increased risk of extinction; the commercially valuable fall-run will decline substantially; and, none of the populations are likely to attain even the inadequate objectives described in the Draft Plan. Each of the species is discussed separately on the pages that follow.

C. Winter-Run Chinook Salmon

1. The Draft Plan and DEIS/DEIR Predict Severe Impairment of Winter-Run Chinook Salmon Population Viability; Significant Impacts are Overlooked or Obfuscated by Inaccurate and Irrelevant Comparisons

i. The Modeling Analysis Demonstrates that the Draft Plan will Result in Substantial Decreases in Abundance, Productivity, and Life History Diversity

The DEIS/DEIR inaccurately claims no beneficial or negative flow-related effect for winter-run Chinook salmon from Alternative 4. DEIS/DEIR at 11-55. However, this reporting ignores several large negative effects reported in the Draft Plan's effects analysis and those that are likely to arise from large changes in flow and temperature reported in the DEIS/DEIR. The Draft Plan's Effects Analysis employs two life cycle models to evaluate the BDCP's likely effects on winter-run Chinook salmon. Draft Plan Appendix 5G. These models project that conditions in the future will be worse for winter-run Chinook salmon assuming current operations required under the Biological Opinion and other environmental standards and climate change as modeled in the BDCP (EBC2_ELT and EBC2_LLT).

Comparing outcomes of the Draft Plan to the status quo under assumed conditions in the future, the results indicate an impermissible negative impact to this endangered salmon population. In reviewing results of the OBAN modeling framework, the Draft Plan's technical appendix states: "The median of median escapement for ESO_ELT was 28% lower than the median for EBC2_ELT, and the median of median escapement for ESO_LLT was 13% lower than the median for EBC2_LLT (Table 5.G-9)." Draft Plan Appendix G at 5.G-51.[67] These results indicate that changes in CVP/SWP operations will be needed to sustain salmonids and achieve long term population abundance targets, particularly in light of climate change and other stressors.

The other model used to assess changes in winter-run Chinook salmon survival into and through the Delta (IOS) indicates that fry survival (Draft Plan at Table 5.G-20) and smolt survival (Draft Plan Table 5.G-21 to 5.G-23) will decline substantially under the Draft Plan BDCP in both the early and late-long term. This model projects a median decline in winter-run Chinook salmon escapement under the high outflow scenario of 27% relative to the EBC2_ELT (the comparison that incorporates climate change assumptions in the early long term for both scenarios); the low outflow scenario shows even more dramatic declines in winter-run Chinook salmon escapement, 66% lower escapement under the BDCP in the median case. Draft Plan at Table 5.G-25. Thus, the model provides no support (and clearly contradicts) the NEPA/CEQA finding that BDCP will not result in significant impacts to salmon migration (AQUA-42). Comparing future conditions under the BDCP Alternative 4/H3 (ESO) to modeled current conditions (without

---

[67] Because organisms experience conditions in particular years, not in the "mean" year, comparisons of the frequency distribution of results are more valuable than simply comparing averages. However, if a quick comparison is to be informative, median results (an indicator of the frequency distribution) are far more relevant than comparison of "mean" results; the latter are almost useless when, as the Draft Plan is at pains to emphasize, model results are not believed to reflect actual values, but are for comparative purposes only. The mathematical mean and variance of a set of values is irrelevant and likely to be misleading if the individual values are not believed to be accurate. When the purpose of analysis is to compare relative outcomes of scenarios, a variety of non-parametric statistical analyses are available (e.g., Chi-Square tests for differences in distribution, Wilxocon Ranked Signs Test, etc.). The technical appendix states: "The BDCP effects analysis uses life cycle models to provide relative comparisons among the effects of alternatives (e.g., direction and relative magnitude of anticipated population response). These results should therefore not be interpreted as predictions of changes in population abundance." Draft Plan Appendix 5G at 5.G-3. The Draft Plan inappropriately presents mean values and parametric error bounds of modeled scenarios despite this warning.

climate change) reveals that IOS predicts a decline in winter-run abundance of 53% in the early long term and 80% in the late long term. Draft Plan at Table 5.G-25 and 5.G-26.

As elsewhere, the DEIS/DEIR focus on changes in "mean" values understates the magnitude of the impacts that will be expected in years that are worse than average – impacts in "below average" years may damage the population irreparably (including, but not limited to, extinction). Understanding the conservation consequences to imperiled species requires assessment of the entire range of potential differences - the DEIS/DEIR should report both the median of differences (not the difference between the medians) and the range of differences between paired predictions arising from different scenarios. These reported declines under equivalent assumptions of climate change represent either the proportional difference between the median cases of both scenarios or the median of differences across years in the comparison (it is not clear which, though the latter would be more informative) but, in either case, it is clear that these declines do not represent the largest declines anticipated from implementation of the BDCP alternative. The technical appendix also presents these results in terms of mean declines and as the projected absolute difference in number of fish returning to spawn, despite the repeated warning in the technical appendix that these model results are for comparison purposes only.

Although both OBAN and IOS use different assumptions and analytical approaches to estimate Chinook salmon population response to different scenarios, both models project declines in winter-run Chinook salmon escapement under the BDCP, as described in the Draft Plan, when compared with current operations and infrastructure (assuming the same effect of climate change for both proposed BDCP and No Action scenarios). In both cases, the negative results were attributed to low reservoir storage and low river flow conditions arising from the BDCP. For example, the technical appendix describes the results for OBAN as follows:

> The lower escapement of winter-run Chinook under ESO compared with EBC2, even though through-Delta survival was higher under ESO, is the result of differences in modeled conditions in the Sacramento River above the Delta. In the Sacramento River spawning reaches, modeled water temperatures at Bend Bridge were higher (Figure 5.G-3) and minimum flow rate were lower (Figure 5.G-4) under the ESO compared to EBC2 scenarios, particularly during the ELT. These differences in Sacramento River conditions cause lower survival in ESO scenarios relative to EBC2 scenarios in the alevin and fry stages and are ultimately reflected in lower escapement under ESO.

Draft Plan Appendix G at 5.G-54.

The Draft Plan Technical Appendix explains its IOS modeling results as follows: "The lower BDCP scenario survival rates were the result of increased flow-related mortality in specific model reaches in the Delta," Draft Plan Appendix 5G at 5.G-68, and "Modeled differences in egg and through Delta survival accounted for the largest differences in escapement between scenarios after the effects of climate change are considered," *Id*. at 5.G-72. Using two through-Delta survival models, different than the ones applied by the Draft Plan, NMFS projected decreased through-Delta survival for winter-run Chinook salmon juveniles under Alternative 4/H3 as compared to EBC2 in the late-long term. NMFS 2013 Evaluation of Flow Effects at 4. Projected survivals for winter-run and steelhead were also lower under HOS and LOS than under EBC2 in all years. *Id*. NMFS' estimates of through-Delta survival for spring-run Chinook salmon under H4 were lower than that projected for EBC2 in a substantial fraction of years in the late-long term. *Id*. Survival under HOS was generally substantially higher than under LOS for spring-run, steelhead, and fall-run. *Id*.

The finding that flow rates and temperature conditions would be negatively impacted during the winter-run incubation, rearing, and migration period reveals that the Draft Plan will not achieve many of its major goals for winter-run Chinook salmon and is not likely to achieve the Draft Plan's biological objectives, will cause significant environmental impacts (contrary to conclusion AQUA-42 that Alternative 4 and several other alternatives would cause less than significant impacts for migrating winter-run salmon), and may result in operations that jeopardize winter-run Chinook salmon. Goal WRCS3 calls for "No degradation of aquatic habitat conditions upstream of the water facilities." Draft Plan at 3.3-145. The related objective (WRCS3.1) states that this species' critical habitat will not be impacted. *Id*. Clearly, if mortality increases because of increased temperature and reduced flow rates upstream, then "aquatic habitat conditions upstream of the water facilities" have been degraded. These projected outcomes represent not simply a failure to meet an important restoration goal of the Draft Plan, but a likely degradation of winter-run critical habitat. *See* 50 CFR § 226.204. These findings also contradict the Draft Plan's repeated claim that BDCP will not affect how cold water pool and flows in the upper Sacramento River are managed. *See, e.g.*, Draft Plan Appendix 5G at 5.G-60; *see also* discussion in section II of these comments regarding modeling flaws. Furthermore, population declines are inconsistent with requirements of the ESA and NCCPA as they increase the risk of extinction and move the population away from recovery.

ii. The Draft Plan Improperly Ignores the Results of its own Modeling Regarding Severe Negative Impacts to Winter-Run Chinook Salmon

The Draft Plan's technical appendix uses spurious arguments and metrics in an attempt to dismiss the OBAN and IOS model results that reveal the Draft Plan will likely lead to significant impacts to viability and degraded conditions for winter-run Chinook salmon upstream and in the Delta. For example, the technical appendix points to the variance in OBAN and IOS model predictions to suggest that there may actually be no difference in model outputs between the

BDCP and baseline conditions in the future. Figures such as 5.G-21, 5.G-23, 5.G-24, and 5.G-26 imply a spurious comparison of within-scenario means relative to their total variance (error bars) when the relevant comparison between scenarios would involve analysis of the differences in outcomes within years (a paired analysis) – as stated above, any analysis that relies on mean values and calculated variances is inappropriate. Although we appreciate the recognition that variance in model predictions must be accounted for when interpreting model outputs, we note that:

- The Draft Plan and DEIS/DEIR do not present error bounds whenever doing so might discount findings that these documents suggest reflect positively on the BDCP. For example, the Draft Technical Appendix's analysis of OBAN model predictions of through-Delta survival for winter-run Chinook salmon claims improvement under BDCP operations (*see, e.g.,* Draft Plan Appendix 5G at 5G-48) and the DEIS/DEIR compares these "positive" results to negative outcomes of the IOS model to suggest that the models conflict and therefore there is uncertainty about the effect of Alternative 4 on winter-run Chinook salmon juvenile survival in the Delta (*see, e.g.,* DEIR/DEIS at 1333). However, neither document reveals that the purported improvement in through-Delta survival rates detected by OBAN are nearly undetectable. Draft Plan at Figure 5.G-13 and 5.G-14. It would be extremely surprising if the maximum survival differences in through Delta survival projected under different scenarios (~0.15%), not to mention the median differences (0.09%; *see* Draft Plan at Table 5.G-7), reflected an actual improvement (i.e., were outside the error bounds for the OBAN model's survival estimation routine). That error estimate is not presented. Thus, any "contradiction" between OBAN and IOS in their estimate of through-Delta survival has likely been overstated: IOS projects substantial declines in Chinook salmon through-Delta survival rates (productivity) and OBAN finds no improvement; both models project declines in survival upstream of the Delta. Even if the differences OBAN detects in through-Delta survival rates for different scenarios were real (in terms of the model's inherent error), it is clear that the extremely tiny alleged increases in through-Delta survival will not lead to the sizeable (though still inadequate) improvements in through-Delta survival specified in the BDCP objective (WRCS1.1) for winter-run Chinook salmon. Thus, there is no scientific evidence that the draft plan is likely to achieve the Draft Plan's biological objectives for salmon survival through the delta.
- The implied statistical comparison of upstream survival rates between scenarios is statistically inappropriate because it confounds variance *among* years surrounding the mean modeled outputs with variance in the *difference* between modeled outputs *within* years. The appropriate statistical approach is a comparison of pairs of "observations" (model outputs for different scenarios) that occur in the same year; in

other words, a statistical comparison (if one were valid) would analyze *the mean and variance of the differences*, not the difference between means relative to total variance in the modeled time series. Simply looking at the comparison of OBAN escapement estimates for EBC2_ELT and ESO_ELT (upper panel of Figure 5.G-15) suggests that the difference between modeled escapement frequently favors EBC2-ELT; OBAN's detection of abundance declines is likely to be statistically significant, whereas the statistical comparison implied by Figure 5.G-17 (which shows overlapping among-year error bounds for each scenario) are completely irrelevant and entirely misleading.

- The use of quantitative comparison of means and variance estimates is inappropriate given the technical appendix's repeated warning that its modeling outputs are for relative comparisons of between scenarios and that the results should not be compared to absolute survival or escapement targets. Comparing differences in the frequency distribution of outcomes are far more appropriate here as the frequency of high and (particularly) low abundances are of greater interest than are the mean population estimates over time – there are tests for differences between frequency distributions (e.g. Chi-square) and non-parametric analyses appropriate for relative comparisons (e.g. Wicloxon Ranked Signs test) that the technical appendix and DEIS/DEIR should have employed.

The Draft Plan also improperly interprets results of a "sensitivity analysis" to undermine the projections from its models. The comparison of "high outflow" and "low outflow" scenarios with EBC2 conditions modeled by OBAN clearly demonstrates that both of these scenarios will produce substantial declines in the median outcome across the early and late long term. Draft Plan at Table 5.G-13. All alternatives where OBAN modeling is presented (including Table 5.G-13) indicate a decline in winter-run Chinook salmon escapement compared to the NAA.

As with the OBAN model, the technical appendix presents results of a "sensitivity analysis" for the IOS model and uses those outputs to cast doubt upon the clear implications of the IOS model results described above; once again, the argument is not credible. When different assumptions are made regarding either winter-run migration paths (e.g., due to implementation of non-physical barriers, CM16) or mortality at the new North Delta diversion facility, IOS model outputs change. From this, the technical appendix derives the elementary conclusion that if different model assumptions and inputs are made, then the model will produce different outputs. But in no case do BDCP operational variants produce higher through-Delta survival than environmental baseline conditions. Draft Plan at Figure 5.G-27 and Figure 5.G-28. There is no rationale for the technical appendix's conclusion that, because the IOS model is "sensitive" to assumptions about conditions in the Delta (which it terms a "limitation"), "IOS results alone do not provide a sufficient basis for drawing conclusions about the overall effect of the BDCP on winter-run Chinook salmon." Draft Plan Appendix 5G at 5.G-78. This statement is problematic because: (1) all models ought to be sensitive to model inputs and assumptions (that is the advantage and disadvantage of quantitative modeling exercises); (2) if the Draft Plan concludes that a model is not appropriate for evaluating future scenarios, it should not dedicate a large fraction of a lengthy technical appendix to describing and presenting model outputs; (3) the conclusion derived from review of the technical appendix's modeling efforts is not based on "IOS alone"; the IOS modeling results are consistent with OBAN modeling results in projecting very serious negative outcomes for winter-run Chinook salmon; and (4) the technical appendix presents no scenario in which BDCP operations result in higher median modeled escapements than those projected under environmental baseline conditions in the Early Late Term, and most scenarios result in lower median modeled escapements in the LLT (*see* Draft Plan at Figure 5.G-27 and Figure 5.G-28) and certainly none that demonstrate attainment of the Draft Plan's own inadequate biological objectives for this species. The Draft Plan's dismissal of the OBAN and IOS modeling results (simply because the model is sensitive to assumptions about modeling inputs) is one of many examples of the Draft Plan and DEIS/DEIR's biased presentations of the BDCP's likely effects.

The results of these modeling runs indicate that changes to flows and temperatures described in the DEIS/DEIR and the Draft Plan will not lead to improved survival of winter-run Chinook salmon in fresh water. As such, the proposed project as described in the Draft Plan and most of the DEIS/DEIR alternatives are not likely: (a) to attain the survival targets set in the BDCP objective for this species (as the ESO estimates clearly underperform the current baseline ("EBC2"); or (b) to increase abundance of winter-run Chinook salmon. Current survival rates in freshwater (through-Delta and upstream) are inadequate to attain any of these targets (and even the BDCP survival objective WRCS 1.1 is not adequate to attain the CVPIA/AFRP targets within the lifespan of the project, *see above*); thus, survival rates lower than the current level cannot be adequate or acceptable.

Whichever approach is used to estimate the significance of differences in winter-run Chinook salmon abundance among scenarios, the Draft Plan and DEIS/DEIR should have acknowledged that, under ESO assumptions, OBAN predicts near-extinction of winter-run Chinook salmon in all but a few years of the 23 year model run depicted in Figure 5.G-15. IOS estimates similarly disastrous results. Reviews of previous versions of the Draft Plan have remarked that, having chosen OBAN and IOS to model projected outcomes of different BDCP operational scenarios, the results of these models should not be "… discounted because they do not show what was "expected." Since these methods were deemed acceptable, the results need to be fully acknowledged." NMFS 2013 Progress Assessment at 12. It is clear that the NCCPA/ESA conclusions in the draft plan, and the CEQA/NEPA findings of less than significant impacts, are not supported by substantial evidence.

iii. The DEIS/DEIR Fails to Report Potentially Significant Negative Impacts to Winter-Run Chinook Salmon Arising from the Project by Improperly Attributing Negative Impacts and by Ignoring its own Analysis

The DEIS/DEIR is inconsistent and internally contradictory in its presentation of temperature and flow impacts to winter-run Chinook and other salmonids in the Sacramento River. Important impacts are overlooked, dismissed without sufficient analysis or obscured with inappropriate comparisons. Its findings of "Not Adverse" and "Less than Significant" flow-related impacts to winter-run Chinook salmon are unsubstantiated and not scientifically credible. DEIS/DEIR at 11-55 (Table 11-4-SUM1).

<u>Temperature Impacts</u>
High temperatures below Shasta and Keswick dams during the winter-run incubation period are a well-known impact on winter-run Chinook salmon. The NMFS 2009 biological opinion notes that "the annual change in TCP has degraded the conservation value of spawning habitat" for winter-run. NMFS 2009 Biological Opinion at 91. Thus, high temperatures in the Sacramento River downstream of Shasta-Keswick have been problematic even when direct impacts of high temperatures (egg or juvenile mortality) have been minimized through real-time management of cold water pool resources. The prior history of Keswick/Shasta operations strongly suggests that the model results overestimate benefits and underestimate the likely environmental impacts of upstream temperature impacts from CVP operations, particularly in light of real time operations to allow greater water deliveries.

As a consequence of operations under Alternative 4 of BDCP, the Bureau of Reclamation winter-run egg mortality model projects much higher mortality rates under Evaluated Starting Operations (H3, "ESO") than under the No Action Alternative (NEPA comparison) during "below normal" and "dry" year types (relative differences in mortality are 76% and 11% higher, respectively, under ESO). DEIS/DEIR at Table 11-4-17. The DEIS/DEIR seeks to minimize those differences by arguing that they "only" happen in two year-types and that the absolute difference in egg mortality is "only" about 1% of the egg population. *Id*. Both arguments are spurious. Egg mortality is generally a large problem for winter-run Chinook salmon in drier year-types because freshwater flows during those years are typically low and reservoir storages are insufficient to provide for sufficient storage of cold water. Lack of projected impact to temperatures affecting winter-run Chinook salmon productivity in wetter years is not surprising or particularly positive news, but the revelation of higher egg mortality in drier year types (representing ~40% of all years) is a major negative outcome for BDCP.

The additional loss of 1% of the total cohort at the egg stage cannot be dismissed as insignificant, especially for a critically endangered population that already suffers high egg-mortality during drier year types. First, the impact assessment ignores sub-lethal negative effects of temperature, which are known to be large at the high end of the Chinook salmon thermal tolerance range. *See* NMFS 2009 Biological Opinion. Second, the increase in egg mortality, as noted by the DEIS/DEIR, is very large in relative terms; to accept the DEIS/DEIR's lack of concern about increased egg mortality, one would have to conclude that current egg mortality is not a problem. Yet egg mortality and other sub-lethal negative effects of high temperatures are currently considered to be a substantial problem for winter-run Chinook salmon in some year types. Moyle 2002; Williams 2006; NMFS 2009 Biological Opinion at 235. A large increase in a stressor that is already considered to be a problem is, itself, a large problem. Similarly, the SacEFT habitat model projects substantial impacts to various life stages of winter-run Chinook salmon dwelling in the upper Sacramento River, which the DEIS/DEIR seeks to minimize (suggesting, for example, that absolute losses in spawning habitat of ~9% would be "small"). DEIS/DEIR at Table 11-4-18.

In another example of its selective emphasis of results that reflect positively on the project alternatives, the DEIS/DEIR reports that, on average, degree-days decrease by up to 5% during August (a good thing in terms of Sacramento winter-run Chinook salmon egg survival and larval development). DEIS/DEIR at 11-1322. However, the results also reveal *increases* of more than 5% in degree days (in most cases, a bad thing for winter-run Chinook salmon eggs and larvae) during June (of Dry and Critical years), July (Above Normal, Below Normal, and Dry), and September (of Below Normal years). Temperatures above a certain threshold can produce negative results whenever critical values are exceeded during the winter-run incubation period; reduced temperatures in some months of a given year and even reduced "average" temperatures throughout a year are meaningless if mortality or sub-lethal negative effects occur during the incubation period. As usual, when the Draft Plan and DEIS/DEIR focus on average results across all years, they overlook important impacts that occur in particular year types (each of which occurs a significant fraction of the time).

The DEIS/DEIR's analysis that categorizes degree-day violations into color-coded "levels of concern" is scientifically unjustified. *See, e.g.,* DEIS/DEIR at Tables 11.4.14 and 11.4.15. Table 11.4.14 defines as "no effect" temperatures that exceed the known limit of winter-run Chinook salmon egg tolerance (56^{o}F) by 1 degree for up to 9 consecutive days and by 2 degrees for up to 4 days; the DEIS/DEIR is only marginally concerned about temperatures 3 degrees higher than the limit that persist for up to 4 days. The biological significance of the 56^{o}F temperature limit for winter-run Chinook salmon is well documented in the NMFS 2009 Biological Opinion, and this threshold has abundant support in the literature. *Id.*; Richter and Kolmes 2005. Optimum temperatures for incubation are somewhat lower than 56^{o}F. McCullough et al. 2001; Myrick and Cech 2004. Furthermore, this method of assessing temperature impacts to winter-run Chinook salmon eggs underestimates temperature problems caused by BDCP operations because it compares scenarios based on the number of days a temperature standard is exceeded at Bend

Bridge. Bend Bridge is not the regulatory standard for temperature compliance (the actual TCP in any given year is a point generated in collaboration among federal agencies that must be approved by the SWRCB). Comparisons of relative performance between BDCP alternatives in the DEIS/DEIR and modeled baseline conditions at Bend Bridge do not necessarily reflect the actual magnitude or spatial extent of problems experienced by incubating eggs upstream. As a result of these and other issues, Tables like 11-4-15 in the DEIS/DEIR fail to provide accurate information on environmental impacts.

In the end, the DEIS/DEIR fails to make a NEPA determination regarding temperature impacts of the Alternative 4 high outflow scenario, claiming:

> "Available analytical tools show conflicting results regarding the temperature effects of relatively small changes in predicted summer and fall flows. Several models (CALSIM, SRWQM, and Reclamation Egg Mortality Model) generally show no change in upstream conditions as a result of Alternative 4. However, one model, SacEFT, shows adverse effects under some conditions. … In conclusion, Alternative 4 modeling results support a finding that effects are uncertain. Alternative 4 does not propose any changes to Shasta operating criteria, but modeled results are mixed and operations that match the CALSIM modeling are not assured. Model results will be submitted to independent peer review to confirm that adverse effects are not reasonably anticipated to occur."

DEIS/DEIR at 1322.

These claims are inaccurate, and the data demonstrates that operations will cause a significant impact under NEPA. First, the DEIS/DEIR does not present results of the Reclamation Egg Mortality Model for the high outflow scenario (H4) of Alternative 4, however, its mischaracterization of serious egg mortality outcomes for H3 suggests that similarly significant results may occur under Alternative 4 operations. Large flow reductions versus NAA are projected during September and October in some year types for Alternative 4/H3 and in October under Alternative 4/H4. DEIS/DEIR Appendix 11C at 11.C.226-227. Water temperatures are affected by reductions in flow as temperature gain during the summer and early fall generally is inversely correlated with flow volume. Thus we would expect higher egg mortality under H4 than was previously reported (and inappropriately downplayed) for H3. Second, temperatures (and thus winter-run egg mortality) were expected to increase under Alternative 4/H4 as compared to H3 between July-September (*see* DEIS/DEIR at 1324) and from August through October (*id*. at 1328). Although it is not valid to measure temperature changes in percentage terms as the DEIS/DEIR does, the temperature increase described would appear to be substantial with potentially significant implications for winter-run Chinook salmon egg viability and juvenile rearing success. Third, the statement suggests that three independent models (CALSIM, SRWQM, and Bureau Egg Mortality) show "no change" in upstream conditions; however, these models are integrally linked, and the SRWQM (and the Reclamation Temperature Model) use CALSIM II inputs to predict temperatures in the upper Sacramento River. DEIS/DEIR Appendix 5A at 5A-A26 and Table A-2. The Draft Plan's Effects Analysis describes the Bureau of Reclamation Salmon (egg) Mortality Model as follows:

> Limited to effects of water temperature on eggs only; daily time step requires linear interpolation between monthly temperatures to compute daily temperatures; third in a sequence of models (CALSIM and Reclamation Water Temperature Model), so limitations of previous models are compounded.

Draft Plan at 5.2-19. Furthermore, the SRWQM, that develops inputs for the egg mortality model, is known to have an error rate that is high relative to the tolerances of Chinook salmon eggs for temperatures above 56^{o}F and the model is known to underestimate temperatures and thus underestimate the impacts to winter-run Chinook salmon eggs. Quoting from the calibration and validation documentation for the model (RMA 2003), the August 2008 OCAP biological assessment reports: "Computed temperatures are generally within 3° F or less of average observed data at each of the locations plotted. Computed temperatures tend to be slightly cooler than observed." 2008 Biological Assessment Appendix H at H-9. We also note that the chain of modelling that connects CALSIM model outputs to winter-run Chinook salmon egg mortality has failed to predict the Bureau's inability to maintain adequate temperatures for winter-run Chinook salmon incubation. Temperature thresholds for migrating, incubating, and rearing winter-run Chinook salmon are already frequently exceeded, even after the annual revision of TCP to accommodate inadequate storage conditions at Shasta Lake. NMFS 2009 Biological Opinion at 234-236.

There is adequate information to reach a conclusion, and the DEIS/DEIR's claim that information regarding temperature impacts is "incomplete or unavailable" is unjustified. Therefore, it is impermissible to fail to reach a NEPA determination of significant impacts of increased temperatures on winter-run Chinook salmon based on results of both of the temperature-egg mortality analyses conducted. *See* 40 CFR § 1502.22.

The Draft Plan and DEIS/DEIR demonstrate that, relative to the NEPA No Action Alternative (which incorporates climate change), both Alternative 4 EOS (H3) and "High Outflow Scenario" (H4) will cause substantial temperature impacts to winter-run Chinook salmon upstream. The SacEFT model reveals significant effects that the DEIS/DEIR inappropriately downplays. *See* DEIS/DEIR at 11-1319 (Table 11-4-18). Similarly, two models employed by the Draft Plan's technical appendix 5G find negative temperature effects on winter-run Chinook salmon arising from BDCP operations under Alternative 4. Failing to acknowledge the consistent finding of negative outcomes related to temperature by four very different modeling frameworks is not a credible interpretation of the results. The dramatic nature of the egg mortality impact is made even clearer when operations under the modeled Alternative are compared to modeled current conditions (i.e. prior to climate change). The DEIS/DEIR describes these severe impacts as follows:

> Egg mortality (according to the Reclamation egg mortality model) in drier water years, during which winter-run Chinook salmon would already be stressed due to reduced flows and increased temperatures, would be up to 42% greater under Alternative 4, including climate change, compared to the CEQA baseline (Table 11-4-17). Egg incubation conditions according to the SacEFT model are predicted to be 26% lower under H3, including climate change, than under the CEQA baseline. Further, the extent of spawning habitat predicted by SacEFT would be 60% lower under H3, including climate change, compared to the CEQA baseline (Table 11-4-18), which represents substantial reduction in spawning habitat and, therefore, in adult spawner and redd carrying capacity. Exceedances above NMFS temperature thresholds would be substantially greater under Alternative 4 relative to the CEQA baseline.

DEIS/DEIR at 11-1325.

Winter-run Chinook salmon are severely imperiled and already suffer from Project operations that lead to temperatures beyond this species well-documented tolerance levels. Moyle 2002; Williams 2006; Williams 2010; NMFS 2009 Biological Opinion, NMFS 2014 Final Recovery Plan. Increases in the magnitude, duration, and frequency of temperature impacts are a significant impact to this imperiled species and likely would violate numerous legal requirements including the ESA. The DEIS/DEIR's attribution of all temperature impacts to the anticipated effects of regional climate change is inaccurate, as evidenced by the scenario comparisons that incorporate climate changes. It is also misleading because it incorrectly assumes that (a) water project operations do not contribute to temperature impacts, that (b) water project operations cannot be changed to ameliorate the effect of current or future temperature impacts to winter-run Chinook salmon, and (c) that climate change and BDCP operations are not cumulative impacts.

In fact, water project infrastructure significantly contributes to temperature impacts to winter-run Chinook salmon because water warms behind the Project dams before it is released into current winter-run spawning habitat, and because reservoir releases that are, in some years, lower than natural flow levels gain temperature more quickly than if full reservoir inflows were provided in those years. Moyle 2002; Williams 2006; Williams 2010; NMFS 2009 Biological Opinion, NMFS 2014 Final Recovery Plan. Equally important, feasible mitigation measures, including infrastructure changes (TCD, cold water curtains) and reoperation of Central Valley Project reservoirs are capable of reducing or ameliorating these problems now and in the future. *See,* *e.g.,* Nickel et al. 2004; NMFS 2009 Biological Opinion. It is unacceptable that the DEIS/DEIR fail to consider feasible mitigation measures and alternatives to reservoir operations that would reduce or avoid temperature impacts to winter-run Chinook salmon. The claims that there are no feasible mitigation measures (AQUA-40 and AQUA-41) are not supported by substantial evidence and are not scientifically credible.

Any temperature-related impacts will, of course, depend on actual reservoir storages and flow release rates. However, BDCP modeling outputs reveal that the modeled operations will violate flow and/or storage (temperature) conditions required in the NMFS 2009 Biological Opinion. *See* section II(C), *infra*. While acknowledging that the four outcomes of the Alternative 4 outflow decision tree, "…have the potential to cause differences in upstream conditions or in-Delta flows in other seasons as well (i.e., summer and winter)," DEIS/DEIR at 11-51, the DEIS/DEIR also maintains that, "Alternative 4 does not propose any changes in Shasta Reservoir operating criteria, and CALSIM results show that Reclamation could operate Shasta in such a manner that it does not affect upstream storage or flows substantially as compared to the NAA." DEIS/DEIR at 11-1322. These two statements are irreconcilable with the BDCP's projections. *See also* MBK Engineers 2014. To meet the storage requirements and temperature conditions required under the biological opinion, reservoir release patterns will be need to change from what has been modeled in the Draft Plan and DEIS/DEIR such that more water is stored upstream in certain years – that will obviously influence flow conditions into and through the Delta in ways that have not been analyzed (it will also likely affect SWP/CVP Project deliveries in ways that have not been modeled). Thus, either the DEIS/DEIR and Draft Plan outputs and analysis are totally invalid, or the negative flow and temperature impacts to winter-run Chinook salmon described in the Draft Plan and DEIS/DEIR are likely, in which case the impacts are significant from a NEPA/CEQA point of view and impermissible from the ESA/NCCPA perspectives. Given the availability of modeling data, it is wholly inadequate to fail to provide accurate information about the likely impacts and to fail to identify whether significant impacts are likely to occur.

<u>Flow impacts on winter-run spawning and downstream migration</u>
Negative impacts to the extent of inundated spawning and incubation habitat for winter-run Chinook salmon should be anticipated as a result of flow reductions projected under the DEIS/DEIR alternatives. Winter-run spawning begins in late-April and lasts through early-August; incubation begins with the onset of spawning and lasts through October, for some fraction of the population. Moyle 2002. Reductions in flow on their spawning habitat during this period represent the potential loss of spawning habitat and/or the dewatering of eggs that have already been deposited. Both should be considered negative effects to this endangered population that suffers both from reduced productivity (low survival rates) and extremely limited spatial distribution. Compared to the No Action Alternative (NEPA), the DEIR/DEIS project substantial flow reductions upstream of Red Bluff Diversion Dam under Alternative 4 operations

for some year types in the July-October period for operational variants H3 (ESO) and H4 (HOS). These range from flows that are 5.3% lower than NAA in July of Dry years under the H4 variant to flows that are 14% lower in Dry years during August of the H3 variant. DEIS/DEIR Appendix 11C at 11.C.-225 to -227. Thus, winter-run Chinook salmon that spawn in July or early August will have less available spawning habitat. Far from mitigating for low flows in the summer period, the higher flows expected during some water year types in May for both H3 and H4 would likely exacerbate the problem of low flows that are expected later. This is because fish that spawn in May will be attracted to deposit their eggs in areas that would be unavailable under the NAA but which are not likely to remain inundated when flows decline in the later incubation period (e.g. after July), some eggs that are deposited based on spawning habitat available in May are likely to be dewatered as a result of temporally asymmetric changes in flow projected in the DEIS/DEIR. Thus, losses to winter-run spawning and incubation habitat projected under Alternative 4 should be listed as a significant impact to productivity, spatial distribution (because the drivers of these impacts (temperature and flow) reduce spawning habitat in a non-random, spatially-explicit manner and spatial extent of winter-run Chinook salmon is already severely constrained), and life history diversity.

The SacEFT model projects large decline in the number of years with desirable spawning conditions for winter-run Chinook salmon. DEIS/DEIR at 1319 (Table 11-4-18). The DEIS/DEIR's lack of concern with the very large reduction in years considered to have "good" conditions for spawning or for juvenile migration demonstrates a poor understanding of both the behavioral ecology and conservation biology of Chinook salmon as well as for the requirement to protect critical habitat for this species. It is not true, as the DEIS/DEIR contends, that these negative impacts to winter-run productivity are only of concern "if the number of spawners is limited by spawning habitat quantity." DEIS/DEIR at 11-1319. Adverse impacts to spawning habitat may violate ESA protections for winter-run Chinook salmon critical habitat, regardless of the number of Chinook salmon spawners.

Negative impacts to migrating juvenile winter-run Chinook salmon are also expected to arise from flow reductions anticipated under the DEIS/DEIR alternatives. Migration flows in the Sacramento River are a known stressor on winter-run Chinook salmon populations. NMFS 2009 Biological Opinion; NMFS 2014 Final Recovery Plan; Williams 2010. The Draft Plan acknowledges this at some points. Draft Plan at 3.3-139. Migration flow rates are also a key input into the modeling tools the Draft Plan relies on to calculate winter-run Chinook salmon juvenile migration success (IOS and OBAN). Draft Plan Appendix 5G. Under analogous climate conditions, migration flows under Evaluated Starting Operations (Alternative 4, H3) would be lower than projected under current operations by 5-18% during November. DEIS/DEIR at 11-1329. The DEIS/DEIR states that migration flows for winter-run Chinook under Alternative 4 will be greater than or equal to flows under the NAA alternative, but again, this is contradicted by the modeling reported in the DEIS/DEIR flows appendix (Appendix 11C). Flows reported for

Wilkins Slough in the "High Outflow Scenario" (H4) of Alternative 4 result in lower flows than the NAA in July (Dry years: flows up to 10.5% lower under Alternative 4 H4), August (Dry years: flows 5.4% lower) October (Below Normal years: flows 11.7% lower), and November (all year types: flows 8.5-15.6% lower). DEIS/DEIR Appendix 11C at 11C-230 to -232 (Table 6). Similar outcomes are projected at Verona, which is closer to the Delta. DEIS/DEIR Appendix 11C at 11C-233 to 11C-237 (Tables 7 and 8). Thus, flow reductions of the magnitude expected under Alternative 3 and 4 represent a significant impact Chinook salmon productivity (survival rates as specified by the Draft Plan in Objective WRCS1.1), and the asymmetrical timing of the flow reductions (unevenly distributed throughout the migration period) is a negative impact to life history diversity in this species arising from operations, contrary to the Draft Plan's objectives for winter-run (WRCS3.2).

<u>Impacts to juvenile winter-run Chinook salmon through-delta migration</u>
The DEIR/DEIS acknowledges that in-Delta flows that affect winter-run Chinook salmon migration success are expected to be reduced by 11-23%, on average, under the BDCP after the new North Delta Diversions come on-line. DEIS/DEIR at 11-1330. However, this fails to accurately assess the problem. A review of the relevant analysis in the DEIS/DEIR flow appendix reveals that:

- With very few exceptions, flows are projected to be reduced in every month from November-April in every year type, under every operational variant (H1-H4) of Alternative 4.
- The average flow reduction for any given month is exceeded (in about half of years) and the true impact on winter-run Chinook salmon populations is likely to be reflected by the maximum flow reductions more than it is by the "average" flow reduction; the maximum flow reduction is 28% in April for Above Normal water year types (and this is still only an average of like years; impacts in individual years of this type will exceed this average).
- The average flows in the "High Outflow Scenario" (H4) are between 10-24% less than projected under the No Action Alternative and, in certain year types, the outflow reductions are greater (e.g. >26% in November of Above Normal and Below Normal years).

See DEIS/DEIR Appendix 11C at 11C-284 to 285 (Table 28). Given the importance of freshwater flows in the Delta to Chinook salmon survival in the Delta, it is unimaginable that such large-scale, pervasive reductions in Sacramento River flow could be anything but a moderate to major negative impact to winter-run Chinook salmon survival and to the species' continued existence. The scientific consensus is that river flow rates have a major impact on salmon survival rates through the Delta. *See, e.g.,* Kjelson and Brandes 1989; Brandes and MacLain 2001; SWRCB 2010; Williams 2010; NMFS, Final Salmon Recovery Plan 2014 at 63, 127; NMFS 2013 Evaluation of Flow Effects. For example, Williams 2010 ranked the

"Hydrograph Modification" in the Delta as among the highest stressors in the Delta for Chinook salmon generally. The NMFS 2014 Final Recovery Plan Stressor matrix for winter-run Chinook salmon rates "changes in delta hydrology" as a "very high" stressor. NMFS 2014 Final Recovery Plan, Appendix B Attachment A. And the Recovery Plan recommends as a high priority action "Develop, implement, and enforce new Delta flow objectives that mimic historic natural flow characteristics, including increased freshwater flows (from both the Sacramento and San Joaquin rivers) into and through the Delta and more natural seasonal and interannual variability." NMFS 2014 Final Recovery Plan at 127; *see also* NMFS 2009 Biological Opinion. The DEIS/DEIR itself states: "Plan Area flows have considerable importance for downstream migrating juvenile salmonids and would be affected by the north Delta diversions, as discussed above for winter-run Chinook." DEIS/DEIR at 11-1330. And the Draft Plan states:

> For this effects analysis, it was assumed with high certainty that Plan Area flows have critical importance for migrating juvenile winter-run Chinook salmon. Agency biologist opinion during the August 2013 workshops generally thought high importance to be warranted.

Draft Plan at 5.5.3-24. NMFS' 2013 evaluation of flow effects on survival indicates that survival under the HOS and LOS are likely to substantially reduce survival (by 10% or more in some years) of migrating winter-run Chinook salmon. NMFS 2013 Evaluation of Flow Effects. So it is not scientifically credible that the substantial reductions in freshwater flow projected by the DEIS/DEIR are likely to result in only a 1% decline (a 3% relative decrease) in juvenile winter-run survival under H3 compared to the NAA. DEIS/DEIR at 1331 (referencing Table 11-4-23). The claim in the text misstates the impact revealed in the accompanying table, which indicates a decline in survival of 4-5% in "drier" years. Such a disproportionately low decline in survival resulting from such large changes in freshwater flow rates argues that the DEIS/DEIR modeling approach understates the effect. Indeed, the Draft Plan's Effects Analysis indicates that agency biologists who participated in August 2013 workshop on Draft Plan effects were of the opinion that reduced Delta flows anticipated under the Draft Plan were more likely to be a "moderate negative change," contrary to the Draft Plan's conclusions that this is impact is a "low" magnitude negative effect. Draft Plan at 5.5.3-26

The DEIS/DEIR analysis of through-Delta survival rates under the different alternatives is yet another example of its biased presentation and interpretation of results that overstates potential benefits and understates potential environmental impacts. Even if we accept that the absolute increase in loss of winter-run Chinook salmon juvenile migrants is as small as 1.4% (the value reported for dry years in Table 11-4-23), despite much larger decreases in freshwater flow rates, further declines in the survival rate of a species that has already declined to the point of being listed as endangered and which continues to decline today is a significant impact and declining winter-run Chinook survival is at odds with the Draft Plan's stated objective (WRCS1.1) of substantially increasing Chinook salmon survival in the short and long-term. To put in context the DEIS/DEIR's interpretation of the increased losses to juvenile salmon migrating through the Delta, we look to the same document's interpretation of reductions in entrainment of winter-run Chinook salmon at the existing south Delta export facilities and reductions in survival during the incubation phase upstream.[68] The DEIS/DEIR estimate that entrainment of winter-run Chinook salmon at the existing south Delta export facilities under Alternative 4 (H3) will decline from 1.4% of the total population to 0.6%, an "improvement" amounting to less than 1% of the population, and less than the projected increase in overall through-Delta mortality described in Table 11-4-23. DEIS/DEIR at 11-1313. The DEIS/DEIR does not conclude that winter-run entrainment reductions will be "small" or "only 0.8% of the total population," but instead it avoids the apparently small absolute effect of Alternative 4 operations (which result from its significant underestimate of current entrainment rates as a proportion of the population) and presents its results in terms of the proportional reduction in entrainment between Alternative 4 and the NAA. Table 11-4-10 purports to show that entrainment under Alternative 4 will decline between 18-70% as compared to the NAA; the maximum reduction (for wet years) is less than the maximum estimated increase in winter-run Chinook salmon egg mortality (76%, Table 11-4-17), but the DEIS/DEIR dismisses the latter effect as unimportant (*see* above).

<u>Turbidity Impacts on through-Delta survival</u>

The Draft Plan and DEIS/DEIR fail to adequately acknowledge and assess the impact of reduced turbidity as a result of CM1 on Chinook salmon survival through the Delta. Predation on Chinook salmon is known to increase under low turbidity conditions. Gregory 1993; Gregory and Levings 1998. Operation of CM1 and evolution of tidal marsh sites targeted by the Draft Plan (CM4) are both expected to reduce turbidity levels throughout the Delta, particularly downstream of the north Delta diversion. As described in our assessment of impacts to Delta smelt, the Draft Plan and DEIS/DEIR both:

- underestimate the reduction of turbidity anticipated under the BDCP (particularly at the high end of the variation in this effect;
- improperly credit actions that are expected to partially ameliorate this effect to the BDCP, even though these actions are properly part of the environmental baseline, and
- incorrectly minimize the negative impact of turbidity reductions that they do report.

BDCP did not adequately model the effects of reduced turbidity on salmon survival, despite BDCP's estimate of significant reductions in downstream sediment as a result of CM1 operations. Draft Plan Appendix 5C at 5C.4-64; DSP Independent Science Review Panel Report

[68] We do not agree that the DEIS/DEIR's calculation or interpretation of winter-run entrainment rates or the proportional impact of entrainment are valid; our presentation of those claims here is solely to illustrate the inconsistent standard the DEIS/DEIR applies to weighting negative impacts as compared to impacts that are perceived as benefits of the BDCP.

2014 at 58; *see also* DSC BDCP Comments June 2014 at 10. As a result, the DEIS/DEIR and Draft Plan likely overestimate salmon survival through the Delta and underestimate the adverse impacts of BDCP on winter-run chinook salmon survival.

<u>Impacts on Upstream Adult Migration</u>
The Draft Plan and DEIS/DEIR fail to accurately assess impacts to upstream adult migration of winter-run Chinook salmon resulting from reduced flows below the new intakes. The DEIS/DEIR shows greater than 10% flow reductions (the DEIS/DEIR standard for impact to this variable) during March-May, during the peak months of winter-run migration. *See* DEIS/DEIR at 11-1332 (Table 11-4-24). This is a significant impact that is not accurately reported in the DEIS/DEIR. The impact would likely be reduced under the HOS of Alternative 4. *See* DEIS/DEIR Appendix 11C at 11C-288 (Table 30). In addition, by reporting the "average" reduction in the percentage of Sac River flow, the DEIS/DEIR understates the problems that will likely occur for Chinook migrants in certain months and year types. See id. (Showing that the maximum flow reductions at Rio Vista under H3 are in Below Normal years in March, and Above Normal and Wet years in April

D. <u>Spring-Run Chinook Salmon</u>

1. <u>The Draft Plan and DEIS/DEIR Fail to Adequately Analyze Likely Impacts to Spring-Run Chinook Salmon, the Analysis that is Available Predicts Severe Impairment of Spring-Run Chinook Salmon Population Viability, and the Documents Understate or Ignore Significant Environmental Impacts</u>

The Draft Plan and DEIS/DEIR fail to adequately analyze potential environmental impacts to spring-run Chinook salmon. In the absence of results from a life cycle model,[69] the documents fail to summarize/synthesize the impacts to various life stages of spring-run Chinook salmon into a single assessment of project effects to this species for each of the attributes of species' viability: abundance, spatial distribution, life history diversity, and productivity. *See* McElhany et al. 2000. Piecemeal analysis and conclusions regarding separate life stages, without a qualitative (or quantitative) framework for synthesizing the effects to attributes of viability across life stages leads to results that are unnecessarily fragmented and without proper context – simply, they fail to address the important questions: "What will happen to this population of

[69] Although the Draft Plan indicates that at least one existing life cycle model (OBAN) has been developed for spring-run, *see* Draft Plan at 5.G-10, the DEIS/DEIR and Draft Plan fail to use the OBAN model to analyze impacts. The reasons for doing so are unclear. We and other reviewers have identified significant limitations and concerns with some of the existing modeling tools. *See, e.g.*, Memorandum to J. Meral from J. Rosenfield, re: "Review of BDCP Effects Analysis Appendix G: December 22, 2011; Delta Science Program Salmonid Model Workshop 2011 at 18.

Chinook salmon under the Plan?" and "How do expected outcomes of the Plan compare with modeled baseline conditions, with and without consideration of cumulative effects such as climate change?" The DEIS/DEIR and Draft Plan should have relied on the DRERIP review process to assess impacts qualitatively (based on well-supported, peer-reviewed conceptual models) and to synthesize results, especially where quantitative models were unavailable or deemed inappropriate. *See, e.g.*, Essex Partnership 2009; TBI letter to BDCP Steering Committee August 2009. Instead, the document largely ignores these reviews and instead reaches conclusions that are not supported by the available scientific information.

i. The Draft Plan and DEIS/DEIR Fail to Report Potentially Significant Negative Impacts to Spring-Run Chinook Salmon Arising from the Project by Improperly Attributing Negative Impacts and by Ignoring its own Analysis

Both the Draft Plan Effects Analysis and DEIS/DEIR downplay or ignore significant impacts to spring-run Chinook salmon identified in their own modeling and overstate the potential benefit of BDCP Alternatives to this state and federally ESA-listed species.

<u>Impacts to Spring-Run Chinook Salmon Upstream -- Egg Mortality and Spawning Conditions</u>
As it does for winter-run Chinook salmon, the DEIS/DEIR projects increased egg mortality for spring-run Chinook salmon as a result of Alternative 4 operations. Both the SacEFT model and Bureau of Reclamation Egg Mortality model suggest very large declines in the frequency of good conditions for spring-run Chinook salmon egg incubation on the Upper Sacramento River. SacEFT projects a 35% decrease in years with "good incubation conditions" for spring-run Chinook under Alternative 4/H3 operations. The DEIS/DEIR describes increased egg mortality projected by the Bureau of Reclamation egg mortality model under BDCP Alternative 4/H3 this way:

> The Reclamation egg mortality model predicts that spring-run Chinook salmon egg mortality in the Sacramento River under H3 would be similar to mortality under NAA in dry and critical years, less in dry years, but greater in wet, above normal, and below normal (11% to 29% greater) water years (Table 11-4-30). Relative increases of 11% mortality of the spring-run population under wet and above normal water years would be negligible to the overall population, particularly because this represents a 3% to 4% increase on an absolute scale. However, the 29% relative increase in mortality in below normal years would have an effect on the spring-run population. Combining all water years, there would be no effect of H3 on egg mortality (3% absolute change).

DEIS/DEIR at 1345. As with analogous impacts to winter-run incubation success, the DEIS/DEIR again seeks to minimize the importance of this negative impact. By referring to what it erroneously believes is a small absolute rather than obviously large relative increase in impact between operational alternatives, the DEIS/DEIR obscures the results to argue that this does not constitute a significant impact. Temperature impacts to egg viability are currently considered a significant problem for spring-run Chinook salmon. *See*, e.g., NMFS 2009 Biological Opinion at 259-260 and Figure 6-16; NMFS 2014 Final Recovery Plan, Appendix B Attachment B at B-36. Increasing that problem by 11-29% in 64% of years (the sum of wet, above normal, and below normal year-type frequencies, *see* Draft Plan at 5.2-16) exacerbates this existing problem and constitutes a significant impact.

Furthermore, the DEIS/DEIR misrepresents its own findings regarding temperature increases in the mainstem Sacramento under Alternative 4/H4 during the holding and spawning periods for spring-run Chinook salmon. The document declares that, "[a]t Bend Bridge, total degree-days under H4 would be up to 5% lower than under NAA during August and similar during other months (Table 11-4-21)." DEIS/DEIR at 11-1355. However, that same table displays increases in degree-days of greater than 5% in the Sacramento River during most years in June and July and during below normal years in September. The text is not supported by the results in this table, and the table shows significant increases in temperature impacts.

Similarly, the DEIS/DEIR summary of Table 11-4-35 focuses exclusively on perceived temperature "benefits" that it (erroneously) expects to occur under Alternative 4/H1, but it ignores that temperatures in the Feather River would be higher in most years during September under Alternative 4/H3, *see* DEIS/DEIR at Table 11-4-35.

Projected temperature increases, relative to NAA, would negatively impact spring-run Chinook salmon egg survival rates (a productivity impact) and disproportionately affect early-spawning salmon that would be exposed to the higher temperatures (a life history impact) – such losses also strongly suggest a reduction in carrying capacity of the Feather River for spring-run Chinook salmon (an impact to abundance). *See* DEIS/DEIR at Table 11-4-41.

The comparison of project alternatives to the NAA removes the effect of climate change from the estimate of temperature impacts caused by operation of the state and federal projects; for example, temperatures in the Feather River under project alternatives are much, much higher than those that are expected under current climate conditions with current operations (Existing Conditions vs. either H1 or H4; Table 11-4-40). These dramatic increases in *actual temperature* conditions experienced by spring-run Chinook salmon spawning and incubating in the Feather River are likely to: (a) extirpate this population if they were not ameliorated or mitigated, for instance by re-operating the reservoir and/or providing passage beyond current dams to cooler habitats at higher elevations, and (b) result in significant changes to reservoir operations analyzed in the DEIS/DEIR and Draft Plan, which do not make any provision to adapt to climate change.

Despite these rather large predicted increases in temperatures experienced by holding, spawning, and incubating spring-run Chinook salmon in the Sacramento River and the resulting decrease in frequency of years with suitable holding or incubation conditions, the DEIS/DEIR finds that its own analytical tools present conflicting results on temperature and egg mortality in the Sacramento River. The DEIS fails to reach a NEPA finding on this effect and instead promise that model results will be submitted to independent scientific review. By contrast, the DEIR concludes that there will be no significant impact to egg incubation success of spring-run Chinook salmon on the Feather River, but it acknowledges that operations under H4 "could affect the cold water pool and fall temperatures" in spring-run spawning habitat and so it promises to submit these modeling results to independent scientific peer review as well. Both of these conclusions are improper; existing information shows that operations in combination with climate change will cause significant adverse impacts under both CEQA and NEPA. Reservoir reoperation will be required to adapt to climate change, yet the Draft Plan and DEIS/DEIR fail to examine changes to upstream reservoir operations to avoid or mitigate these impacts.

The DEIS/DEIR concludes that, under NEPA, there will be no significant effects to spring-run Chinook salmon upstream as a result of the Draft Plan and Alternative 4 operations. This finding is contradicted by the comparisons referenced above and others. The CEQA analysis of Alternative 4 impacts to spring-run Chinook salmon upstream is starkly different from the result of the NEPA analysis:

> Collectively, the results of the Impact AQUA-59 CEQA analysis indicate that the difference between the CEQA baseline and Alternative 4 could be significant because, under the CEQA baseline, the alternative could substantially reduce the amount of suitable habitat, contrary to the NEPA conclusion set forth above. There would be small to moderate flow-related effects of Alternative 4 on spring-run Chinook salmon in the Sacramento and Feather rivers and temperature-related effects in the Feather River. Both SacEFT and SALMOD predict reduced habitat conditions for spring-run Chinook salmon in the Sacramento River. Exceedances above NMFS temperature thresholds would be higher under Alternative 4 relative to Existing Conditions. Results would be similar among model scenarios.

DEIS/DEIR at 11-1374. At a minimum, the CEQA analysis reveals that the Draft Plan cannot achieve its stated objectives of not modifying critical habitat for spring-run Chinook salmon. SRCS3.1; Draft Plan at 3.3-153 ("Implement covered activities so as to not result in a reduction in the primary constituent elements of designated critical habitat for spring-run Chinook salmon upstream of the Plan Area"). Clearly, the DEIS/DEIR analysis that the Draft Plan will fail utterly to achieve that objective or even alleviate the degrading effect of modeled changes to the regional climate.

Impacts on Spring-Run Holding, Rearing, and Juvenile Migration: Upstream

Temperature impacts to spring-run Chinook salmon juveniles rearing in the Feather River and those preparing to spawn (holding) and may be severe. Under Alternative 4/H3 operations, the DEIS/DEIR reports substantial increases in the number of years when August temperatures will be 4°F (8% increase) and 5°F (19% increase) above the relevant temperature threshold (63°F) for rearing juveniles. DEIS/DEIR at Table 11-4-43. Marine and Cech (2004) documented increased sub-lethal negative effects of on Central Valley Chinook salmon juveniles reared in temperatures above 17°C, and Richter and Kolmes (2005) reference numerous studies that found that optimal temperatures for Chinook salmon juveniles are ≤17°C. Furthermore, although the impact of water temperatures on developing embryos is not well-understood, it is believed that developing reproductive tissues exposed to high temperatures may be less viable than those that are formed under cooler temperatures. Berman 1990 (a Master's thesis cited in US EPA 1999) found that offspring of adult Chinook salmon that had been held for two weeks at temperatures between 17.5-19°C had higher pre-hatch mortality and developmental abnormality rates and lower weight than a control group held at lower temperatures. NMFS Final Recovery Plan lists high water temperatures as a stressor of "high" importance for adult spring-run Chinook salmon holding on the Feather River. NMFS 2014 Final Recovery Plan, Appendix B Attachment 2 at B-10. Thus, the anticipated increase in the number of years in which August temperatures will exceed 17°C could have large impacts on spawning success of Feather River spring-run Chinook salmon.

Migration and rearing flows would be reduced during critical months of some years under Alternative 4/H3 Operations. For example, the DEIS/DEIR projects reduced flows in the Feather River during December of Above Normal years and during January and March of Below Normal years. DEIS/DEIR at 11-1376 (Table 11-4-48). Reductions of flow in these months, with the frequency projected by the DEIS/DEIR suggests a significant impact to migration flows for spring-run Chinook salmon. The projected increase in Feather River flows during April and May under H4, *see* DEIS/DEIR at 11-1379, may benefit spring-run migration during those months, in some years; however, the improvement during two months combined with degraded conditions in earlier months of the spring-run migration period represents a large asymmetry in effects to different part of the life history spectrum represented by different migration timing; this is in stark contrast to the Draft Plan's stated objective (SRCS3.2) to, "Operate water facilities to support a wide range of life-history strategies for spring-run Chinook salmon without favoring any one life-history strategy or trait over another." Draft Plan at 3.3-153.

Rearing flows would be reduced in the high flow channel of the Feather River during June by up to 39% (DEIS/DEIR at 1369) under Alternative 4/H3. According to the DEIS/DEIR, June is the end of the spring-run rearing period and, as a result, the DEIS/DEIR does not consider this very large reduction in river flows to be biologically significant. This conclusion is erroneous as spring-run juveniles that follow a yearling life history strategy rear in the river through the summer months; dramatic reductions in flow represent a potentially serious loss of rearing habitat for these fish. The Delta Science Program Independent Review Panel expressed similar concerns regarding the Draft Plan's unsubstantiated assertion that this change in flows would not affect rearing Feather River spring-run or steelhead. DSP Independent Review Panel Report 2014 at 50. In addition, adult spring-run Chinook salmon hold in the river throughout the summer before spawning in the fall – the loss of almost 40% of river flows expected from Alternative 4/H3 operations likely represents a serious impairment to this run-defining behavior. The DEIS/DEIR fails to acknowledge this very important impact to life history diversity of spring-run Chinook salmon; this contradicts the Draft Plan's stated objective of operating to avoid differential impacts to components of the spring-run life history distribution, *see* Draft Plan at 3.3-153 (Objective SRCS3.2), and the Draft Plan's aim to reduce stressors such as "predation, spatial structure, lack of rearing habitat, … and altered migration flows." Draft Plan at 3.3-151.

<u>Entrainment and Predation Impacts on Spring-Run Juvenile Migration: Downstream</u>
The DEIS/DEIR finds that reduced entrainment of spring-run Chinook salmon in the Delta will be a CEQA net benefit to this unique population under Alternative 4/H3 operations (Table 11-4-SUM1). This finding is not likely to be correct and lacks scientific support. As with all runs of migratory fishes, the DEIS/DEIR and Draft Plan net findings emphasize the benefits of potential reduced entrainment in the south Delta and they assume that there will be little or no entrainment or predation-related mortality at the North Delta facilities. *See, e.g.*, DEIS/DEIR at 11-1341. Regarding entrainment, the Draft Plan and DEIS/DEIR simply assume the efficacy of these screens will be perfect or nearly so under all conditions throughout the life of the north Delta diversion. There is no certainty that entrainment related mortality at the North Delta Facilities will start or remain low. In fact, the Draft Plan's Appendix 5B found that it was not possible to be certain about the level of impact these screens will have on either Chinook salmon or steelhead. Draft Plan, Appendix 5B at 5B-304. This contradicts the Draft Plan's effects analysis, which asserts that there is a moderate level of certainty that the effect will be low. Draft Plan at 5.5.4-23. The DEIS/DEIR should have considered what would happen if this assumption was incorrect, even periodically (i.e. what if damage to, imperfect maintenance, or malfunction of the screens occurs with "x" frequency and results in "y" entrainment rate for a duration of "z" weeks).

With regard to predation at the north Delta diversion, the DEIR/DEIS ignores analyses that show negative impacts, In addition to a bioenergetics model, on which it bases its findings, the Draft Plan (Appendix 5F) also applies a fixed predation model, based on observed entrainment rates at the Glenn-Colusa Irrigation District screens which are somewhat similar to those proposed for BDCP. These two models provide strikingly different predictions of predation on Chinook salmon; the bioenergetics model indicates predation rates at the NDD will be <1% for all Chinook populations, whereas the fixed predation model estimates ~12-13% loss of juvenile migrants at the NDD for each population of Chinook salmon. Both models cannot be correct and the Draft Plan and DEIS largely ignore the result showing significant predation at the north Delta diversion. *See, e.g.,* Draft Plan, Appendix 5F at 5.F-77. In reporting only the results that are more favorable to the BDCP, the Draft Plan and DEIS/DEIR miss the opportunity to learn from the different outputs of the two models. As the Delta Independent Science Review Panel noted, the high mortality of Chinook salmon at the GCID screening facility indicates that predators may aggregate at high densities near that structure; this suggests the same risk exists for the NDD. DSP Independent Science Review Panel Report 2014 at 52. Thus, the difference in projected predation rates between the two modeling approaches applied by the Draft Plan could reveal that its inputs to the bioenergetics model, including the range of predator densities at the GCID facility or their metabolism, were unrealistically low. The bioenergetics model methodology used to calculate potential predation rates arising from the presence of the North Delta diversion would not, apparently, predict existing mortality rates at the GCID screening facility; thus, a larger range of predator densities should have been modeled. Instead, the DEIS/DEIR and Draft Plan simply assume that one model (the fixed predation model) was completely wrong (despite the fact that it's based on a relevant, recent, local observation) and the other model is completely correct. This choice was not scientifically justified.

With regard to changes in South Delta entrainment, the methodology applied is not as precise as the outputs in the DEIS/DEIR suggest accuracy to the nearest single fish, as is implied in Table 11-4-25. *See* Draft Plan, Appendix 5B (modeling appendix showing the 95% Cis, which are not displayed in the DEIS/DEIR). The Delta Science Program Independent Review Panel commented that the normalization procedure used by the Draft Plant to estimate South Delta entrainment effects across years tends to mask some of the variation and uncertainty related to different operational alternatives and the Panel found that the "variance calculations for salvage abundance and entrainment index are being calculated incorrectly." DSP Independent Science Review Panel Report at 54. We concur with these critiques and with the recommended method of calculating variance and the appropriate use of the normalized values (i.e., for qualitative purposes but not for modeling). The Delta Independent Science Board also recommended estimation of entrainment/predation impacts under different assumptions about diversion rates between north and south Delta diversion facilities that would reflect the difficulties and inherent inaccuracies associated with using monthly CalSIM outputs to reflect daily export management decisions. Delta ISB 2014 at B-40.

This brings us to the DEIS/DEIR estimate of the actual effect of reduced entrainment on spring-run Chinook salmon. With respect to the finding that effect of entrainment reduction resulting from CM1 operation under Alternative 4 will be a net benefit to spring-run Chinook salmon, the DEIS/DEIR again applies an opaque and inconsistent standard to evaluating impacts. The DEIS/DEIR states that entrainment of spring-run Chinook salmon will be reduced under Alternative 4/H3 from 5.3% on average across all years (as elsewhere, we find the "average across all years" metric to be misleading and without value) to 3.2% on average – an absolute difference of 2.1% of the population. The NEPA conclusion states that this will be a "small" benefit, because it claims current predation losses are low; but for CEQA, it claims the entrainment reduction would be "substantial." DEIS/DEIR at 1341. By contrast, when the DEIS/DEIR found increased temperature-related mortality to spring-run incubating in the Sacramento River it concluded: "Relative increases of 11% mortality of the spring-run population under wet and above normal water years would be negligible to the overall population, <u>particularly because this represents a 3% to 4% increase on an absolute scale</u>." DEIS/DEIR at 1345 (emphasis added). So, when negative impacts occur, the DEIS/DEIR insists that absolute losses to the spring-run Chinook salmon of less than 5% are "negligible" or at least "not adverse" (*see also* DEIS/DEIR at 11-1341 (predation rates at the North Delta diversion), but when a perceived positive effect occurs (such as reduced south Delta entrainment) it is termed "substantial" even if it's absolute effect is 2.1%. This fluctuating, dual standard for evaluating the impact of positive versus negative effects is uninformative, misleading, and unacceptable.

<u>Through-Delta Survival Summation</u>
The Draft Plan applies a modification of Newman's (2003) methodology to estimate spring-run smolt survival through-Delta under different Alt 4 scenarios. EBC2_LLT outperforms both ESO and HOS in the early and late long term in this modeling (Table 5C.5.3-111, 5C.5.3-112, Table 5C.5.3-113, 5C.5.3-114 respectively), though it is not clear that any of these results is statistically significant. The Draft Plan should analyze these results using statistical techniques appropriate for paired-observations. If the results are significant, then it should conclude that EBC2 is superior to Alternative 4 variants with respect to spring-run smolt survival; if the results are not significant, then it should conclude that there is no detectable difference (using this modeling approach) between spring-run smolt through Delta survivals among alternative operations compared. In either case, the results indicate that spring-run survival through the Delta will not increase under BDCP operations, in contrast to the Draft Plan's objectives for spring-run (objective SRCS1.1), which include much higher survival rates than are currently observed. Application of the Delta Passage Model confirms that through-Delta survival of spring-run Chinook salmon juveniles is expected to decline as compared to current conditions under the LOS Alternative 4/H3. Draft Plan at 5.5.4-17 to -18. The Draft Plan estimates that survival through the Plan Area will be similar to or slightly higher than the environmental baseline under the HOS using the same methods. *Id.* The DEIS/DEIR attributes slight (but not likely meaningful) improvements in survival under H4, especially in wet years, to high river flows.

The NEPA conclusion for spring-run Chinook salmon relies on outcomes of the Delta Passage Model, and finds that:

> … through-Delta survival under Scenario H3 by juvenile spring-run Chinook salmon Alternative 4 <u>averaged 29% across all years</u>, ranging from about 24% in

> drier years to 38% in wetter years (Table 11-4-51). Scenario H3 survival was similar to NAA in both drier years (0.5% less survival, or 2% less in relative difference) and wetter years (2.5% reduced survival, or 6% less in relative difference) (Table 11-4-51). … Average survival under Scenario H4 (high outflow) was 30.7%, compared to … 30.3% for NAA.

DEIS/DEIR at 11-1382.[70] These results do not appear consistent with the conclusions previously drawn by NMFS, which indicate substantially lower survival of spring- run Chinook salmon under ESO LLT than under either EBC2 LLT or HOS LLT, with survival generally reduced under the HOS LLT as compared to EBC2 LLT as well. NMFS 2013, Evaluation of Flow Effects on Survival in Vicinity of Proposed North Delta Diversions. Furthermore, we note that foraging spring-run Chinook salmon should be expected to experience higher through-Delta mortality than migrant strategy fish because (a) they are smaller, (b) they spend a longer time in the Delta, (c) foraging exposes fish to additional risk of predation compared with migratory behavior. Thus, the DEIS/DEIR's reliance on DPM outputs to draw NEPA conclusions regarding spring-run Chinook salmon survival through the Delta is not supported scientifically and it probably understates mortality impacts to spring-run Chinook salmon from implementation of the BDCP. Finally, neither the DPM nor Newman (2003) methodologies would account for the substantial decline in turbidity throughout the Delta that is expected to arise from operation of the north Delta diversion and/or restoration of tidal marshes (CM4) or the decline in river stage (corresponding to reduced flow volumes) that should be expected immediately downstream of the new diversion. Both reduced turbidity and reduced river stage will translate to greater light penetration and exposure of migrating Chinook salmon to predation pressures. Existing models of Chinook salmon survival through the Delta do not account for the increased susceptibility to predation that will arise from diversion of water and sediment at the new diversion facility; therefore, existing survival models are likely to overestimate survival under BDCP conditions relative to a NAA – this would tend to make comparisons of through-Delta survival less favorable to BDCP operational alternatives.

[70] We and other reviewers have previously emphasized that the Delta Passage Model is not an appropriate tool for evaluating cumulative changes in survival for wild, spring-run Chinook salmon because a substantial fraction of this population migrate to the Delta as fry or parr-sized fish. Williams 2006; Williams 2010. DPM is based on the relative success of migrant-strategy, hatchery-produced salmonids (such as late-fall run Chinook salmon) and thus cannot be used to understand fry and parr mortality in the Delta. *See* Draft Plan at 5.C.5.3-65. Even applying DPM to large spring-run (or fall-run) smolt is inappropriate as these fish migrate through the Delta in a different season than do late-fall run or steelhead smolt; there is no reason to expect that survival rates (and even relative survival rates) in Delta channels remain unchanged across seasons as numerous influences on predator efficiency (temperature, light penetration, SAV coverage, etc.) may all change seasonally. Memorandum to J. Meral from J. Rosenfield December 21, 2011; NMFS 2013 Progress Assessment at 8; DSP Independent Science Review Panel Report 2014 at 30.

Several things are apparent from the DEIS/DEIR summary of through-delta survival net effects. First, the DEIS/DEIR project lower survival under Alternative 4/H3 operations compared to the NAA; this contradicts the documents finding that the proposed project will have no significant effect, especially if one factors in other negative effects upstream (*see above*) that the impacts assessment inappropriately ignores. Second, restoration of floodplain habitat in the Yolo Bypass that may benefit downstream rearing and migration success is inappropriately excluded from the baseline in the Draft Plan and the DEIS/DEIR, as described above. Third, none of the survival models indicate a likelihood that survival rates will significantly increase as compared to the status quo, which would be necessary to achieve the Draft Plan's through-Delta survival objective. Thus, the document fails to provide substantial evidence that the Draft Plan is likely to achieve its objectives for spring-run Chinook salmon survival.

<u>Impacts to spring-run Chinook salmon juveniles – roll-up</u>:
The DEIS/DEIR largely estimate decreases in through Delta survival. Because the DEIS/DEIR finds that Alternative 4 operations produce only one result that is not "less than significant" for through-Delta survival (reduced entrainment), and that effect is a "benefit" to the species, one would expect to find a meaningful increase in predicted spring-run Chinook salmon through-Delta survival under Alternative 4 – but that is not the case.

Indeed, it is unlikely that spring-run Chinook salmon will benefit from operations described under Alternative 4/H3, even when combined with habitat restoration actions that were not modeled. The Delta Science Program Independent Review Panel (2014) found:

> The negative impact of reduced plan area flows should have been greater on Sacramento River species such as spring Chinook and steelhead that are dominated by migrant life histories.
>
> Migrant life histories are less likely to benefit from habitat restoration activities, which are a key focus of the BDCP conservation measures. This implies that spring Chinook and steelhead may experience less benefit from BDCP actions than other salmonid species, or they may even experience a negative net effect in response to reduced spring flows. The key question, which deserves more attention in the BDCP, is whether the migrant life history will sufficiently benefit from conservation measures to offset moderate negative impacts related to reduced spring flows. This question is key for spring Chinook and steelhead that are composed mostly of migrant life histories.

DSP Independent Science Review Panel Report 2014 at 30.

The Draft Plan also identifies an objective of improving survival of spring-run Chinook salmon juveniles emigrating from the San Joaquin basin (objective SRCS1.1). The Draft Plan suggests that several of its conservation measures will affect better survival for Chinook salmon emigrating from the San Joaquin River basin (including, CM1 operations, efforts to reduce illegal harvest, improvement of water quality conditions in the Stockton Deep Water Ship Channel, floodplain creation in the lower San Joaquin River, etc.). Yet the Draft Plan and the DEIS/DEIR wholly fail to evaluate potential effects of the BDCP on the migration success of juvenile spring-run Chinook salmon entering the Delta from the San Joaquin River. Thus, both the Draft Plan and DEIS/DEIR fail to analyze whether the BDCP will attain its stated objectives. This is a major omission and failure to provide information readers will need to evaluate BDCP benefits to spring-run Chinook salmon abundance, productivity and spatial distribution.

<u>Impacts to upstream migration of adult spring-run</u>
Adult spring-run Chinook salmon may begin their upstream migrations as early as late-March and as late as September, with peak migrations occurring in May and June. Yoshiyama et al. 1998; Moyle 2002. Adult salmon use olfactory cues to home to their natal rivers and streams. Healy 1991; Moyle 2002; Quinn 2005; Williams 2006. Thus, reduction of flows into and through the Delta from spawning tributaries, and the diversion of those flows, can result in confusion, delayed migration, straying, and failure to spawn. For instance, current operations of the CVP/SWP and reduced inflows from the San Joaquin River cause significant impacts on adult migration of fall-run Chinook salmon of the San Joaquin River. Marston et al. 2012. The Draft Plan describes the potential for reduced Sacramento River flows below the new North Delta Diversion to cause orientation problems for spring-run Chinook salmon adults as follows:

> … the difference in Sacramento River flow at Rio Vista in April–May was more than 20% less in wet and above-normal years and similar in other water-year types under the ESO; as described for winter- run Chinook salmon, flows in March–May were similar or greater under HOS_LLT compared to EBC2_LLT (Table 5.C.5.3-235, Mean Monthly Flows (cfs) in Sacramento River at Rio Vista for EBC2, HOS, and LOS Scenarios, and Table 5.C.5.3-236, Differences between EBC2 Scenarios and HOS and LOS Scenarios in Mean Monthly Flows (cfs) in Sacramento River at Rio Vista, in Appendix 5.C). The importance of these changes to the homing ability of spring-run Chinook is unknown. In considering the results of the DSM2 fingerprinting results and the CALSIM flow analyses, it is concluded with low certainty that there will be a low negative change to adult migration Plan Area flows under the BDCP for upstream migrating adult spring-run Chinook salmon. The low certainty in these conclusions would be informed by monitoring and targeted research under the BDCP (e.g., examining migration success of tagged adult Chinook salmon under different flow regimes), with any adverse effects being addressed by adaptive management.

Draft Plan at 5.5.4-19

However, the impacts to spring-run adult migrations from flow reductions in the lower Sacramento River will be higher than estimated in the Draft Plan, as this summary avoids impacts to flows in the peak migration month of June and misstates the predicted flow modifications it does present. According to the referenced table (Table 5.C.5.3-236), average Sacramento River flows at Rio Vista (indicative of the flows that migrating Chinook salmon might use to orient) are expected to decline on average in every month of the spring and early summer in both the High Outflow and Low Outflow Scenarios, in both the early and late long term, when equivalent climate change assumptions are applied. The proportional declines vary by scenario and year-type. In May (the beginning of peak spring-run migrations) flows under the HOS decline relative to EBC2 (factoring in climate change) by more than 10% in critical years during the ELT and by more than 9% in Wet years of the LLT; under the LOS, flow declines of greater than 10% are expected to occur in Below Normal, Above Normal, and Wet years. In June (also a peak migration month), reductions in flow exceeding 30% occur frequently (Wet and Above Normal year types of the HOS_ELT and HOS_LLT, and Wet years in the LOS_ELT). Flows in July, the shoulder of spring-run migration timing, shows even greater reductions (>30% on average across all year-types in both HOS_ELT and HOS_LLT, Critical years in LOS_ELT and LOS_LLT). DEIS/DEIR Appendix 11C at 11.C-288 to -290. The DEIS/DEIR presents expectations of flow reductions at Rio Vista under each of the Alternative 4 operational scenarios (Table 30, DEIS/DEIR Appendix 11C at 11.C-288 to -290); the results show even greater declines than those described in the Draft Plan especially when flows are compared to baseline conditions – under each operational variant, the Sacramento River's flow will be over 40% lower (up to 56% lower) in at least one year type during June. The loss of more than one-third and, in some cases, more than one-half of a River's flow is a large impact for Chinook salmon attempting to find and navigate to their natal streams. If the Draft Plan found low impact under the expectation of a 20% reduction in flow, we would expect that the magnitude and certainty of the impact would be higher when flow reductions of more than 30%, 40%, and 50% are projected. There is no credible scientific evidence that would support a finding of "low" potential impact under these conditions.

Similarly, the DEIS/DEIR analyzes flow reductions on the Feather River during the spring-run adult migration period and finds that under H3 during this period, flow reductions of up to 53% would represent changes "of moderate to large magnitude"; yet the DEIS/DEIR also concludes that the effect would "would not affect spring-run Chinook salmon in a biologically meaningful way." DEIS/DEIR at 11-1375. Once more, there appears to be no scientifically credible evidence to support a conclusion of low or "less than significant" impacts to migrating spring-run Chinook salmon adults.

Finally, with respect to efforts to control illegal harvest (poaching) of spring-run Chinook salmon, the Draft Plan overstates the importance of the stressor in the Plan Area and the likely impact of the proposed conservation measure, CM17. For adult spring-run Chinook salmon, the Draft Plan assumes with "moderate certainty" that illegal harvest is an "attribute of moderate importance for spring-run Chinook salmon adults. Draft Plan at 5.5.4-14. As described above, spring-run Chinook salmon may be the most susceptible of the salmonid species to poaching because, during the summer, *they hold in small streams, away from population centers*. *See* Moyle 2002; Williams 2006; Williams 2010. However, the "Illegal Harvest" conservation measure (CM17) is designed to increase enforcement of anti-poaching laws *within the Plan Area*. Draft Plan at 3.3-151 to -152; DEIS/DEIR at 11-233. Thus, while there could be some moderate (though uncertain and un-measureable) benefit to spring-run Chinook salmon of anti-poaching efforts upstream, where they are most vulnerable, the impact of poaching efforts "in the Plan Area" is unknown (highly uncertain) and likely quite small. Furthermore, the Draft Plan provides no evidence to support its claim that anti-poaching effort will produce measureable benefits (to say nothing of "high" effects) on the survival of spring-run juvenile salmon migrating through the Plan Area. Thus, there is no support for the Draft Plan's conclusion that its efforts to reduce illegal harvest will "...be a high positive change (i.e., decrease) in the illegal harvest attribute for spring-run Chinook salmon juvenile foragers, juvenile migrants, and adults due to CM17" or the implication that this stressor is of more than low (probably very low) importance *in the Plan Area* where the conservation measure is to occur. Furthermore, in the Plan Area, the magnitude of the stressor and the ability of warden's to reduce it is likely to decline as passage improvements described in the Draft Plan are completed. The same arguments hold for other runs of Chinook salmon and steelhead, all of which are less susceptible to poaching overall than spring-run.

Neither the Draft Plan nor the DEIS/DEIR address potential effects of the BDCP on the migration of spring-run Chinook salmon into the San Joaquin River where it enters the Delta. This is known to be a current problem affecting fall-run Chinook salmon of the San Joaquin basin. Marston et al. 2012. Thus, both the Draft Plan and DEIS/DEIR fails to analyze the potential impacts to the Draft Plan's stated objectives. Draft Plan at 3.3-53 (Objective L.2.4) and Draft Plan at 3.3-133 (objective L3.4). Objective L.2.4 is intended to "provide flows that support the movement of adult life stages of native fish species to natal spawning habitats." The DEIS/DEIR also fails to analyze potentially important effects on spring-run Chinook salmon of the San Joaquin Basin of conservation measures intended to address low dissolved oxygen in the Stockton Deepwater Ship Channel (CM14). These are major oversights given that the Draft Plan states an intention to benefit spring-run Chinook salmon in the San Joaquin Basin when spawning populations there have been reintroduced.

E. Central Valley Steelhead

1. The Draft Plan and DEIS/DEIR Fail to Adequately Analyze Impacts to Central Valley Steelhead, but the Available Analyses Demonstrate that the Draft Plan is not Likely to Achieve Plan Objectives and is Likely to Result in Significant Adverse Impacts to the Species

As with many other species, the Draft Plan fails to assess whether the BDCP will attain many of the conservation strategy's objective for steelhead. Draft Plan at 5.2-8. The failure to evaluate whether the Draft Plan is likely to achieve the through-delta survival objective is not scientifically justified. The Draft Plan's claim that it would have needed life-cycle models for steelhead that are unavailable is not accurate; because objective STHD1.1 concerns through-Delta survival only, there are existing modeling tools and analytical approaches that should have been used, albeit with caveats. Although the Draft Plan inappropriately applied DPM to interpret survival of spring, fall, and winter-run Chinook salmon (which migrate at smaller size than the fish whose movements and success were used to construct the DPM), it did not apply this model to projection of differential success rates for steelhead migrating through the Delta. Of course, caution in interpreting these results would still have been warranted for steelhead. *See, e.g.,* Memorandum to J. Meral from J. Rosenfield re: Comments on Appendix G, December 2012.

The DEIS/DEIR relies on its improper use of DPM for Chinook salmon to conclude that, "…steelhead survival would not be expected to change more than 1% under Alternative 4." DEIS/DEIR at 11-1531.[71] Late fall-run Chinook salmon migrate at similar size and in similar season to steelhead suggesting potentially similar impacts. Yet this statement neglects to mention that the DEIS/DEIR anticipates decreased through Delta survival of late fall-run Chinook salmon under H1 as compared to the NAA and in all Alternative 4 operational variants during wetter year types compared to current conditions. DEIS/DEIR at 11-1458 (Table 11-4-76).

Similarly, the DEIS/DEIR concludes that "Alternative 4 would have no effect on steelhead migration success through the Delta" for San Joaquin steelhead." DEIS/DEIR at 11-1532. Its conclusion that steelhead survival would not change seems to indicate that adverse effects of BDCP on through-Delta flows offset any benefits from reduced steelhead entrainment at the south Delta export facilities, *see* DEIS/DEIR at 11-1476 (Table 11-4-77).

In general, both the Draft Plan and DEIS/DEIR fail to use existing scientific information to evaluate the effects of CM1 on steelhead migratory survival, completely ignoring key scientific information including the 2013 NMFS Evaluation of Flow Effects on Survival in Vicinity of Proposed North Delta Diversions. *See* DEIS/DEIR at 11-1531 to -1532. In addition, Appendix

[71] The change referred to is likely to be a decrease in through-Delta survival. Draft Plan at 11-1551.

3G to the Draft Plan projects that steelhead populations will decline substantially for both Sacramento and San Joaquin basin fishes in the first 10 years of the BDCP (to extinction, in the latter case). Draft Plan, Appendix 3G at Table 4. This result is consistent with that described in NMFS testimony to the State Water Resources Control Board regarding necessary flow improvements on the lower San Joaquin River. NMFS Comments on the Phase I WQCP Update Phase 1, March 2013.

Regardless of the methodology used, these analyses (and others, like NMFS Evaluation of Flow Effects on Survival in Vicinity of Proposed North Delta Diversions 2013, which the Draft Plan and DEIS/DEIR fail to utilize in their analysis) all demonstrate the Draft Plan is unlikely to achieve the increases in steelhead survival identified in the Draft Plan's biological objective (STHD1.1). As such, the DEIS/DEIR and Draft Plan lack any scientific evidence to conclude that the Draft Plan is likely to achieve its steelhead survival objective.

Furthermore, the Draft Plan and DEIS/DEIR overstate the potential value of conservation measures to steelhead juveniles migrating through the Delta and underestimates the potential negative effects on steelhead survival through the Delta. Specifically, flow is understood to be a key driver to the success of salmonids that are primarily attempting to migrate through the Delta; salmonids that are primarily focused on foraging, by contrast, may benefit differentially from increased food and rearing habitat in the Delta. The Draft Plan assumes that 95% of steelhead juveniles in the Delta are following a migrant strategy. Draft Plan at 5.5.6-3. We concur with the Delta Science Program Independent Review Panel finding that:

> The effect of each attribute on migrant versus forager salmonids was examined in Chapter 5, but summary Figure 5.5.3-2 did not capture differences in the assumed relative abundances of these life histories among the species. Plan area flows were typically ranked as a moderate negative effect on migrant salmonids in the Sacramento River and a low negative effect on foragers. However, this attribute was ranked the same for each salmonid species regardless of the proportion migrants versus foragers assumed in the population. The negative impact of reduced plan area flows should have been greater on Sacramento River species such as spring Chinook and steelhead that are dominated by migrant life histories.
>
> Migrant life histories are less likely to benefit from habitat restoration activities, which are a key focus of the BDCP conservation measures. This implies that spring Chinook and steelhead may experience less benefit from BDCP actions than other salmonid species, or they may even experience a negative net effect in response to reduced spring flows.

DSP Independent Science Review Panel 2014 at 30; *see also* Williams 2010; NMFS 2013 Progress Assessment at 4. The findings in the Draft Plan and DEIS/DEIR regarding foodweb benefits to steelhead in the Plan Area are not scientifically supported because the vast majority of steelhead are not foraging in this location.

Similarly, the Draft Plan and DEIS/DEIR's failure to emphasize the important negative impact of flow reductions (and even status quo flows) to the 95% of steelhead that are primarily seeking to migrate through the Delta quickly is not supported by the best available science. For example, in describing the need for improved Delta inflows from the San Joaquin River to the Delta, NMFS stated:

> Flow is undisputedly a key driver for [salmon and steelhead] survival…San Joaquin River <u>flows must be augmented significantly from current levels in order to reverse the present trend of salmonid population declines</u> in the basin. Survival rates in the San Joaquin River were only slightly greater than one percent in 2003 and 2004 and 12 percent in 2006, which was a very high flow year… <u>We note that these survival rates are unlikely to support a viable salmonid population</u>.

NMFS Comments on the Phase I WQCP Update Phase 1, March 2013 (emphasis added). NMFS' comments also emphasize that habitat fixes generally cannot replace the need for increased flows in the lower San Joaquin River (but should supplement needed improvements in flows). *Id*. BDCP fails to consider any changes in upstream CVP reservoir operations in the San Joaquin Basin that could improve flow conditions.

Meanwhile, the DEIS/DEIR and Draft Plan assume, without justification, that the BDCP will provide benefits to steelhead that are unlikely to occur. For example, the Draft Plan assumes with low certainty that reduced illegal harvest of steelhead will produce a low benefit to steelhead even though the stressor itself is likely to be of low importance (and even that is a low certainty conclusion). Draft Plan at 5.5.6-9. Another way of stating this outcome is that it is unlikely to produce any measurable effect to the steelhead population. Indeed, steelhead adults migrate through the Delta during winter months when river flows are typically high and these fish are relatively difficult to detect. Williams 2010. Thus, it is very unlikely that reduction of poaching in the Plan Area (as the Conservation Strategy specifies) is likely to have much of measureable effect on steelhead populations.

Also, the Draft Plan fails to support its claims regarding the effect of predation mortality on steelhead. Draft Plan at 5.5.6-8. To the extent that their aggressive behavior and relatively large size limits predation on steelhead in the Delta (steelhead are typically ~250cm when they reach the Delta), predation mortality in the Delta is not likely to be a direct limit on steelhead populations currently, so perceived low-level benefits from measures to control predation are unlikely to yield population-level benefits. Although steelhead that are lost, malnourished, entrained in diversion infrastructure, or otherwise stressed from poor migration conditions may be eaten by opportunistic predators, these are secondary effects; steelhead are relatively large fish when they migrate through the Delta and they are capable swimmers and are more aggressive than Chinook salmon. Moyle 2002; Quinn 2005; Williams 2006. Although predation in the Delta is probably not a major stressor for steelhead currently, ecosystem alterations anticipated under BDCP could increase steelhead exposure and susceptibility to predators in the future. For instance, the Draft Plan claims that tidal marsh restoration would provide "more shallow water habitat with less predators." Draft Plan at 5.5.6-9. However, this ignores the fact that (a) steelhead are not expected to make great use of these habitats because 95% of them are migrating quickly towards the Bay and ocean and (b) there is little evidence and no guarantee that these restored habitats will be low predation environments. Even if the promised invasive vegetation removal succeeds, predation rates may be accelerated in these environments because not all predators rely on submerged aquatic vegetation, such as avian predators or striped bass. In contrast to the statement in the Draft Plan, the DRERIP review concluded that the potential for increased predation associated with habitat restoration planned for the West Delta ROA and elsewhere was a potentially high magnitude negative impact. Essex Partnership 2009 at Appendix D. In addition, the DEIS/DEIR and Draft Plan fail to address the potential impact of reductions in turbidity increasing predation risk. *See* our discussion of impacts of reduced turbidity for Delta smelt and both sturgeon species.

For steelhead, as for most of the covered fish species, the Draft Plan largely ignores the weight of scientific evidence that improved flows are needed with respect to steelhead, in combination with other measures. *See, e.g.*, NMFS, Comments on the Draft Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Salinity Objectives (Report), February 4, 2011;[72] CDFW 2010 Flow Criteria.

2. <u>The Draft Plan and DEIS/DEIR fail to acknowledge significant negative impacts to steelhead arising from the project upstream of the Plan Area</u>

Both the Draft Plan Effects Analysis and DEIS/DEIR downplay or ignore significant upstream impacts to steelhead that result from BDCP operational alternatives, particularly regarding egg mortality and spawning conditions. The DEIS/DEIR claims that Alternative 4 will have "negligible" impacts to spawning and egg incubation habitat for steelhead, but this conclusion is not supported by the analysis. For instance, it reports a relative decline of 10% in the weighted usable area for steelhead spawning on the Sacramento River. DEIS/DEIR at 11-1478 (Table 11-

[72] These comments are available online at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/cmmnts020811/010411dpowell.pdf and are incorporated by this reference.

4-78). Also, under Alternative 4/H4, Sacramento River flows are expected to decline substantially during the spawning and egg-incubation seasons during May in Below Normal and Wet years (9% and 18.3%, respectively); the DEIS/DEIR improperly concludes that these effects will be "small" and have no meaningful biological effect on steelhead spawning or rearing. DEIS/DEIR at 11-1507. There is no scientific basis for such conclusions; such substantial declines in flow are likely to have a significant biological effect that the DEIS/DEIR simply ignores. On Clear Creek, the DEIS/DEIR reports no change between Alternative 4/H3 and NAA but it does indicate that flow declines in Wet years relative to current conditions are expected to be as high as 38%. DEIS/DEIR at 11-1478. Similar degradation of flows and temperatures as compared to existing conditions are expected on: the Feather River, *see* DEIS/DEIR at 11-1480 to -82, -89 (Tables 11-4-80, 4-82, and 4-83; the American River, DEIS/DEIR at 11-1490 to -91 ; and the Stanislaus River, DEIS/DEIR at 1491. The net effects in the Draft Plan and conclusions in the DEIS/DEIR fail to adequately account for these increases in upstream temperatures and their likely impacts to steelhead productivity, abundance, and spatial distribution in the future. They also reveal the Draft Plan is unlikely to achieve two of its stated objectives (STHD3.1 and STHD3.2, which indicate that the Draft Plan will be implemented so as not to negatively impact critical habitat or life history diversity of steelhead, respectively). As with other salmonids, it is clear that changes in reservoir operations will be needed to adapt to climate change and other cumulative impacts.

Juvenile steelhead rearing conditions on the mainstem Sacramento River would decline substantially under Alternative 4/H3 relative to the NAA. DEIS/DEIR at Table 11-4-78 (SacEFT projects an absolute decline in frequency of years with "good" conditions of 10 percentage points and a relative decline of 22%). The DEIS/DEIR suggests that the impact would be counterbalanced by a 2% absolute (10% relative) reduction in the incidence of juvenile stranding resulting from flow fluctuations. The DEIS/DEIR concludes that more frequent degradation of steelhead juvenile rearing conditions would cause negligible effects, *see* DEIS/DEIR at 11-1498, is not supported by a scientific analysis and is contrary to the available biological evidence. For example, any countervailing effect of reduced juvenile stranding presumes that the years in which this improvement occurs are not the same years in which juveniles are expected to experience diminished quantity and quality of rearing habitat – "saving" fish from stranding is not a benefit if the fish later die in a river that is too hot or has too little flow. Even were there no overlaps between years with reduced stranding and years in which the DEIS/DEIR anticipates impacts to steelhead rearing conditions, the number of years in which the latter (negative) impact are expected outnumber the years where reduced stranding is expected. Loss of "good" rearing conditions in more than an additional 2 years out of ten (22%) under Alternative 4 operations is a bad outcome for Sacramento River steelhead.

Large reductions in flow (up to 50%) are projected during the juvenile steelhead rearing period (specifically, July through September) in the "high flow" channel of the Feather River, *see*

DEIS/DEIR at 11-1499 and on the American River (August-September) under Alternative 4/H3. As reported for spring-run Chinook salmon, the frequency of temperature exceedances on the Feather River is expected to increase during July and August of most years. Similarly large increases in temperature are reported for the American River under Alternative 4 operations and the method of reporting such exceedances on both rivers vastly underestimates the likely negative effects. Temperature exceedances on the Feather and American Rivers are reported in the DEIS/DEIR as "degree-months" or the number of months in which the *average* temperature exceeds a certain threshold, but temperature thresholds reported for salmonids and steelhead are generally daily or multi-day temperature maxima. When temperatures exceed these short-duration thresholds on a monthly basis, it means that fish are exposed to deleterious conditions for at least a large plurality of days during that month. Thus, the DEIS/DEIR's depiction of increased frequency in temperature exceedances that are greater than 5 degrees higher than the 63^{o}F temperature threshold (Table 11-4-43, Table 11-4-85) reveal that steelhead will experience temperatures greater than 68^{o}F (a temperature associated with negative effects to rearing steelhead; Reese and Harvey 2002) for most of those months. The table does not capture the number of months/years in which temperatures will exceed steelhead thresholds for many days (when the monthly average temperature remains below the threshold), even though severe negative impacts to rearing steelhead juveniles will occur in these months. As a result, the DEIS/DEIR dramatically understates the likely adverse temperature impacts on steelhead. We note that predicted reductions in the frequency of temperature exceedances during June under Alternative 4 versus NAA (Table 11-4-43, Table 11-4-85) do not mitigate for the high temperature impacts that are projected to occur later in the spring or summer, especially because actual temperatures are predicted to exceed critical steelhead temperature thresholds much more frequently in June relative to current conditions.

The DEIS/DEIR is inconsistent and contradictory regarding its assessment of the impact of flow reductions on steelhead migration upstream of the Plan Area. Flow reductions on major steelhead spawning rivers during the steelhead migration season represent potentially serious impacts to migration and adult survival. For example, the DEIS/DEIR appropriately finds that under Alternative 4/H3 operations on the Feather River, "The substantial reductions in flows during drier water years would have biologically meaningful effects on migration conditions during September through March." DEIS/DEIR at 11-1536. In contrast, the DEIS/DEIR concludes that under Alternative 4/H1 the significant flow reductions would have no effect "…because they occur in only one of seven months." DEIS/DEIR 11-1525. This rationalization ignores the potential survival and life history impacts to steelhead on the Feather River that can occur from unsuitable adult migration and contradicts the Draft Plan's objective to implement operations in a way that does not differentially impact particular parts of the life history range of steelhead. There is also no scientific support for the DEIS/DEIR claims that November flow reductions under Alternative 4/H3 (and other operational variants) on the Sacramento River above Red Bluff in all water year types (declines from 7.9%-16.3%, *see* DEIS/DEIR Appendix 11C (Table

4)) are "isolated" and will not have meaningful biological effect, *see* DEIS/DEIR 11-1520. The reluctance of the DEIS/DEIR to acknowledge impacts to steelhead migration resulting from reduced fall flows is not scientifically supported.

3. Conclusion

The DEIS/DEIR analysis of impacts to steelhead fails to adequately and accurately assess the overall effects of the Draft Plan to this species. The DEIS/DEIR projects no increase in through-Delta survival rate arising from Alternative 4 operational variants; in fact, it allows for and projects a decrease in through-Delta survival rates below unacceptable status-quo conditions. Projected levels of through-Delta survival are inadequate to maintain populations from either the San Joaquin Basin or Sacramento Basin, and NMFS' appendix describing through Delta survival objectives indicates that abundance will go to zero quickly at such low levels of through Delta survival. Given these outcomes, the draft documents indicate the extirpation of Central Valley steelhead in the San Joaquin Basin and substantial reductions in abundance of populations in the Sacramento Basin within the first half of the BDCP's proposed permit terms. In addition, the DEIS/DEIR reveals substantial impacts to steelhead spawning, rearing, and migration upstream of the Delta (in both the San Joaquin drainage and the Sacramento drainage). These significant adverse impacts are likely to result in the loss of one or more steelhead populations during the course of BDCP permit term, and these adverse impacts biologically outweigh and overwhelm any potential benefits from other BDCP conservation measures.

F. Green and White Sturgeon

1. The Draft Plan Fails to Define Adequate Objectives for Viability of Both Sturgeon Species

The southern distinct population segment (DPS) of green sturgeon is a federally-listed threatened species. In the Central Valley, its current spawning, egg incubation, and early rearing range falls entirely in the area downstream of Anderson, CA on the Sacramento River to and through the Plan Area. Israel and Klimley 2008; NMFS 2009 Biological Opinion at 125. White sturgeon spawning is currently believed to occur in the Sacramento River only from Colusa to the gauge at Verona, though spawning has been detected on the San Joaquin River, with rearing occurring throughout the Plan Area. Israel et al. 2009 . Both species are expected to have occurred on other larger rivers in the Central Valley, though there are no recent records from these other waterways. Both species are anadromous, meaning they spend some portion of their post-juvenile life history in marine environments. Thus, spawning, larval, and juvenile life stages of both of these covered species occur within the Plan Area or reaches of the Sacramento River where flow and water quality are significantly affected or controlled by operations of the SWP and CVP.

The Draft Plan's presentation of global goals and objectives for green sturgeon is confused, conflicting, and not specific. For instance, whereas the global goal for endangered species such as Delta smelt is to remove them from the endangered species list through restoration of their abundance and distribution, *see* Draft Plan 3.3-107, the Draft Plan identifies a global goal for green sturgeon that is to ensure that they use habitats they currently use and to maintain a stable population size and age structure. Draft Plan at 3.3-190. Clearly, this is an inadequate goal for a federally-threatened species that is at risk of extinction because of low abundance and a greatly restricted geographic range. *See, e.g.,* NMFS 2009 Biological Opinion. Fortunately, this erroneous global target is contradicted by global objectives that call for increased abundance, productivity, spatial distribution, and life history and genetic diversity, but, none of these global objectives are SMART, so they fail to set the context for what the BDCP will do to serve these larger conservation aspirations. The description of global goals and objectives for white sturgeon is identical to what is described for green sturgeon and similarly flawed

As described above, the green sturgeon productivity objective GRST1.1 is too vague to understand or to use in evaluating the adequacy of conservation measures or to assess the efficacy of the BDCP as it is implemented (i.e. for adaptive management). *See also* NMFS 2013 Progress Assessment at 15. Another objective related to green sturgeon productivity (GRST1.2; to eliminate stranding in migration corridors of the Yolo Bypass, *see* Draft Plan at 3.3-193) is actually a stressor reduction target (as it refers to a particular stress on adult survival) but it is at least close to being SMART. Unfortunately, the Draft Plan has no objectives for improved spatial distribution or life history and genetic diversity for this species – issues that are identified as important in the preceding statements of global objectives and in the existing biological opinion. NMFS 2009 Biological Opinion at 558. Again, the descriptions of white sturgeon BDCP objectives are identical to those provided for green sturgeon in the Draft Plan and they are inadequate for the same reasons.

2. <u>The Draft Plan and DEIS/DEIR Ignore Several Effects of the BDCP that are Each Likely to Cause Significant Negative Impacts on Survival of Sturgeon Juveniles in the Plan Area and Upstream. Operation of the New North Delta Diversion (CM1) Likely Will Cause Significant Impacts to Both Species that are not Reported in the DEIS/DEIR, and the Draft Plan and DEIS/DEIR Ignore the Cumulative Impacts on these Two Species.</u>

Because the Draft Plan's objectives for the sturgeon species are unacceptably vague, it is not possible to evaluate whether the Draft Plan is likely to achieve such objectives. Still, the DEIS/DEIR indicate that BDCP will cause significant environmental impacts to both sturgeon species and prevent attainment of conservation objectives. Alone and cumulatively, these impacts represent potentially devastating impacts to both sturgeon species.

Sturgeon larval and juvenile life stages are most susceptible to major stressors such as entrainment, low migration/dispersal flows, and predation. Young-of-the-year green sturgeon are present in the middle and lower Sacramento River from April-October (larvae) and from August through March (juvenile). All stages of white sturgeon are present in the lower Sacramento River, with larvae present from February-May and the smallest juveniles present from April-June. Israel *et al*. 2009. Larval and young-of-the-year juvenile sturgeon are expected to be most abundant following spawning seasons characterized by high river flows. Kolhorst 1991; Moyle 2002; Israel *et al*. 2009. The spawning cues for green sturgeon are not known, but they are believed to be analogous to those for white sturgeon, with spawning being triggered by high river flows. NMFS 2009 Biological Opinion at 127.

i. Larval and Juvenile Sturgeon Migration – Flows Downstream of North Delta Diversion

Migration and dispersal of juvenile and larval white sturgeon will likely be significantly and adversely affected by reduced flows below the north Delta diversion. The DRERIP life history conceptual model for green sturgeon indicates that the volume of flow in the middle and lower Sacramento River is a stressor that can limit transport and dispersal of larval and juvenile green sturgeon. Israel and Klimley 2008 at 32; the white sturgeon conceptual model indicates the same potential stressors for that species, Israel et al. 2009 at 36, and rates "flow operations" as the stressors with the highest possible importance and understanding for this species, *id*. at 43. Compared to EBC2 LLT, flows below the new diversion would be substantially lower under both the low and high outflow scenarios; under the LOS, flows will be reduced between 11.7%-20.4% on average, and under the HOS, flows will be reduced between 5%-18.9% on average. Draft Plan at 5.5.8-21 to 5.5.8-23 (Table 5.5.8-9). Worse, the flow reductions are greatest during above normal and wet years (up to 28% in the HOS and 28.5% in the LOS, *see id*.), the very years in which sturgeon species are likely to spawn. Anticipated average flow decline in the August-March period, when green sturgeon juveniles would be in the lower river, are dramatically lower under BDCP Alternative 4 than under the environmental baseline in the late-long term, and the reductions are greater than those identified above affecting white sturgeon juveniles. For example, flows in September under the low outflow scenario would be 49% less than under the baseline on average across all year types, and 57.4% and 70% lower in the vital above normal and wet years, respectively. *See id.* Substantially lower flows downstream of the new north Delta diversion are expected in nearly every year type of every month under Alternative 4/H3 ("evaluated starting operations"). *See also* DEIS/DEIR Appendix 11C at 11C-284 (Table 28). These significant reductions in flow are likely to result in significant adverse impacts on juvenile survival of both sturgeon species that is contrary to the Draft Plan's conservation objectives. *See* Draft Plan at 3.3-190 (GRST1.1); id. at 3.3-198 (WTST1.1).

Despite these significant reductions in flows and the prior acknowledgement of their importance, the Draft Plan disregards its own findings about the importance of river flows in the lower Sacramento River and about the large changes anticipated under Alternative 4. It identifies rearing habitat has a major stressor on both green and white sturgeon, Draft Plan at 3.3-190, 3.3-198, and it acknowledges that flow management may affect larval and juvenile rearing habitat "upstream of the Plan Area." Draft Plan at 3.3-191. The Draft Plan even concludes with "moderate" certainty that the BDCP will: "… result in a moderate negative change to migration flows for green sturgeon larvae and a low negative change for juvenile green sturgeon in the Feather River, and a low negative change for white sturgeon juveniles in the Feather River." Draft Plan at 5.5.8-19. Despite this, the Draft Plan does not regard the projected huge changes in flow downstream of the north Delta diversion as problematic. Rather, it states:

> <u>Given that most green and white sturgeon occupying the Plan Area are likely to be from the Sacramento River region</u>, it is concluded with moderate certainty that there would be a low negative change to Plan Area flows because of diversions at the north Delta intakes, for juvenile and adult green sturgeon; and for larval, juvenile, and adult white sturgeon … flows on the Sacramento River below the north Delta intakes, <u>the main migratory pathway</u> … would be lower; therefore it is felt that a low negative change is warranted.

Draft Plan at 5.5.8-24 (emphasis added). The conclusion that flow reductions represent a "low" impact change for either sturgeon species is not supported by the best available science, particularly because it impacts "most green and white sturgeon occupying the Plan Area" as they migrate through their "main migratory pathway". In fact, commenting on a previous version of the Draft Plan, the California Department of Fish and Game stated:

> River flows are important to sturgeon production in the Sacramento River system and Delta, and [proposed project] operations are predicted to result in significant occurrences of river flow reduction during the sturgeon spawning and early rearing periods. Reductions are most pronounced in the mainstem Sacramento River downstream of the Fremont Weir and the proposed northern delta intakes, but occurrences of substantial flow reductions are also predicted in more upstream river reaches.
>
> … the [proposed project] is predicted to expose green sturgeon larvae to substantial reductions in July-September Feather River flows in most years.
>
> The collective predicted negative river flow effects of the [proposed project] create the risk of a depressive effect on sturgeon production that may not be overcome by more favorable [proposed project] aspects (e.g. reduced entrainment,

> increased food production supply). This suggests the need to modify the [proposed project] to reduce the magnitude and frequency of river flow reduction occurrences, in both upstream and downstream areas.

CDFW Red Flags 2012 at 2. The Bureau of Reclamation made an analogous observation in its comments on the same earlier draft of BDCP. USBR Red Flags 2012 at 4. These problems have not been resolved in the current Draft Plan or DEIS/DEIR.

The negative effect of reduced flows is likely to extend to areas downstream of the north Delta diversion. The best available science indicates that Delta outflows likely correlate positively with sturgeon rearing success in this estuary. Israel et al. 2009 (citing Kolhorst et al. 1991); USFWS 1995;[73] AFRP 2001 Final Plan; NMFS 2010 Testimony to the SWRCB, Exhibit 9; Fish Agencies 2012 "Scenario 5 Modeling." Consistent with this scientific information, CDFW noted in 2012 that:

> The EA seems to suggest that a reduction in entrainment of juvenile sturgeon at the south Delta offsets (justifies) the effects of reduction in winter-spring outflows. While the statement that "Entrainment of juvenile sturgeon at the south Delta pumping facilities, however, is considered an important stressor for this life stage." may be true, it is not considered to be a more important stressor on sturgeon than reduced winter-spring outflow. Entrainment of juvenile white sturgeon at the south Delta pumping facilities is not a significant stressor, when compared to the loss of winter-spring outflow. Although entrainment of green sturgeon is a somewhat different matter, reducing it in exchange for reducing winter-spring outflow is still not preferred.

CDFW Red Flags 2012 at 1. As noted elsewhere in our comments (*see, e.g.,* discussion *supra* regarding longfin smelt and Delta outflows), operations under all Alternative 4 variants reduce Delta outflows, in some cases severely. Given that the best available science indicates that current levels of Delta outflow are inadequate to maintain or restore many native fish species in the Delta including sturgeon, *see* SWRCB 2010; CDFW 2010; DSP Outflows Review Panel Report 2014, the failure to increase winter-spring Delta outflows from present levels (let alone to decrease them) will perpetuate and likely exacerbate negative impacts to green and white sturgeon.

---

[73] U.S. Fish and Wildlife Service, 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 Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, California.

As with other strong, well-documented relationships between flow and fish species' abundance, the Draft Plan attempts to cast doubt on the effect by pointing to a general lack of consensus regarding the mechanism underlying the effect. Yet this does not justify ignoring the best available science that clearly identifies strong relationships between freshwater flow rates and positive population-level responses among numerous aquatic species in this estuary; one does not need to understand the mechanism of an effect to be certain that a relationship exists and is likely to persist into the future. With regard to the Draft Plan's statement that: "… there is appreciable uncertainty in the mechanisms involved in Plan Area (and other) flows for migration and movement, which would be investigated during BDCP implementation monitoring and research," CDFW previously commented that:

> The assessment effects seems to turn the notion of uncertainty upside down. In general, the Plan reduces winter-spring outflow, and in some regards Sacramento River Flow. There is a strong historical association between flow conditions and sturgeon production, which the EA seems to dismiss, citing a lack of understanding of the mechanisms underlying the association.

CDFW Red Flags 2012 at 1. The best available science indicates with high certainty that green and white sturgeon spawning, larval and juvenile rearing and transport success is positively correlated with the rate of freshwater flows into, through, and out of the Delta. There is no justification for the Draft Plan or DEIS/DEIR to ignore the potential effect of reduced flows in the lower Sacramento River, Delta through-flow, and Delta outflow on these two species. Both the DEIS/DEIR and Draft Plan fail to use the best available science regarding the effects of flow reductions on green and white sturgeon. In particular, the DEIS/DEIR conclusions regarding effects on migration conditions for green sturgeon (AQUA-132),[74] including the conclusion in AQUA-130 that Alternative 4 would not cause adverse impacts on migration conditions and that there are not feasible mitigation measures to reduce impacts under other alternatives are both incorrect; the former ignores the weight of scientific evidence, and the latter ignores changes to operational rules that reduce impacts on Delta inflows, bypass flows, and outflows.

ii. Predation Risk

The DRERIP life history conceptual models for the sturgeon species both indicate that predation may be a concern to the youngest/smallest life stages, when they are in the riverine environment. Israel and Klimley 2008 at 32; Israel et al. 2009 at 36. Reduced turbidity below the north Delta intakes would exacerbate this problem as increased water clarity increases predator efficiency on sturgeon. Gadomski and Parsley 2005a,b,c. The Draft Plan inappropriately assumes that

[74] The DEIS/DEIR's conclusions regarding white sturgeon (AQUA-149 and AQUA-150) lack substantial evidence for the same reasons.

predation rates are not important to either white or green sturgeon larvae or juveniles in the Plan Area (though it is not clear why the location of these life stages in the Plan Area would reduce their susceptibility to predation); nevertheless, it assumes that the BDCP could produce a beneficial reduction in predation throughout the Plan Area. Draft Plan at 5.5.8-14. In fact, the Draft Plan and DEIS/DEIR analytical outputs indicate a substantial risk of increased predation on early life stages of both sturgeon species; this increased risk arises from both the reduced flows (*discussed above*), reduced turbidity, the interaction between the two, and the increased density of predators expected to aggregate close to the CM1 facility, *see* Draft Plan at 5.5.8-14. The US Bureau of Reclamation, commenting on an earlier version of the Draft Plan, specifically requested a more thorough evaluation of the claim that predation of green sturgeon would be a minor effect. USBR Red Flags 2012 at 5. The DEIS/DEIR and Draft Plan do not do so, as we discuss below.

iii. Reduced Turbidity and Predation Risk

Projected diversion of sediment and other suspended particles from the Sacramento River at the north Delta diversion facility are expected to increase water clarity and reduce turbidity throughout the Delta on average. DEIS/DEIR at 11-267. The effect is actually larger than the DEIS/DEIR acknowledges as operations under ESO_LLT are expected to remove well over 20% of the Sacramento River's sediment load in most months April-October. Draft Plan Appendix 5.C, Attachment 5C.D at 5C.D-24 (Figure 5.C.D-11). This is the period when this stretch of river would normally be occupied by larval and juvenile white and green sturgeon. Thus, the reduced turbidity expected under the BDCP in the primary migration corridor for white and green sturgeon juveniles will likely lead to increased predation on young-of-the-year white and green sturgeon, and this adverse impact is inappropriately dismissed in the Draft Plan (*see* Draft Plan at 5.5.8-32) and is not considered or analyzed at all in the DEIS/DEIR.

iv. Predation Risk: Combined Effects

Reduced flows and reduced turbidity below the new north Delta diversion facility (CM1) each represent separate independent threats to white and green sturgeon that the DEIS/DEIR improperly discount or ignore, and the combination of these two effects is expected to exacerbate the increased predation rates that might arise from either of the individual impacts. When river flow rates fall substantially, as they will below the new North Delta diversion, the reduction in volume concentrates predators and prey into a smaller area. In addition, the decline in river volume will also cause a drop in river depth (stage) that will allow sunlight to penetrate through more of the water column, to depths that represent prime sturgeon habitat in many places. Furthermore, diversions at the north Delta facility would be expected to reduce the Sacramento River's velocity and, therefore, its competence to transport suspended sediments that have not been diverted. Thus, diversion of water and suspended sediment by CM1 will increase water clarity, increase light levels in near-bottom environments frequented by both sturgeon, and concentrate predators in a smaller area – it is highly likely that this will increase predation rates on both green and white sturgeon juveniles and larvae; this is likely to represent a severe impact on both species. *See, e.g*., Gadomski and Parsley 2005 a,b,c. The proportional and absolute reduction in fresh water flows and turbidity downstream of the north Delta diversion are expected to be greatest during Wet and Above Normal type water years, the very years in which the most white and green sturgeon young-of-year would be exposed to predation risks. In addition, we note that this combined impact would apply to all species that use the Sacramento River as a primary migration corridor (e.g. all the covered salmonid species).

v. Entrainment/Impingement and Indirect Effects (Predation) at North Delta Diversions

The Draft Plan and DEIS/DEIR fail to adequately analyze the potential effect of a range of entrainment and impingement rates at the new North Delta diversion on green and white sturgeon larval-juvenile survival rates. Entrainment at existing agricultural diversions like that of the Glenn-Colusa Irrigation District is believed to be a stressor of high importance for green sturgeon feeding larvae. Israel and Klimley 2008. White sturgeon spawn downstream of the GCID diversion, so this stressor is not regarded as high currently, Israel *et al*. 2009, but the addition of a new diversion facility in the heart of this species' juvenile rearing grounds is cause for concern. Entrainment rates of juvenile green and white sturgeon at the new North Delta Diversion are unknown; however, the Draft Plan's unsubstantiated dismissal of this potential effect is unsupported by science.

The bypass flow conditions for the new screens (which are unprecedented in the length of river they will cover) were designed to protect migrating Chinook salmon juveniles and Delta smelt. These fish live in the middle and/or upper part of the water column, unlike sturgeon, which are bottom-dwellers. As indicated by green sturgeon's much greater susceptibility to entrainment in unscreened small agricultural diversions, *see* Mussen *et al*. 2014, sturgeon behavior and ability to avoid entrainment and impingement at the CM1 screens are unknown and not analogous to those of salmonid species. Furthermore, as predators are likely to aggregate near the new diversion facility, *see* Draft Plan at 5.5.8-14, the DEIS/DEIR and Draft Plan fail to adequately analyze the effects of increased predation, which is likely to be as much or higher than that affecting salmonids as described above. *See* Draft Plan, Appendix 5.F, Section 5.F.6.3.1.4). The Draft Plan and DEIS/DEIR fail to adequately analyze these impacts, and both documents need to be revised to analyze the effect of greater entrainment, impingement, and predation as a result of the operation of CM1, consistent with the scientific information provided above.

vi. Entrainment at South Delta Diversions:

The DEIS/DEIR overstates the likelihood of positive impacts from reduced entrainment of sturgeon at the south Delta export facilities. Confidence intervals on estimated entrainment at south Delta diversion suggest there are may be no differences among modeled alternatives, particularly for wet years. Draft Plan Appendix 5B at 5.B-270 (Table 5.B.6-206). Thus, reported proportional declines in sturgeon entrainment DEIR/DEIS are misleading, as they represent actual differences amounting to just a few fish and there is little confidence that these effects are real, given error bounds around the estimates. NMFS identifies entrainment as a problem for this species; thus, if there is no real change in entrainment rates under modeled alternatives, then entrainment may continue at unacceptably high rates. It is possible that entrainment at the south Delta facilities will decline in dry years at the CVP, but again the differences are not as great as the raw percentages might suggest.

vii. Temperature and Flow – Upstream Effects

Both the Draft Plan and DEIS/DEIR suggest that temperature and flow impacts to green sturgeon may occur upstream, particularly on the Feather River. We have indicated our concern with elevated temperatures and reduced flows in our discussion of potential impacts of the BDCP to salmonid populations, and there are similar concerns with regard to the potential impacts to green and white sturgeon. In particular, the DEIS/DEIR indicates that temperatures will exceed the 64^{o}F threshold at Gridley (on the Feather River) with much greater frequency during the July-September period and that this negative effect will be most common in the Above Normal and Wet years when rearing sturgeon larvae and juveniles are expected to be most abundant. DEIS/DEIR at 11-1576. Similarly, exceedances of the temperature threshold identified for rearing green sturgeon larvae and juveniles would increase under Alternative 4/H3 on the Sacramento River at Bend Bridge in July-September. DEIS/DEIR at 11-1578 (Table 11-4-104). This table contradicts the DEIS/DEIR claim that there would be no difference in mean monthly temperatures at Bend Bridge in any month or water year type and therefore no impact to green sturgeon rearing habitat. DEIS/DEIR at 11-1588. The temperature appendix reveals that temperatures during the green sturgeon rearing period are expected to increase compared to those currently experienced. DEIS/DEIR, Appendix 11D at 11D-268 to -269 (Table 2). In other words, there will be a significant impact of elevated temperatures in the Sacramento River to rearing green sturgeon juveniles.

The DEIS/DEIR inappropriately dismisses these temperature exceedances and ignores scientific evidence indicating this is a stressor of "medium" importance and certainty to green sturgeon. *See* Israel and Klimley 2008; NMFS 2009 Biological Opinion at 712. In discussing the impacts of temperature changes driven by proposed BDCP operations, the DEIS/DEIR fails to look at cumulative impacts and implies that perceived positive effects to green sturgeon eggs and early larvae will offset the negative effects to later life stages of the same fish; it states:

> Water temperature-related effects of H3 on green sturgeon rearing habitat in the Feather River were also evaluated by determining the total degree-months exceeding the 64°F temperature threshold at Gridley (Table 11-4-102). Combining water years, total degree-months exceeding the threshold under H3 would be 8% to 31% lower relative to NAA during May and June and 13% to 126% higher during July through September. These results indicate that there would be both beneficial and negative temperature-related effects to green sturgeon rearing in the Feather River.

DEIS/DEIR at 11-1587. Increasing survival of green sturgeon eggs (as the DEIS/DEIR asserts will occur), cannot be reported as a positive effect if, as the analysis reveals, high temperatures will impair or kill the resulting larval and juvenile life stages of these fish. Thus, the DEIS/DEIR's statement that Alternative 4 operations will not impact juvenile rearing habitat for green sturgeon is without scientific support. DEIS/DEIR at 11-1586. As a result, the DEIS/DEIR's conclusions regarding effects on rearing habitat for green sturgeon (AQUA-131) and white sturgeon (AQUA-149) lack substantial evidence and are contrary to the best available science.

viii. Conclusion

As discussed above, the Draft Plan and DEIS/DEIR fail to use the best available science and fail to adequately analyze likely impacts on green and white sturgeon. Contrary to findings and conclusions in the DEIS/DEIR, the project is likely to cause significant adverse impacts to green and white sturgeon spawning, rearing habitat, migration success, and abundance. Projected benefits associated with modeled reductions in entrainment at the existing south Delta diversion facilities are overstated. The DEIS/DEIR must be revised, and the Draft Plan and DEIS/DEIR must propose mitigation measures and operational changes to increase flows and otherwise reduce or avoid such impacts.

G. Fall-Run and Late Fall-Run Chinook Salmon

Fall-run Chinook salmon and late fall-run Chinook salmon merit conservation as independent and distinctive lineages. Smith et al. 1995; Moyle 2002. Thus, regardless of the population designation, it is clear that at a minimum, late fall-run warrant conservation efforts that maintain their distinctiveness from other Central Valley fall-run Chinook as an important life history variant. *See also* NMFS 2009 Biological Opinion at 181 (showing differences in life history timing between the different runs in the Central Valley). In particular, late fall-run Chinook salmon are mostly "stream-type" Chinook salmon as opposed to fall-run Chinook salmon which are typically "ocean-type" Chinook salmon. Moyle 2002. This is a basal life-history distinction within Chinook salmon, Healy 1991, which indicates, among other differences, that late fall-run Chinook salmon juveniles tend to rear in freshwater for many months (up to one year) whereas fall-run Chinook salmon migrate to the ocean quickly, usually in less than half a year. Moyle 2002 at 255. Thus, when late fall-run Chinook salmon reach the Delta, they generally follow a "migrant" strategy (meaning they do not rear much or for long in the Delta) and fall-run Chinook salmon juveniles are much more likely to forage or rear in the Delta.

The difference in these two strategies has implications for the distribution of positive and negative effects among late fall-run and fall-run juveniles. For example, late fall-run juveniles are unlikely to benefit much from efforts to improve prey productivity in the Delta. Williams 2010. In contrast, fall-run Chinook juveniles are among the salmonids most likely to benefit from improved rearing conditions in the Delta because they actually tend to rear in downstream environments. On the other hand, fall-run Chinook salmon juveniles migrate to the Delta at smaller sizes than late fall-run juveniles and they are thus more likely to suffer from increased predation pressure and altered delta hydrodynamics that would lead to entrainment or other sources of mortality following diversion from an optimal migratory path. Clearly, the different adult migration timing of these fish exposes them to different flow rates and temperatures during their adult migration, spawning, and egg incubation phases – juveniles also migrate at different times with late fall-run arriving in the Delta in the late fall-winter while fall-run Chinook salmon juveniles enter the Delta primarily between March and June. Moyle 2002; Williams 2006.

The Draft Plan appropriately sets different through-Delta survival objectives for fall-run and late fall-run Chinook salmon. However, two other objectives regarding the maintenance of spawning and rearing conditions upstream of the new water facilities (FRCS3.1 and FRCS3.2, *see* Draft Plan at 3.3-162), treat the late fall-run and fall-run Chinook salmon life history variants cumulatively. In keeping with the genetic and eco-phenotypic differences between these two runs, the Draft Plan appropriately provides separate analyses of effects for late-fall and fall-run Chinook salmon. However, despite the separate analyses, the Draft Plan and DEIS/DEIR tend to interpret different results for the two runs as though they were the same result. More importantly, we see no indication that the Draft Plan will accomplish the objective of benefiting both life history types equally. As with most other objectives, the DEIS/DEIR does not compare projected outcomes to those described by the conservation strategy objectives.

1. <u>The Draft Plan and DEIS/DEIR Overstate Potential Benefits Within the Plan Area and Underestimate Environmental Impacts, the Available Scientific Information Demonstrates that the Draft Plan is Unlikely to Achieve its Biological Objectives, and the Analyses Predict that the BDCP will Fail to Conserve Both Runs in the Plan Area</u>

i. Upstream Adult Migration

The Draft Plan finds that olfactory cures for migrating adult salmon will be changed differentially for fall-run and late-fall run Chinook salmon. Specifically, the strength of olfactory cues to migrate towards the Sacramento River (i.e., the proportion of water in key Delta channels that emanates from the Sacramento River) declines under ESO operations by 10% for fall-run Chinook salmon and 50% for late-fall run Chinook salmon. Draft Plan at 5.5.5-25. Given these reductions, the Draft Plan concludes with low certainty that there will be a low magnitude negative impact for both fall-run and late-fall run adult migrants trying to orient towards the Sacramento River. The Draft Plan provides no rationale as to why both runs would experience low magnitude and low certainty negative effects given the vast difference in proportional impact to flows experienced by the two runs; it seems that the late-fall run should experience a greater impact, with greater certainty, than for fall-run given the larger projected decline (50%) in the indicator of olfactory cues for late-fall run Chinook salmon. In fact, the DEIS/DEIR implies a threshold for effect on adult salmon migration of proportional declines in flow that are 10%, but, contrary to the Draft Plan, it finds that the proportion of Sacramento River flow in the Delta will only be 10%. DEIS/DEIR at 1458. The difference between Draft Plan and DEIS/DEIR predictions of Sacramento River proportional flow reduction must be resolved in order to allow evaluation of impacts on late-fall run Chinook salmon adult migrants.

ii. Spawning, Incubation, and Rearing (Upstream)

The Draft Plan and DEIS/DEIR understate and downplay negative impacts to fall and late-fall run Chinook salmon upstream of the Delta that are related to project operations under Alternative 4. The DEIS/DEIR reports an increase in years with adequate available spawning area for fall-run Chinook salmon on the Sacramento River under Alternative 4, but also report an increased frequency of years where dewatering of redds will be a problem for Chinook salmon (particularly in November). DEIS/DEIR Appendix 11c at 11C-225. Dewatering of fall-run Chinook eggs is already a problem for Sacramento River fall-run, *e.g.* SRTTG 2013, and, it is important to note that flow levels in this spawning area that cause redd dewatering are almost completely under the control of the CVP at this time of year. The DEIS/DEIR estimate a 7% increase in years when redd dewatering will be problematic; this is a significant impact, regardless of the perceived increase in frequency of “good” availability of spawning habitats –

fish that spawn in habitats that will eventually be dewatered obviously do not benefit from any increase in spawning habitat availability.

In addition, the projected increase in available spawning habitat ignores the anticipated increase in water temperature downstream of Keswick Dam during September and October in almost every year type under Alternative 4/H3 as compared to the NAA. *See, e.g.*, DEIS/DEIR at 11D-257. Though small in relative terms, these projected increases in temperature would be expected to negatively affect available fall-run spawning habitat and egg incubation success. Temperatures are already at or near threshold for Sacramento River fall-run Chinook salmon in many years and, judging from the comparison of temperatures under existing conditions and those under Alternative 4/H3, temperatures problems will increase in the future; thus, even small (proportional) increases in temperature under H3 relative to NAA likely represent large impacts to incubating fall-run Chinook salmon eggs. In fact, the DEIS/DEIR reports increases in egg mortality of 5% or more in most years under Alternative 4/H3 relative to the NAA. The magnitude and frequency of egg mortality increases for fall-run Chinook salmon eggs is of great concern. The DEIS/DEIR reports that “Total degree-days exceeding 56°F … under H4 would be 10% higher than those under NAA during March and similar during remaining months (Table 11-4-68).” DEIS/DEIR at 11-1412. Temperature exceedances during March are likely to result in extra mortality to fall-run Chinook salmon eggs and juveniles rearing on the upper Sacramento River, an impact to run productivity; in addition, the asymmetrical impact to those fall-run Chinook salmon that incubate towards the end of this run’s incubation period represents a negative impact to fall-run Chinook salmon life history diversity.

Similarly, SacEFT projects a 5% decrease in years when juvenile rearing conditions will be considered “good” for fall-run juveniles on the Sacramento River upstream under Alternative 4/H3 operations. DEIS/DEIR at 11-1393 (Table 11-4-56). The net impact of increasingly frequent occurrence of years that are “not good” for fall-run Chinook salmon redds or rearing juveniles cannot be good for fall-run Chinook salmon; but, the magnitude of the impact depends largely on how “bad” conditions become and whether bad conditions for redds overlap years with bad conditions for juveniles.

Temperatures exceeding fall-run Chinook egg tolerances are expected to increase in some year types, during either October or November, under Alternative 4/H3 on the Feather River. DEIS/DEIR at 11-1397 (Table 11-4-61). Increased temperature exceedances are also expected during September in most years under H1. DEIS/DEIR at 11-1354 (Table 11-4-41). Furthermore, comparison to current conditions indicate that temperatures on the Feather River will exceed egg incubation thresholds much more frequently in the future than under current conditions; this indicates that the BDCP will not be implemented in a way that would mitigate for expected temperature effects related to climate change. As a result, Feather River fall-run Chinook salmon spawning will be substantially impacted in a future with BDCP.

The frequency of years with "good" rearing habitat conditions for late-fall run Chinook salmon in the upper Sacramento River are projected to decline by 33% in Alternative 4/H3 as compared to the No Action Alternative. DEIS/DEIR Table 11-4-58 at 11-1394. Furthermore, the frequency of years with increased risk of juvenile stranding would increase by 9% between the two scenarios. Finally, the projected 10% increase in temperature exceedances in late-fall run Chinook salmon incubation habitat on the upper Sacramento River during March (referenced above) will likely lead to increased egg mortality for this run under Alternative 4/H4.

The DEIS/DEIR finds that "collectively" there will be no adverse impact of the BDCP to egg incubation conditions for fall-run Chinook salmon on the Sacramento River. DEIS/DEIR at 11-1415. This finding is not supported by the DEIS/DEIR analyses which reveal negative impacts to abundance, productivity, and life history diversity of fall-run Chinook salmon resulting from increased occurrence of high temperatures and red dewatering. The DEIS/DEIR concludes that Alternative 4 operations will not result in significant impacts to juvenile rearing conditions for fall or late-fall run Chinook salmon upstream on the Sacramento River; however, its rationale is confused, as it states:

> Changes in flow rates and water temperatures are generally small and infrequent under Alternative 4 relative to the NAA. Therefore, there would be no biologically meaningful effects to fall- or late fall-run Chinook salmon, <u>except for a moderate reduction in juvenile rearing habitat for late fall-run Chinook salmon</u> as predicted by SacEFT. Because this effect is isolated, it would not cause the impact to be adverse, particularly in combination with modeled flow outputs indicating that flows, which drive rearing habitat availability, would increase during the rearing period.

DEIS/DEIR at 11-1435 (emphasis added). This statement is inaccurate and the DEIS/DEIR fails to demonstrate how the reduction in surviving juveniles as a result of increased redd dewatering is somehow outweighed by improved conditions later in the year (obviously, eggs in dewatered redds will die rapidly and they will not be resurrected by subsequent flows). In addition, the DEIS/DEIR points to increased frequency of other relatively severe outcomes, such as egg incubation temperature exceedances, and large increases in the frequency of sub-optimal rearing conditions for fall-run and particularly for late-fall run Chinook salmon.

In summary, the DEIS/DEIR's projections of degraded upstream egg incubation, rearing and juvenile rearing conditions represents a significant impact to fall-run and late-fall run Chinook salmon. Impacts of Alternative 4 to late-fall run Chinook salmon are severe in the only remaining river that supports this life history; declines in the abundance and productivity of this run represent a significant loss to valuable life history diversity for the Central Valley fall-run

ESU overall. Furthermore, the DEIS/DEIR demonstrate large negative impacts to fall-run Chinook salmon incubation and juvenile rearing in the Sacramento River drainage. The available scientific information demonstrates that Alternative 4 will cause negative impacts upstream to the fall-run/late-fall run Chinook salmon ESU.

iii. North Delta Diversion Survival

The Draft Plan and DEIS/DEIR simply assume that screens on the new north Delta diversion will function perfectly and consistently throughout the life of the BDCP. The Draft Plan's Effects Analysis asserts that there is a "moderate" level of certainty that the effect will be "low." Draft Plan at 5.5.4-23. But this is contradicted by the Draft Plan's Appendix 5B, which declares that it was not possible to be certain about the level of impact these screens will have on either Chinook salmon or steelhead. Draft Plan, Appendix 5B at 5B-304. The DEIS/DEIR should have considered what would happen if the assumption of negligible entrainment was incorrect, even periodically (i.e. what if damage to, imperfect maintenance, or malfunction of the screens occurs with "x" frequency and results in "y" entrainment rate for a duration of "z" weeks?).

The DEIR/DEIS ignores analyses that show negative impacts of additional predation at the north Delta diversion facility. In addition to the bioenergetics model results presented in the DEIS/DEIR, the Draft Plan (Appendix 5F) also applies a fixed predation model, based on observed entrainment rates at the Glenn-Colusa Irrigation District diversion screens. These screens are somewhat similar to those proposed for the NDD. The two estimates of potential predation at the new facility provide strikingly different predictions of predation on Chinook salmon; the bioenergetics model indicates predation rates at the NDD will be <1% for all Chinook populations, whereas the fixed predation model estimates ~12-13% loss of juvenile migrants at the NDD for each population of Chinook salmon. Both models cannot be correct and the Draft Plan and DEIS simply ignore the result showing significant predation at the north Delta diversion. *See, e.g.*, Draft Plan Appendix 5F at 5.F-77. In reporting only the results that are more favorable to the BDCP, the Draft Plan and DEIS/DEIR miss the opportunity to learn from the different outputs of the two models and fail to inform decisionmakers and the public of the potential that these impacts may be more significant than reported in the documents. As the Delta Independent Science Review Panel noted, the high mortality of Chinook salmon at the GCID screening facility indicates that predators may aggregate near that structure, suggesting this risk exists for the NDD. DSP Independent Science Review Panel Report 2014 at 52. Thus, the difference between the two modeling approaches applied by the Draft Plan's appendix could reveal that the range of predator densities at the GCID facility or their metabolism is greater than those that were input to the bioenergetics model. The bioenergetics model methodology used to calculate potential predation rates arising from the presence of the North Delta diversion apparently would not predict existing mortality rates at the GCID screening facility; thus, a larger range of predator densities should have been modeled. Instead, the DEIS/DEIR and Draft

Plan simply assume that the high predation predicted by the fixed predation model was completely wrong (despite the fact that it's based on a relevant, recent, local observation). This assumption is not scientifically justified.

iv. Through-Delta Survival of Late Fall-Run

The effects analysis provides no compelling evidence that late-fall run Chinook salmon through-Delta survival success will improve under ESO conditions as compared to the environmental baseline (with equivalent assumptions regarding climate change). For example, the Delta Passage Model (DPM; which may actually be applicable to late-fall run Chinook salmon, though it is not appropriate for modeling other runs) finds very small differences in the early or late long-term between Alternative 4/H3 operations and current operations. Draft Plan at 5C.5.3-98 (Table 5C.5.3-49); DEIS/DEIR at 11-1458 (Table 11-4-76).

The DPM results are likely to underestimate negative effects of BDCP on through-Delta survival of late-fall run Chinook migrants because of reduced flows, decreased turbidity, and the potential for increased predator exposure. The reductions in flow and other changes below the new intakes are likely very different from the conditions that were used to generate DPM. Operation of CM1 will lead to significant reductions in flow rates downstream of the facility and will cause an increase in water clarity (due to diversion of sediment and loss of river velocity needed to support sediments that remain) and increase in the river's width-to-depth ratio (WDR; i.e., a drop in river stage). Flow rates and turbidity are strongly and positively correlated with late-fall run Chinook salmon survival through the Delta and WDR is strongly and negatively correlated with late-fall run survival. Michel 2010; Michel et al. 2012; *see* Perry et al. 2010. Thus, the changes anticipated under operation of CM1 are beyond the range used to create the relationships in the DPM model and all strongly indicate that late-fall run Chinook salmon are likely to suffer significant impacts in the lower Sacramento River. Furthermore, even the relative success of late-fall run migrants through different Delta channels is likely to change under CM1 operations as predator distribution and success rate may change as flows, turbidity, and depth in the mainstem Sacramento River drop, following operation of the new north Delta diversion.

As the Draft Plan notes, DPM does not account for "growth benefits related to floodplain and tidal wetland restoration," Draft Plan Appendix 5C at 5.C.5.3-65, but even if marsh restoration is successful, (a) late-fall run Chinook salmon juveniles generally follow a migrant strategy, *see* Michel 2010; Williams 2006; Williams 2010, and are thus not likely to use or benefit from those habitats, and (b) salmon rearing in tidal marsh habitats should be expected to experience *additional* mortality in the Delta (though potentially better post-Delta survival) because predation exposure will increase as time in the Delta increases and as foraging behavior increases. Helfman et al. 1997.[75] Furthermore, DPM does not account for increased in-Delta mortality to migrating late-fall Chinook salmon that is likely to result from decreased turbidity under the BDCP (e.g. as a result of CM1 operation, sediment loss in restoring wetlands, CM4, etc.). Thus, DPM outputs are expected to overstate survival of late-fall run Chinook salmon through the Delta. In addition, the analysis provides no basis for concluding that the Draft Plan is likely to achieve the applicable through Delta survival objective and instead demonstrates that the Draft Plan is unlikely to achieve that biological objective for this species.

v. Through-Delta Survival of Fall-Run

It is well established that fall-run Chinook salmon experience greater survival through the Delta when river flows increase. Kjelson and Brandes 1989; Newman and Rice 2002. In-Delta flows in the Sacramento River channel are projected to decrease substantially once the new North Delta diversion (CM1) begins operations. Thus, the DEIS/DEIR and Draft Plan should anticipate that survival of fall-run Chinook salmon migrating through the Delta in the Sacramento River will decline substantially. Instead, the DEIR/DEIS and Draft Plan fail to adequately analyze survival rates of fry and parr fall-run Chinook salmon in the Delta, despite the fact that this represents most fall-run Chinook salmon migrating into the Delta.

DPM is not an appropriate tool for modeling cumulative fall-run Chinook salmon through-Delta survival rates because most fall-run Chinook salmon enter the Delta as fry or parr (foraging fish). Moyle 2002; Williams 2006. DPM is based on the relative success of migrant-strategy, hatchery-produced salmonids (such as late-fall run Chinook salmon) and thus cannot be used to understand fry and parr mortality in the Delta. Draft Plan at 5.C.5.3-65). We note that foraging fall-run Chinook salmon should be expected to experience higher through-Delta mortality than migrant strategy fish because (a) they are smaller, (b) they spend a longer time in the Delta, (c) foraging exposes fish to additional risk of predation compared with migratory behavior. Even applying DPM to large fall-run (or spring-run) smolt is subject to significant caveats as these fish migrate through the Delta in a different season than do late-fall run salmon; there is no reason to expect that survival rates (and even relative survival rates) in Delta channels remain unchanged across seasons as numerous influences on predator efficiency (temperature, light penetration, SAV coverage, etc.) may all change seasonally.

The Effects Analysis applies a modification of Newman's (2003) methodology to estimate survival of fall-run smolt survival through-Delta under different Alternative 4 scenarios. Again, smolts are expected to be a small fraction of fall-run entering the Delta. EBC2_LLT outperforms both ESO and HOS in the early long term, meaning that fall-run survival through the Delta is

[75] The Draft Plan and DEIS/DEIR ignore the likely positive relationship between increased in-Delta rearing time and total in-Delta mortality in their discussion of all salmonids.

lower under the Draft Plan than under the status quo. Draft Plan Appendix 5C at Tables 5C.5.3-115 and 5C.5.3-117. In the late long term, through Delta survival is higher under the baseline (EBC2_LLT) than under ESO. *See* Draft Plan at 5C.5.3-238 (Table 5C.5.3-116). Under HOS in the late long term, through Delta survival is similar to and may slightly exceed the baseline. Draft Plan at Table 5C.5.3-117. It is not clear that any of these results is statistically significant, and the Draft Plan should analyze these results using statistical techniques appropriate for paired model observations. Whatever the outcome, it is apparent that differences in through-Delta survival (if there are any) as estimated by this modification of the Newman (2003) methodology will be slight – not enough to claim any benefit to fall-run Chinook salmon smolt survival through the Delta and certainly not enough to achieve the Draft Plan's objectives for through Delta survival (FRCS1.1).

The DEIS/DEIR projects no overall change in through Delta survival for fall-run Chinook salmon migrating through the Delta from the San Joaquin River; decreases in through-Delta survival of ~3% in wet year survival are expected to be balanced by improvements in survival of ~1% during dry years. DEIS/DEIR at 11-1459. Setting aside the fact that the small projected changes in through-Delta survival are not equal (and would only "balance" if dry years were more frequent than wet years), the analysis demonstrates that the Draft Plan is likely unable to improve through-Delta survival rates of fall-run Chinook as specified in the biological objective for this species (objective FRCS1.1). Moreover, current rates of through-Delta survival are expected to lead to extirpation of fall-run Chinook emigrating from the San Joaquin basin in the very near future. Draft Plan Appendix 3G; NMFS Comments on the Phase I WQCP Update. We note that benefits to San Joaquin River fall-run Chinook salmon that are assumed to arise from measures in the conservation strategy (e.g. as described at 3.3.-158 through 159) cannot offset the impacts if fall-run Chinook salmon continue to suffer with status quo levels of through-Delta survival.

H. Delta Smelt

1. Draft Plan Objectives for Delta Smelt are Inadequate to Attain the NCCPA Standard for this Species

The Delta smelt geographic range for spawning, egg incubation, and early rearing fall is almost entirely contained within the Plan Area. *See, e.g.*, Moyle 2002; Bennett 2005; Nobriga and Herbold 2009; DEIS/DEIR at 11-1300. Thus, as discussed above, under the NCCPA the BDCP must provide conservation measures sufficient to achieve conservation (recovery) of this species.

The Draft Plan identifies a global goal for Delta smelt to "Remove delta smelt from the state and federal lists of endangered species through restoration of its abundance and distribution" Draft Plan at 3.3-107. The Draft Plan lists three global objectives that it believes, if attained, will lead to attainment of the global goal (objectives define goals in SMART terms). The objectives relate to increased abundance, reduced entrainment, and increased spatial distribution of this species. However, the Draft Plan completely ignores the need to maintain or restore the historical range of life history variation of Delta smelt that is so important to its future viability. *See* Bennett 2005; Nobriga and Herbold 2009.

The Draft Plan appears to adopt the USFWS 1996 Draft Recovery Plan's global objective for spatial distribution of Delta smelt. Draft Plan at 3.3-107. This global objective is inadequate as it disregards the large portion of Delta smelt's historic range and historic spawning habitat (including the Central Delta and San Joaquin River, *see* Wang 2007). USFWS 1996 Draft Recovery Plan at 16. The USFWS correctly identifies the need to restore Delta smelt to its historic (1967-1981) distribution prior to de-listing. USFWS 1996 Draft Recovery Plan at 21. But its specific description of that range is inappropriately narrow. Also, as written, the Draft Recovery Plan's objective (and thus the BDCP's global objective) for spatial distribution allows for the species to be detected in just one sampling locality in 40% of years – for a species that is critically imperiled because of its limited geographic range, such an outcome cannot represent success of a conservation plan. The Draft Plan includes several measures that it claims will benefit Delta smelt in the south Delta, including reducing exports from the south Delta pumping facilities (CM1) and restoring shallow sub-tidal habitats in the south Delta ROA, e.g. Draft Plan at 3.3-112; thus, the Draft Plan should acknowledge its intent to restore Delta smelt to their historic range, including in the south Delta.

The BDCP-specific set of these objectives calls for (1) improving fecundity, (2) limiting entrainment, and (3) achieving target abundance. Draft Plan at 3.3-108. The first two of these objectives are related to the productivity attribute of viability while the third objective is related to the abundance viability attribute. *See* McElhany et al. 2000. The first two of these "abundance" objectives actually relate to "productivity", as they address biological rates, not threshold values of abundance or ecosystem capacity to maintain abundance levels. The first (DTSM1.1) calls for increases in Delta smelt fecundity – this is a laudable target, but the statement has none of the specificity required of SMART objectives. What does it mean to "increase" fecundity? How much? And by when must this increase occur? DTSM1.1 does not provide answers to these questions; thus, it is not useful in guiding development or evaluation of restoration actions in the Draft Plan or in guiding adaptive management of the BDCP following implementation. Without more specificity, it is not possible to know how actions described by this or other Plans will contribute towards attainment of this biological outcome.

The second of the Delta smelt targets related to productivity calls for limiting entrainment of Delta smelt. As described for longfin smelt (the parallel objectives are nearly identical), DTSM1.2 is inadequate to conserve or restore Delta smelt. First, there is no time-bound for this objective. Second, the objective is less protective of Delta smelt than protections already offered by the USFWS 2008 Biological Opinion; for instance, because the target is constructed as a 5-year running average, extremely high rates of entrainment (i.e. up to 25%) can occur in a single year without triggering a response from BDCP's implementing agency and adaptive management process. USFWS 2008 at 387; *see* discussion *supra*. Such a result could be devastating to the population. *See* Kimmerer 2011. Also, as the Draft Plan notes, entrainment rates are highly variable due to environmental conditions in any year, and measuring entrainment as a 5-year running average obscures the impact of measures identified in the Draft Plan that are intended to reduce entrainment as these effects are conflated with "natural" variance in entrainment and entrainment-related risk.

Again, we note that the second component of the DTSM1.2 (assure that entrainment risk is evenly distributed over the adult migration and larval-juvenile life stages) is not adequately described to allow us to understand what this target will accomplish or how it will be implemented. As with the similar longfin smelt entrainment objective, this component of the "entrainment objective" could easily be made into its own "life history diversity" sub-objective or stressor reduction target and defined as a limit on entrainment on a short, within year time step (e.g. a maximum entrainment of x% in any one or two week period). Such an objective would limit disproportionate entrainment impacts on any one temporal segment of the critical life stages of this species. Combined with a single-year limit (e.g. ≤5%) and a 5-year running average (e.g. ≤3%), a within-year time step would provide protection against entrainment impacts to life history diversity, productivity, and abundance.

Furthermore, this Delta smelt "objective" is actually a stressor reduction target, as is the parallel target for longfin smelt. Although entrainment rates are an important source of Delta smelt mortality that the BDCP must reduce, they are not the only factor related to Delta smelt productivity (population growth rate potential).[76] The Draft Plan should have an objective for Delta smelt survival rates (productivity) of larval, juvenile, and sub-adult Delta smelt that complement its stated (though non-specific) objective for increased fecundity. Both of these productivity objectives should be consistent with the goal of delisting the species as quickly as possible; SMART targets for reducing particular stressors (e.g. entrainment) to levels that will allow attainment of the required survival objective should be clearly articulated as stressor reduction targets. However, substituting biological outcomes (productivity expressed as survival and/or fecundity rates) for particular strategies chosen to achieve those outcomes (e.g. reduction in entrainment) inappropriately narrows the options available to achieve desired biological

[76] This omission is partially (though inadequately) resolved in the BDCP-specific objectives for Delta smelt which identify a target for fecundity (another driver of population growth potential) and in the conservation measures for this species which seek to address other sources of mortality for this species. The scattering of components of species' productivity across the Draft Plan's conservation strategy for Delta smelt represents its general confusion about attributes of species' viability and the function of different levels of the logic chain framework for conservation planning.

conditions. In other words, even were entrainment rates reduced more than is called for in the Draft Plan target, desired productivity (population growth rates) for Delta smelt might not be achieved if other forces (water quality, predation) limited survival rates; attainment of the Draft Plan's targets ("success") while failing to produce desired levels for each attribute of species viability does not represent success.

Similarly, another objective for Delta smelt sets targets to "increase the extent of suitable habitats…" Draft Plan at 3.3-111. This objective in the Draft Plan inappropriately changes from a spatial distribution objective that defines a desired biological outcome (expressed in the parallel global objective as detecting Delta smelt in various areas throughout the Plan Area, *see* Draft Plan at 3.3-107) to creating "habitat" – the two are not the same. The current BDCP objective DTSM2.1 is actually a stressor reduction target and, as defined, is more related to providing the habitat capacity the Draft Plan believes to be necessary to support Delta smelt abundance. The term "habitat" can encompass everything from physical characteristics to biotic interactions (and the Draft Plan does describe these to a certain extent) and, in choosing so vague a term as "habitat" to supplement the very specific desired outcome (repeated detection of Delta smelt successful use of various areas), the Draft Plan immediately loses focus on what needs to happen to restore this species to a geographic range that will represent a viable Delta smelt population. For example, whereas the inadequate global objective at least specified the frequency with which Delta smelt must be detected in certain areas, the BDCP-specific objective states only "Suitable habitat for delta smelt should also be distributed geographically within the Plan Area to provide a diversity of habitat locations for delta smelt." Draft Plan at 3.3-112; this is not a SMART objective and thus obscures the Plan's intentions and limits the ability to rectify inadequate performance, because adequate performance has not been defined.

Thus, the Draft Plan has no adequate SMART target for improving and conserving the spatial extent of Delta smelt. The erosion of the Delta smelt's geographic range is a major concern for this species' conservation and restoration as they have an extremely small spawning range, that is much-reduced from historical conditions. USFWS 1996; Bennett 2005; Nobriga and Herbold 2009. Restricted geographic ranges (i.e., the area encompassed by successful spawning at the population-level) are well-correlated with extinction risk among freshwater fishes. Rosenfield 2002. The same is true for other species. *See* Macarthur and Wilson 1967; Meffe and Carrol 1994; Laurance et al. 2002. In fact, the Draft Plan identifies a "limited geographic range" as a threat to this species, *see* Draft Plan at 3.3-98, and it defines restoration of spatial distribution as global goal and objective for restoration of Delta smelt, *see* Draft Plan at 3.3-104. It also claims that the conservation measures will improve spatial distribution of juveniles and pre-spawning adults. *Id*. at 3.3-99. But neither the global objective nor BDCP-specific objective will ensure an adequate *spawning range* for this species, which is increasingly confined to the northwest corner of the Delta. The Draft Plan objective (and stressor reduction targets and conservation measures that flow from them) must provide for increased distribution of spawning among Delta smelt into the central Delta and lower San Joaquin River. Delta smelt spawning, larval, and post-larval distribution is closely tied to Delta outflow and salinity. *See, e.g.,* Dege and Brown 2004; Bennett 2005; Nobriga and Herbold 2009. Both Delta outflow and salinity would be heavily influenced by water project operations and restoration actions under the Draft Plan. The failure to adequately define necessary spatial distribution targets for this species (which arguably experiences immediate risk from its severely constrained geographic range that is equal to or greater than the risk it experiences from its extremely low abundance), and to design measures to alleviate this risk, is a serious shortcoming of the Draft Plan's strategy to conserve and restore Delta smelt.

As noted above, the Draft Plan identifies no target to conserve and restore life history diversity among Delta smelt. Differential impacts to certain life history variants has been identified in Delta smelt and it is believed that diversity in spawning timing, growth rates, repeat spawning, and fecundity play a critical role in the Delta smelt population. Bennett 2005; Nobriga and Herbold 2009. The Draft Plan's entrainment objective for Delta smelt (DTSM1.2) actually suggests the benefit of protecting life history diversity in this species, as it states that entrainment should, "Assure that proportional entrainment risk is evenly distribution over the adult migration and larval-juvenile rearing time periods." Draft Plan at 3.3-104. This clause is not defined adequately (not SMART) to allow for evaluation of its effects or implementation through conservation actions. Also, the Draft Plan states as a "landscape objective" for Delta smelt the extremely general intent to "Maintain or increase the diversity of spawning, rearing, and migration conditions for native fish species in support of life history diversity," Draft Plan at 3.3-99, but it contradicts that intention stating that "maintaining or increasing life-history diversity is not as applicable to delta smelt [because] delta smelt do not have the range of life-history strategies…that species such as Chinook salmon have," Draft plan at 3.3-100. This statement is simply false. For instance, otolith studies have shown significant variation in life history strategies and differential survival rates depending upon the timing and location of spawning and rearing. *See, e.g.*, Hobbs et al. 2007; USFWS 2011 at 173 (draft biological opinion). As elsewhere, the Draft Plan's failure to identify objectives that represent desired outcomes for each attribute of species viability (as opposed to targets for reduction of stressors the Draft Plan *believes* will produce those desired outcomes) impedes its ability to develop specific, measureable targets that can be used to (1) evaluate the Draft Plan prior to implementation, (2) determine its progress towards these targets and adjust, as necessary, following implementation, (3) identify stressors that impede attainment of the targets, and (4) design conservation measures that provide the right level of benefit to the species. In this case, the failure to develop specific metrics for measuring the maintenance or restoration of life history diversity among the Delta smelt population is a key failing of the Draft Plan; Delta smelt are threatened by human-induced loss of critical life history diversity, *see* Bennett 2005, and this threat will be allowed to persist (and may be increased) under the Draft Plan.

Even the objectives that the Draft Plan does specify are inadequate to conserve the species in the Plan Area. The Draft Plan's biological objective for abundance (objective DTSM1.3, *see* Draft Plan at 3.3-108) is inadequate. The objective, while specific, measureable, achievable, and relevant to its associated goal, is not time-bound. There is no indication of *when* the Draft Plan intends to achieve this target. Without a specific time-bound, no trigger exists to force an evaluation of progress towards the target – without a specific trigger, adaptive management is unlikely to occur. Moreover, this objective only requires that its targets, to achieve a Recovery Index ≥ 239 for at least two years of *any* consecutive 5-year period, are achieved once; as written, the Delta smelt population can decline swiftly after attaining this target one time. Even the "floor" of the objective (limiting any two consecutive years to a mean Recovery Index of 84) can result in extinction without violating the objective; for instance, if the Delta smelt Recovery Index in one year is 169, then extinction (Recovery Index of 0) could occur the next year without causing the 2-yr average to drop below 84. The abundance objectives for Delta smelt must be rewritten to prevent extinction (e.g., establishing minimum values for any 1 year) and to require a high level of performance after attaining intermediate targets (e.g., after hitting 239 on the Recovery Index).

As currently drafted, these objectives for Delta smelt are inadequate, and the objectives in the Draft Plan should be revised consistent with these comments.

2. <u>The Draft Plan Fails to Identify and Address the Correct Stressors on this Species</u>

The Draft Plan presents a scattered and unbalanced description of stressors on the Delta smelt population, ignoring some stressors entirely and focusing myopically on others. In tables identifying the Draft Plan's objectives, stressors, and stressor reduction targets, it identifies as stressors only "food" and "habitat" (which is partially determined by the availability of "food"). As with longfin smelt, the Draft Plan does not specifically identify entrainment rates at the south Delta export facilities as a stressor, even though it sets an objective for reducing entrainment rates. Draft Plan at 3.3-108. Entrainment is a well-studied and well-documented stressor on the Delta smelt population that has population level effects. Kimmerer 2008, 2011; Kimmerer and Nobriga 2008; Mac Nally 2010; Thomson 2010; Maunder and Deriso 2011; Rose et al. 2013a,b; *see discussion above*. The failure to clearly identify this stressor is a major omission and is inconsistent with the best available science.

The Draft Plan is also inconsistent in its description of the type of habitat that Delta smelt need. There is no evidence that Delta smelt *abundance* suffers from lack of spawning habitat (i.e. that there is not sufficient habitat for Delta smelt to spawn in), but there is ample evidence that the spatial extent of Delta smelt spawning habitat is increasingly limited to an extremely small fraction of its historic range. Nobriga and Herbold 2009. As we describe above, the Draft Plan acknowledges these facts in some places but then claims benefits from what it believes will be an increased abundance of Delta smelt spawning habitat (which is not well-described in the literature) while ignoring the need for increased spatial extent of that habitat.

The Draft Plan's description of stressors also fails to acknowledge the importance of reduced flows and an altered Delta hydrograph as important stressors that affect "habitat" for this species (including suitable salinity conditions). As a result of failing to acknowledge the importance of the flow stressor to this species, the Draft Plan is equivocal about the need for flows and assumes that it can provide adequate low salinity habitat for Delta smelt simply by constructing new habitats. The effect of outflows on the extent, availability, and quality of Delta smelt habitat in the spring, summer, and fall months is well-documented. Dege and Brown 2004; Bennett 2005; Nobriga et al. 2008; Nobriga and Herbold 2009; Kimmerer et al. 2009; Feyrer et al. 2007, 2010. In particular, several studies have related the long-term decline in flows to limited habitat extent during the fall months and to fluctuations in Delta smelt abundance indices. Feyrer et al. 2007; Feyrer et al. 2010; USFWS 2008 Biological Opinion; USFWS 2011 (draft biological opinion). The 2008 biological opinion requires implementation of a "Fall X2" action. USFWS 2008.

Thus, the Draft Plan fails to adopt the best available science, which confirms the role of freshwater flow in affecting the habitat area available to this species. As a result, the Draft Plan's description of its "decision tree" process to determine optimal outflows for covered species is inaccurate because it does not "initially use operating criteria based on the best information available," Draft Plan at 3.3-113, and this strategy for determining outflow requirements (as described in CM1 Water Facilities and Operation) is inadequate – if the Draft Plan ignores the best available science that is currently available, there is no assurance that it will utilize additional science as it becomes available in the future.

3. <u>Conservation Measures do not Adequately Address Known Stressors for this Species and/or Their Impacts are Overstated</u>

As elsewhere in the Draft Plan, the rationale behind different conservation measures intended to benefit Delta smelt contradicts the Draft Plan's explanation of why this species has declined. Some of the Draft Plan's conservation measures do not address the identified stressors (even conceptually) and, in some cases, will aggravate those stressors. For example conservation measures that the Draft Plan and DEIS/DEIR expect will generate large quantities of important food items for Delta smelt (e.g. CM2 and CM4) ignore the Draft Plan's favored causes of food declines (invasive clams and/or nutrient ratio limitations on prey productivity). These and other logical disconnects between the Draft Plan's description and prioritization of stressors on Delta smelt and the actions it proposes to conserve species in the Plan area are further described in our discussion of longfin smelt.

In addition, we note that the operation of a new North Delta diversion (CM1) is not consistent with ameliorating an important stressor on Delta smelt: low turbidity. Delta smelt are strongly associated with higher turbidity waters within their range and recent reductions in turbidity are among the stressors believed to affect this species' predation-related mortality and productivity overall. Feyrer et al. 2007; Feyrer et al. 2011; Herbold and Nobriga 2009. The Draft Plan acknowledges the need to raise turbidity levels within the Delta smelt range, and identifies lower turbidity as a stressor. Draft Plan at 3.3-100; Draft Plan, Appendix F, Attachment 5C.D; Draft Plan, Appendix 5.F at 5.F-ii. The Draft Plan includes turbidity as part of numerous objectives. *See* Objectives L2.2 and L2.11, Draft Plan at 3.3-103; Objective TPANC2.1, Draft Plan at 3.3-105; Objective DTSM2.1, Draft Plan at 3.3-111. And the Draft Plan designs specific conservation measures (CM 13) to address the problem locally. The Draft Plan states: "For this effects analysis, it was assumed with very high certainty that water clarity is an attribute of critical importance to delta smelt larvae, juveniles, and adults." Draft Plan at 5.5.1-30 (emphasis added). The Draft Plan also identifies low turbidity as a stressor on longfin smelt, Draft Plan at 3.3-114, Sacramento splittail, Draft Plan at 3.3-174, green sturgeon, Draft Plan at 3.3-183, white sturgeon, Draft Plan at 3.3-196, and water quality in the Delta generally, Draft Plan at 3.2-6. In addition, the Draft Plan should have identified low turbidity conditions as a stressor on Delta smelt as decreased turbidity is associated with higher predation-related mortality for many native species. *See* Gregory 1993; Gregory and Levings 1998.

When CM1 operations begin, water and the turbidity it carries will be removed from the lower Sacramento River and the north Delta – the very areas the Draft Plan targets for Delta smelt "restoration." The U.S. Fish and Wildlife Service previously expressed concern with the effect of CM1 operations on turbidity on Delta smelt and longfin smelt as follows:

> The effects analysis acknowledges that a portion of the Sacramento River sediment supply will be diverted at the North Delta intakes, and that that diversion might be detrimental to native fishes, estimating the average effect to be minus 8-9% of sediment. It is hard to draw definitive conclusions about the ultimate effect of this change, but an average loss of 8-9% of the sediment supply that would ordinarily pass into the Delta and Suisun Bay likely implies higher average water clarity throughout the year. Besides potentially negative effects on delta smelt and longfin smelt and their habitat, which benefit from turbid water, clearer water would encourage growth of exotic aquatic plants and related effects in many areas of the North and West Delta.
>
> …
>
> [Diversion of turbidity at a north Delta intake] …remains an important issue, because we are concerned that an average loss of 8-9% of sediment will have greater negative effects on delta smelt and longfin smelt and their habitats

> downstream of the diversions than are acknowledged in the effects analysis and net effects, and will likely encourage the growth of exotic aquatic plants in the lower Sacramento River and in off-channel tidal marsh areas.

USFWS 2013 Progress Assessment at 16; *see id*. at 8. Both USFWS and CDFW raised similar concerns in earlier analyses. USFWS Red Flags 2012; CDFW Red Flags 2012. The Delta Independent Science Board also raised similar concerns. Delta ISB 2014 at B-24. Unfortunately, as discussed below, the DEIS/DEIR improperly understate the negative effects of BDCP on delta smelt, including the negative effects of CM1 operations on turbidity levels throughout the Delta and those impacts to Delta smelt and other species.

4. <u>Projected Outcomes for Delta Smelt are Inaccurate, and/or do not Attain the Conservation Standard for this Species. In addition, Presentation of these Results is Incoherent, Biased, and Unacceptably Confusing</u>

The Draft Plan and DEIR/DEIS both demonstrate that BDCP is likely to result in substantial negative impacts to Delta smelt and is unlikely to achieve the biological objectives for the species. This is clear even though both documents fail to synthesize the expected outcomes of BDCP conservation measures and operations to Delta smelt. There are numerous life cycle models and statistical models that the documents can and should have used and/or modified by the Draft Plan effects analysis and the DEIS/DEIR to assess the impacts to Delta smelt of the Draft Plan and operational alternatives. Statistical approaches to understanding cumulative effects of changes in multiple environmental variables have been developed and demonstrated, for example by Thomson et al. 2010, Mac Nally et al. 2010. Life cycle models described by Rose et al. (2013a,b) should also have been applied to understand the combined effects of changes to environmental conditions that would result from BDCP. Failure to provide such analyses represents an unacceptable omission from the DEIS/DEIR. Numerous peer reviews have also expressed concern that the Draft Plan and DEIS/DEIR inappropriately excluded some of these life cycle models. DSP Independent Science Review Panel Report 2014 at 14, 21, 31-32 (expressing concern that some models were inappropriately dismissed, and stating on pages 31-32 that, "Appendix 5G excluded delta smelt life cycle models in the Effects Analysis without adequate justification."); Delta ISB 2014 at B-43, B-45.

i. Entrainment Rates for Adult and Larval-Juvenile Delta Smelt are Likely to Exceed Targets set by Draft Plan Objectives and Claims of Modest CM1 Benefits are Likely Overstated

The Draft Plan's claim of reduced entrainment resulting from the BDCP is confused, internally inconsistent, and unsubstantiated. The Effects Analysis and DEIS/DEIR confuse the issue by discussing separately the results of its analyses of larval-juvenile and adult Delta smelt; the outcome that matters is the proportional entrainment to the Delta smelt population as a whole (i.e. the Draft Plan's objective and overall impacts to productivity must be assessed by the additive effect of entrainment to the two life history stages). The Draft Plan claims relative reductions of ~20% in both adult and larval entrainment under BDCP, but these results translate to an average reduction in entrainment of only 1.5% or 2% respectively. The DEIS/DEIR analysis reveals only tiny differences in entrainment rates between Alternative 3 operations and the NAA. Draft Plan at Figures 11-3-1, 11-3-2 (which is actually the same figure as the previous, though labeled differently)). The DEIS/DEIR identify similarly small differences in entrainment among Alternative 4 operational variants H1, H3, and H4. Draft Plan at Figures 11-4-1 and 11-4-2. Although, in most years, absolute entrainment rates for each of the Alternative 4 variants, are projected to be well above the 5% target of identified in the conservation strategy, all of the *differences* between BDCP operations and NAA are less than 5% in absolute terms. These "differences" in modeled outcomes are unlikely to represent any change at all in actual entrainment rates within year-type comparisons; however, if it can be shown that the projected differences are significant within the error of the modeling technique, then it must also be concluded that Alternative 4/H3 has higher entrainment rates than NAA in most years and that all Alternative 4 variants have higher entrainment rates than NAA in Critically Dry years. DEIS/DEIR at Figure 11-4-1.

The Draft Plan's entrainment appendix (5B) provides estimates of entrainment impacts for the population as a whole (both age classes considered together) and demonstrates that all Alternative 4 operational variants would have total entrainment rates that are much higher than the 5% annual total average entrainment called for by objective DTSM1.2 (Figure 5.B.6-22 at 5.B-215).[77] This strongly implies that the BDCP will fail to meet its own entrainment objective for Delta smelt and that it will violate the existing incidental take limit of 5% of the adult population in any year. USFWS 2008 Biological Opinion at 387. Nonetheless, the Draft Plan concludes that BDCP will produce a "moderate" positive change for adult Delta smelt and a "low" positive change for larval and juvenile Delta smelt and (at 5.5.1-28) – the Draft Plan does not explain the difference in the two ratings given that projected reductions in entrainment of adult and larval-juvenile Delta smelt are both less than 5% in absolute terms and the difference between the two outcomes is less than 0.5%. In contrast to the findings in the Draft Plan, agency biologists who participated in August 2013 workshops "suggested that <u>zero</u> or low positive change [for larval-juvenile entrainment] would be warranted on the basis of the high-outflow scenario" and "<u>low</u> to moderate change" would be warranted for adult Delta smelt. Draft Plan at 5.5.1-28 (emphasis added). The Draft Plan does not explain why it chose the high end of agency biologist position in each case, but we note that the sum of a "low" and a "moderate" change is qualitatively different than the sum of a "zero" and "low" change – the Draft Plan's optimism biases the overall projected result.

[77] Only Wet water year types have average entrainment rates close to 5%.

The claim of "high certainty" about the projected benefits of reductions in Delta smelt entrainment, Draft Plan at 5.5.1-28, is unwarranted and unsupported by science and by the Draft Plan's own statements. The small differences in projected entrainment rates among variants of the Alternative 4 do not suggest a significant difference (i.e. greater than the intrinsic error rate of the entrainment modeling method).[78] In fact, the Draft Plan contradicts its own statements of certainty in the same paragraph where those statements are offered, as it acknowledges that "modeling of entrainment of larval-juvenile delta smelt—and indeed other species—has uncertainty because of real-time management decisions that could occur and alter export rates from those modeled here … Such decisions cannot be modeled accurately; accordingly, the results of the entrainment analyses should be viewed with some caution" and "the extent of positive change under the BDCP in light of existing and future real-time management cannot be predicted with very high certainty." Draft Plan at 5.5.1-28. Thus, the Draft Plan overrates the certainty of its supposed entrainment benefits to Delta smelt entrainment.

The BDCP can attain lower entrainment rates than those projected under Alternative 4 operations. The entrainment rates under Alternative 4 operations are, at best, only slightly better (if at all) from those under baseline operations, but, there appear to be substantial changes in entrainment across year-types, with wetter years showing lower (though still high) entrainment rates. This demonstrates that human management activities in the Delta can have meaningful impacts on Delta smelt entrainment. Differences in Delta conditions among year-types are largely a result of human management decisions, although there are certainly exceptions (such as wet years that follow wet years, when flood control releases occur, or after several drier conditions in a row, when management options regarding Delta flow conditions are severely limited). Differences in year-type conditions in the Delta that are under the control of human export and reservoir release decisions appear to produce measureable differences in Delta smelt entrainment. As the documents acknowledge, "[h]igher outflows under HOS_LLT could result in lower proportional entrainment loss of larval-juvenile delta smelt than under EBC2_LLT." Draft Plan at 5.5.1-28. In contrast to these smaller changes, the data presented in the Draft Plan and DEIS/DEIR demonstrate that Alternative 7 and Alternative 8 operations project substantial declines in both juvenile and adult Delta smelt entrainment. DEIS/DEIR at Figures 11-7-1, 11-7-2 and 11-8-1, 11-8-2. Thus, it is possible for operational decisions to produce larger reductions in Delta smelt entrainment that appear capable, with some refinement, of satisfying the BDCP Delta smelt entrainment objective (DTSM1.2) and of producing a substantial benefit to the species relative to the NAA.

[78] As discussed in section 2 of these comments, modeled results are unlikely to occur.

ii. The DEIS/DEIR and Draft Plan Understate and Improperly Downplay Negative Impacts to Delta turbidity Caused by BDCP, and this will Cause Significant Impacts to the Species

The concerns with impacts to turbidity found in previous versions of the Draft Plan (*see above*) were not addressed in the current Draft Plan and DEIS/DEIR; the DEIS/DEIR acknowledges the potential for an 8 or 9% decline in turbidity on average (under ESO_LLT or HOS_LLT scenarios, respectively as compared to NAA). DEIS/DEIR at 11-267. The effect is actually larger than the DEIS/DEIR acknowledges as operations under ESO_LLT are expected to remove well over 20% of the Sacramento River's sediment load in most months April-October. Draft Plan at Figure 5C.D-11. Both sets of results are for "average" conditions, meaning the actual loss of turbidity is likely to be greater in some years (probably in wet years, when the north Delta diversions would divert a greater amount of flow). Finally, the DEIS/DEIR and Draft Plan's estimate of average effects on turbidity levels throughout the Delta incorporates anticipated additions of suspended sediment from floodplain inundation on the Yolo Bypass, but the increased acreages and frequency of floodplain inundation anticipated by the Draft Plan were improperly excluded from the baseline as restoration of even greater acreages are required under NMFS 2009 Biological Opinion.[79] Thus, the Draft Plan and DEIR/DEIS improperly report lower levels of turbidity impact under BDCP than would occur under an accurate accounting of baseline conditions.

Even given their underreporting of anticipated declines in turbidity under the BDCP, the Draft Plan and DEIS/DEIR downplay the effect of reduced turbidity as a result of CM1 operations. The DEIS/DEIR does not adequately explain or analyze its interpretation of projected reduced turbidity throughout the Delta, despite the DEIS/DEIR's claim that, for its physical modeling, "A 'difference' was defined as a >5% difference between the pair of model scenarios in at least one water year type in at least 1 month." DEIS/DEIR at 11-202. The Draft Plan declares with "very high certainty" that reduced turbidity is a stressor of "critical importance," found a large proportional negative change in the stressor under BDCP operations, and then concluded that the impacts of such a change are "low" or nonexistent with "low" certainty. Draft Plan at 5.5.1-31. This conclusion is unwarranted and not supported by the scientific information that is available. The average loss of turbidity of 8-9% (and, more likely, over 20% in some months) is a significant impact. Thus, in addition to concerns about the impact of reduced flows below the north Delta diversion and its effects on through-Delta flows and Delta outflow (addressed elsewhere), it is clear that CM1 aggravates rather than alleviates important stressors like low turbidity that affect most, if not all, of the covered species. The magnitude of CM1 operations reduction of turbidity suggests that it will have a significant negative impact on productivity (for

[79] This is another example of how the improper baselines lead to flawed analysis of potential impacts. *See* discussion *supra* regarding improper baselines for analysis.

instance through increased predation and decreased foraging success) of Delta smelt, longfin smelt, Chinook salmon, and Sacramento splittail. We note that low river flows below the north Delta diversion may cause additional reductions in turbidity (slower river velocities can result in deposition of additional sediments, beyond those that are diverted directly at CM1) and that there are synergistic interactions between reduced river velocities, stage, and turbidity that would lead to increased predation of Delta smelt and other small fishes in the riverine environment below the north Delta diversion. In addition, the loss of turbidity may further reduce the geographic range and carrying capacity of the Delta for endemic species like Delta smelt, *see* Nobriga and Herbold 2009 at 14, and Sacramento splittail.

5. <u>The Draft Plan and DEIS/DEIR Fail to use the Best Available Science Regarding the Impacts of Tidal Marsh Habitat Restoration, Dramatically Overstating the Likely Benefits to Delta Smelt and Understating Likely Negative Impacts to the Species Under the Draft Plan and some Alternatives</u>

There is no indication that Delta smelt populations are limited by the availability of shallow sub-tidal or inter-tidal habitats, except as access is limited by unsuitable salinity or temperature conditions. *See, e.g*., Nobriga and Herbold 2009. For example, the Draft Plan acknowledges that spawning habitat is not believed to be limiting to the population. Draft Plan, Appendix 5F at 5.F-63. So, it is not clear why the Draft Plan concludes with "moderate certainty" that there would be an "very high positive change in the intertidal habitat attribute for occupancy by delta smelt eggs and larvae as a result of restoration actions under CM4 Tidal Natural Communities Restoration" and that there would be a "moderate" positive change in egg and larval habitat from addition of subtidal habitat. Draft Plan at 5.5.1-9. These statements obviously overstate the potential for any benefit to Delta smelt spawning habitat (if, indeed, such habitat is limited by the existence of shallow water, and not by the existence of appropriate salinity and flow conditions in existing shallow water habitats). In particular, they assume that all restored wetland acreages, and both inter-tidal and sub-tidal habitats, will benefit Delta smelt eggs and larvae when, in fact, inter-tidal habitats are unlikely to provide any direct benefit to either larvae or eggs. Bennett 2005; Nobriga and Herbold 2009. Shallow sub-tidal habitats may be locations of egg deposition (though this is unknown; Nobriga and Herbold 2009) but, upon hatching, larval Delta smelt are believed to migrate quickly away from nearshore habitats towards the Delta's low salinity zone. Dege and Brown 2004; Nobriga and Herbold 2009 at 5, 9. It is thus highly unlikely that larval Delta smelt experience benefits substantial benefit from shallow sub-tidal habitats of the type targeted for restoration by the BDCP.[80]

---

[80] Again, we emphasize, as we have many times before, that we are not opposed to restoring tidal and sub-tidal wetlands in the Plan Area as a potential measure that may benefit numerous species and ecosystem processes in the Delta and northern San Francisco Estuary. However, the Draft Plan's heavy

Numerous reviewers have reached similar conclusions. In their 2013 comments on a previous version of the Draft Plan, the USFWS recommended that future versions: "…either (1) show through modeling what subset of "tidal habitat restoration" will have sandy beaches with a turbid, active overlying water column, or (2) avoid the speculation that habitat restoration will create spawning habitat and the speculation that spawning habitat is limiting delta smelt recruitment"; analogous recommendations were made for longfin smelt. USFWS 2013 Progress Assessment at 9.Although some studies have found benefit of "shallow" environments for Delta smelt, these almost always refer to the shallow pelagic environments like those in Suisun Bay (Bennett 2005; Hobbs et al. 2006; Nobriga and Herbold 2009), not, as the Draft Plan assumes, those immediately adjacent (within one to several dozen meters) of historic or restored wetlands. Furthermore, the Draft Plan overstates the acreages of "restored" wetlands that are likely to benefit Delta smelt (if those benefits even occur); the USFWS stated in 2013 that:

> Because delta and longfin smelts are generally pelagic fish, they are not expected to extensively rear in many restored tidal habitats except under very specific circumstances where there is somewhat deep (> 1, but < 4 meters), cool, and very turbid open water (examples: Liberty Island, Suisun Bay, Sherman Lake). These conditions cannot be created everywhere. Current scientific understanding suggests that some regions of the Plan Area are unlikely to be good places for delta and longfin smelt – especially if the only practical option is to flood subsided Delta islands; existing examples include the interiors of Franks Tract and Mildred Island.

USFWS, 2013 Progress Assessment at 14-15. Even if Delta smelt receive little (or short-lived) direct benefit (related only to spawning and egg incubation) from some fraction of the shallow sub-tidal, nearshore habitats targeted for restoration under the BDCP, the Draft Plan's claims of increased suitable habitat during fall (non-spawning) months (Fall X2 habitat) are overstated and inaccurate. Draft Plan, Table 5.5.1-6; DEIS/DEIR, Table 11-4-3. As the DEIS/DEIR states, with regard to its projections for fall habitat for Delta smelt:

---

reliance on these measures to address all manner of problems for all covered fish species lack scientific support and fails to adequately consider well-known risks of such restoration projects. We, and others, have recommended before that these marsh restoration actions should be implemented as targeted research projects so that uncertainties regarding their potential beneficial and negative impacts can be reduced and so that agencies responsible for BDCP implementation can learn whether there are design or implementation strategies that maximize benefits and minimize risks of these restorations. If the Draft Plan's expectations of benefits from the proposed tidal marsh restoration actions are demonstrated, then an effective adaptive management program can adjust the overall strategy accordingly. *See also* National Research Council 2010; USFWS 2013 Progress Assessment at 8; Mount and Saracino et al. 2013 at 109.

> The benefits of restored habitat for this species will depend on the success of restoration in creating physical habitat for smelt and in fostering ecological conditions that favor good feeding conditions and production of food upon which smelt can feed. The magnitude of restored habitat benefits is uncertain.

DEIS/DEIR at 11-1298; *see* discussion *infra*. Furthermore, the Draft Plan's assumption that Delta smelt may benefit from spawning in shallow sub-tidal habitats fails to consider that such habitats may also be occupied by invasive predators, such as inland silverside, Nobriga and Herbold 2009, and that restoration of these habitats may support predators as well, Grimaldo et al. 2012. Indeed, the potential for restored areas to be colonized organisms that compete with Delta smelt for food or prey on different life stages of Delta smelt were chief concerns of the earlier expert review of a prior draft of the BDCP. Essex Partnership 2009 (2009 DRERIP reviews). However, these scientific concerns are not addressed at all with regard to habitat restoration in the DEIS/DEIR and are only mentioned in passing in the Draft Plan.

The Draft Plan argues that, "The certainty level reflects some uncertainty regarding selection of habitat types by delta smelt." Draft Plan at 5.5.1-10. This is an understatement as, even though spawning microhabitat utilization of Delta smelt are unknown, Bennett 2005, they are not believed to include inter-tidal habitats, *see* Nobriga and Herbold 2009. As the Draft Plan admits, agency biologists polled at an August 2013 workshop concluded that, "… the function of the restored intertidal habitat for delta smelt may have less to do with direct occupation as opposed to other functions." Draft Plan at 5.5.1-10. Additional uncertainty must be attributed to any benefit to Delta smelt because, as the Draft Plan notes, "Use of restored areas by delta smelt will depend on the habitat characteristics within these areas (e.g., the extent of tidal excursion and velocity, temperature, and turbidity)," factors that have not been described or modeled for the BDCP's wetland and sub-tidal restoration areas.

Equally important, as described at length above, there is little to no scientific support for the notion that the Draft Plan's habitat restoration conservation measures (e.g. CM2, CM4) will export substantial amounts of Delta smelt food items to the pelagic habitats these fish inhabit. Numerous agencies and independent expert reports have found unlikely or, at best, highly uncertain the Draft Plan's proposed linkage between tidal marsh restorations and meaningful benefits to the Delta smelt prey base (i.e. the kind of food Delta smelt consume in the areas and at the times where food is believed to limit their populations), including:

- Brown 2003;
- National Research Council 2010;
- USFWS Red Flags 2012;
- USFWS Progress Assessment 2013;
- DSC 2013 BDCP Comments;

- DSP Independent Science Review Panel Report 2014;
- Delta ISB 2014;
- Mount and Saracino et al. 2013;
- Herbold et al.2014; and
- BDCP's own review process involving outside scientific experts (DRERIP Reviews, Essex Partnership 2009)

Each of these reports is described in detail elsewhere in this comment letter.

Thus, there is no scientific support for the Draft Plan's conclusions that tidal and sub-tidal habitat restoration will produce: "…a moderate positive change … on zooplankton abundance for juvenile delta smelt". As noted above, and elsewhere, the Draft Plan's reference to literature it believes supports its alleged benefits to the Delta smelt food web are inaccurate and biased. For instance, the Mount and Saracino et al. 2013 review of the Draft Plan's alleged benefits to the Delta smelt food web finds that the methodology applies in the Draft Plan habitat restoration appendix (5E) is flawed in that it:

> …uses "prodQacres" to index the expected productivity of phytoplankton in the restored areas. However, this index is conceptually flawed in two ways. First, it uses an estimate of growth rate rather than production of phytoplankton, which is the product of growth rate and biomass. Second, it assumes implicitly that all phytoplankton growth is available as food for the zooplankton consumed by the smelt species, but analyses published on the San Francisco Estuary and elsewhere show that most of the production is consumed by benthos and by microzooplankton such as ciliates (e.g., Lopez et al. 2006, Lucas and Thompson 2012, Kimmerer and Thompson submitted).

Mount and Saracino et al. 2013 at 71.

The "low certainty" attributed to this outcome is not solely due to the potential for restored sites to be colonized by invasive clams, as the Draft Plan suggests. There is simply not much evidence that restored habitats will generate a regular supply of food (on any time step) to the surrounding environment and even less evidence or indication that any measureable quantity of exported food will be transported far downstream to the areas where pelagic species (like Delta smelt and longfin smelt) rear. Mount and Saracino et al. 2013 at 78. Even the reference the Draft Plan cites regarding export of food from existing shallow sub-tidal habitats makes the point that these habitats are (at best) periodically sinks for primary productivity, Lehman et al. 2010, not a surprising result as tidal marsh areas are characterized by accretion of materials. Invasion of restored sites by invasive clams could actually change the effect of habitat restoration to a negative effect as habitats created under CM4 would then become a sink for primary productivity generated elsewhere in the Delta. Essex Partnership 2009 (DRERIP Reviews 2009). The independent peer review panel report from Mount and Saracino et al. 2013 concluded:

> Thus, marshes may act either as net sources or sinks for plankton in the adjacent waters, depending on the availability of habitat for small fish and the degree of colonization by benthic grazers such as clams. The exact details of the exchange processes depend on the physical configuration of the marsh including permanence of inundation (Brucet et al. 2005), residence time of the water (Lucas and Thompson 2012), and the biological composition, i.e., the kinds and abundance of producers and consumers within the marsh including transient organisms (Kneib 1997).

Mount and Saracino et al. 2013 at 71; *see also* Lucas and Thompson 2012. Indeed, an accurate reporting of uncertainty regarding the food web effect of CM4 for Delta smelt would be that there is "low" certainty of any positive effect at all, "moderate certainty" of no effect (especially for ROA's that are not immediately adjacent to Delta smelt and longfin smelt habitat), and, a "moderate-high" certainty of negative effects to Delta smelt if the restored habitats become colonized by invasive clams or invasive Delta smelt predators. BDCP's DRERIP reviews made exactly these points in their ratings of most tidal marsh ROA's. Essex Partnership 2009 at 9 and appendices.

In addition, any benefits from shallow water habitat restoration could not arise until the habitat restoration occurred, and potentially many years after active restoration ceased. In most cases, the planned restoration will not occur for several decades, meaning there cannot possibly be a food benefit to the covered species for many of these species' generations. In addition, the Draft Plan's assertion of benefits to Delta smelt from habitat restoration incorrectly assumes that no habitat restoration occurs under the environmental baseline. In fact, as we have discussed elsewhere, restoration of 8,000 acres of tidal marsh and shallow sub-tidal habitat is already called for in the USFWS 2008 Biological Opinion, and under the NMFS 2009 Biological Opinion a much larger expanse of floodplain habitat is targeted for restoration, at an earlier date, than what is expected under the Draft Plan. Thus the DEIR/DEIS improperly credits to the BDCP all of its expected benefits to Delta smelt from tidal marsh restoration and Yolo Bypass floodplain restoration because of the flawed baseline used for comparison.

In summary, the Draft Plan and DEIS/DEIR claims that operations under the proposed project will benefit Delta smelt by reducing entrainment are not supported scientifically. In fact, operations of the new north Delta diversion are likely to have a negative effect on Delta smelt as a result of the diversion of turbidity that both the Draft Plan and DEIS/DEIR report will occur there (though both underestimate the overall reduction in turbidity and its likely effects). If restored habitats are not utilized by Delta smelt to the degree expected or if habitat restorations are delayed, any scenario of BDCP operations that does not include provision of fall outflows will result in a marked decrease in fall habitat for Delta smelt. DEIS/DEIR at 11-1298. The best available science demonstrates that the Fall X2 action is necessary to meet minimum protections for delta smelt. The Draft Plan and DEIS/DEIR overstate the value of habitat restoration measures in both their estimate of the direct utility of these habitats to Delta smelt and in their claims that these habitats will export significant amounts of food to environments where Delta smelt are common. Benefits to the species rely completely on habitat restoration measures, which are unlikely to produce intended benefits and which cannot produce those benefits until they are actually restored, decades from now. Furthermore, the Draft Plan and DEIS/DEIR inappropriately ignore or downplay the risk that restored habitats will be colonized by species that compete with Delta smelt for food or prey directly on Delta smelt eggs, larvae, juveniles, or adults or that restoring marsh habitats will become sinks for turbidity or Delta smelt prey items. The risks posed by shallow water habitat restorations to Delta smelt have not been adequately evaluated.

6. <u>The Draft Plan and DEIS/DEIR Fail to use the Best Available Science to Analyze Environmental Effects on the Effects of Fall X2, and the Documents Understate the Likely Negative Impacts to the Species</u>

Finally, the DEIS/DEIR and Draft Plan fail adequately analyze the effect of fall Delta outflows on delta smelt abundance and productivity. First, the documents fail to discuss the results of scientific studies on the higher fall outflow provided in 2011, when delta smelt abundance increased by a factor of approximately 10, consistent with the predicted outcomes in the adaptive management plan for Fall X2. The California Department of Fish and Game in 2011 stated that, "Delta smelt abundance in 2011 is greater than it has been since 2001 but remains a small fraction of historical abundance, state biologists say. The improvement is likely due in large part to higher than usual Delta outflow which resulted in more and better habitat." California Department of Fish and Wildlife, press release, Endangered Delta Smelt Population Improves, December 22, 2011, available online at: http://cdfgnews.wordpress.com/2011/12/22/endangered-delta-smelt-population-improves-2/.

Increased Delta outflow in the fall of 2011 appeared to result in higher growth rates, reduced effects of invasive clams on productivity and prey abundance, and increased food production. *See, e.g.*, Brown et al. 2012; Thompson et al. 2012; Teh 2012; Baxter and Slater 2012. The DEIS/DEIR and Draft Plan likewise make no reference to the MAST report or other Fall X2 studies conducted in 2011 and recent years. *See* Baxter et al. 2013. The documents need to be revised to incorporate this existing scientific information.

Second, the documents fail to use existing statistical methods to quantify and analyze the effects of fall outflow on delta smelt abundance. Kimmerer, as part of an independent peer review of BDCP, developed an alternative model that analyzed the effects of fall outflow on subsequent summer abundance as measured by the townet survey. Mount and Saracino et al. 2013 at 64-66, 68. That peer review concludes that the model "was appropriate for the data," and found that "the predicted ratio of townet index for LOS:NAA was about the same as that for HOS:NAA about half the time, and the other half of the time it was much lower, with large confidence intervals related to the uncertainty in the prediction from the model." *Id*. at 65. The peer review concludes that "projections under LOS showed about half the time a marked reduction in predicted summer abundance index compared to NAA." *Id*. at 68.[81] The Draft Plan and DEIS/DEIR need to be revised to use this existing model to asses effects of fall outflow on delta smelt.

V. THE BDCP FAILS TO ADEQUATELY ANALYZE IMPACTS TO NATURAL COMMUNITIES, TERRESTRIAL SPECIES AND WILDLIFE REFUGE AND THE CONSERVATION STRATEGIES BENEFITTING TERRESTRIAL SPECIES SUFFER FROM MULTIPLE FLAWS.

A. The Conservation Strategies in Chapter 3 for Protection and Restoration of Natural Communities are Uncertain and are Based on Unsupported Assumptions

The Plan assumes that restoration of various natural communities and habitat types will provide sufficient benefits for covered natural communities, plants and wildlife. However, as the Delta ISB pointed out in detail in their assessment of the BDCP, Chapter 3 suffers from a lack of underlying reasoning and evidence to support the conclusion that conservation acreage or restoration goals will provide the contemplated benefits to covered species. *See* Delta ISB 2014. In particular, the Delta ISB commented that the BDCP relies on an assumption that restoration will adequately address the impacts from the project. However, that conclusion is premised on the assumption that restoration would occur in a time-frame relevant to address the impacts. Such a conclusion is flawed as restoration of most habitat types may take years or decades to achieve the level of what had been functioning habitat before it was destroyed or degraded by BDCP activities. *Id*. at B-51. In addition, the BDCP is also based on the assumption that restoration will always be effective and would provide habitat equal or better than the habitat lost. However, such a conclusion is fraught with uncertainties, none of which were acknowledged or addressed in the Plan. *Id*. at B-52. Finally, the extensive use of habitat suitability models, which rely on assumptions about where habitat may or may not be located, results in uncertainty about the location of species and the value of habitat. *Id*. at 50. The Delta

[81] However, as noted above, this review also identified significant modeling flaws with outflow in the fall months that may affect these results.

ISB recommended that the BDCP incorporate extensive monitoring in order to ensure that the extensive uncertainties are addressed. *Id*.

B. <u>The Conservation Strategy relying on Cultivated Lands is confusing and lacks clarity</u>

The BDCP proposes to conserve 48,625 acres of cultivated land for the benefit of wildlife. Draft Plan at 3.4-76 to -88. However, the acreage numbers of cultivated lands do not appear consistent. For example, of the 48,625 acres of cultivated land, the BDCP requires 43,325 acres of cultivated lands for Swainson hawk, leaving 5300 acres for crops that are not of moderate or high value for hawks. However, this acreage breakdown does not fit with the cultivated lands requirement for Sandhill crane, which requires 7300 acres of cultivated land for foraging, of which 5840 must be of high quality (i.e., rice or corn). Since moderate or high value crops for Swainson hawk cannot be rice or corn, the remaining 5300 acres of cropland not needed for Swainson's hawk does not match with the 5840 acres of high value crop needed for cranes.
In addition, the Plan fails to provide any details regarding the management of cultivated lands after harvest. For many species, how cultivated lands are managed after harvest is critical for those species. For example, Sandhill crane require specific timing and flooding of fields after harvest. In addition, tillage practices can leave fields either providing food for wildlife or providing no value to wildlife. The final Plan must include specific details about treatment of after-harvest lands.

C. <u>The Plan fails to assess the direct and indirect impacts to wildlife refuges.</u>

As discussed *supra* in section I(h), the DEIR/DEIS failed to include level 4 water supply as part of the baseline conditions, which is a significant oversight by the state and federal agencies as level 4 water supply for wildlife refuges is required under the CVPIA. The Central Valley Joint Venture (CVJV) partners specifically requested that the BDCP assess impacts to refuge water supply and "adopt a goal to contribute to the attainment of the acreage, water, and bird population goals set forth by the CVJV Implementation Plan." Central Valley Joint Venture Letter to BDCP (May 24, 2013). Similarly, it is not clear that the Draft Plan included Level 4 water deliveries. *See supra*, section I(d). As a result, the DEIR/DEIS fails to adequately assess the direct and indirect impacts from BDCP operations on state and federal wildlife refuges. The BDCP must take into account the effects of water operations on the timing and quantity of water deliveries to refuges across water years. Those impacts must be assessed and fully mitigated consistent with the requirements of the CVPIA.

D. <u>The BDCP must improve the analysis and conservation strategies for specific covered terrestrial species.</u>

1. Tricolored Blackbird

Tricolored blackbird population numbers have crashed in the last few years, resulting in DFW proposing to emergency list the blackbird under CESA. *See* Fish and Game Commission Agenda Item 11, "Possible Adoption of Emergency Regulations to add the Tricolored Blackbird (Agelaius tricolor) to the list of Endangered Species (pursuant to Section 2076.5, Fish and Game Code)," available online at http://www.fgc.gov/meetings/2014/aug/080614agd.pdf (incorporated by reference). Given the dire condition of Tricolored blackbirds and the likely imminent listing under CESA, the BDCP must include a robust conservation strategy for this species. Unfortunately, the Plan provides a mere 50 acres and no restoration within the Plan area. This does not meet the NCCP's conservation standard.

2. Sandhill Crane

The BDCP will have a significant impact on Sandhill crane due to the decision to site the tunnel alignment and other associated structures in crane habitat. As noted above, there are substantial concerns about the temporal mismatch between habitat lost and conservation lands protected or restored. This concern applies to the conservation strategy for cranes. Further, there are serious concerns that the siting of powerlines through and near crane habitat will result in a serious impact to cranes. It is appears that the scientific information associated with powerline impact analysis and the minimization of those impacts is outdated. The analysis of the risk to birds from powerlines did not include a 2012 report from the Avian Powerline Interaction Committee (APLIC), "Reducing Avian Collisions with Powerlines: The State of the Art in 2012," Edison Electric Institute and APLIC. Washington, DC, available online at: http://www.aplic.org/uploads/files/11218/Reducing_Avian_Collisions_2012watermarkLR.pdf (incorporated by reference).

3. Giant Garter Snake

The conservation strategy for Giant garter snake appears to be little more than 1:1 mitigation for habitat acres lost, which falls well short of the NCCP conservation standard. Conservation Measure 1 as well as impacts from the conversion of land in the Yolo Bypass will result in the loss of 6,538 acres of Giant garter snake habitat in key areas for garter snake. Draft Plan at 3.3-30 to -31. There is no explanation how a 1:1 mitigation ratio for a critically endangered species with only 13 populations left in California meets the NCCP requirement that the plan "provide for the conservation" of the species in the Plan Area. The conservation strategy for Giant garter snake must be revised to include substantially more habitat for snakes within the Plan Area.

4. California Red-Legged Frog and California Tiger Salamander

The conservation strategy for California red-legged frog and California tiger salamander includes a directive to protect stock ponds on conserved grasslands. Draft Plan at 3.3-31. While such a conservation requirement is important, additional detail should be required, including a requirement that funding shall be directed towards stock pond improvement and maintenance in perpetuity as part of the management of the grasslands. Stock ponds are frequently in need of repair and require on-going management (e.g., cleaning and tulle control) in order to remain of value to these listed species.

5. Valley Elderberry Longhorn Beetle

The conservation objectives for Valley elderberry longhorn beetle (VELB) lacks any specific conservation acreage number. Draft Plan at 3.3-32. It is impossible to tell how much acreage is required in this plan to address VELB impacts and to provide for the conservation of VELB in the plan area. The conservation objective must be revised to be quantifiable.

LITERATURE CITED

AFRP 2001. U.S. Fish and Wildlife Service. 2001. Final Restoration Plan for the Anadromous Fish Restoration Program. A plan to increase natural production of anadromous fish in the Central Valley of California. Prepared for the Secretary of the Interior by the United States Fish and Wildlife Service with assistance from the Anadromous Fish Restoration Program Core Group under authority of the Central Valley Project Improvement Act. January 9, 2001.

Baxter, R and 18 co-authors. 2013. An updated Conceptual Model for Delta smelt: our evolving understanding of an estuarine fish. Management, Analysis and Synthesis Team. July 22, 2013. Available at: http://www.water.ca.gov/iep/docs/mast_draft_7-21-13.pdf

Baxter, R. and S. Slater 2012, Delta Smelt Distribution & Diet Fall 2011. Presentation to the Delta Science Program independent scientific peer review of the Fall Low Salinity Zone (FLASH) Studies and Adaptive Management Plan Review. Available at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Baxter_Slater_Flash_DeltaScienceJuly2012_v2.pdf

Brown et al 2012, Synthesis of Studies in the Fall Low Salinity Zone of the San Francisco Estuary, September – December 2011, Available at: http://deltacouncil.ca.gov/sites/default/files/documents/files/FLaSH_combined_7_0_12.pdf

Bennett, W. A. 2005. Critical Assessment of the Delta Smelt Population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science 3(2). Available at: http://repositories.cdlib.org/jmie/sfews/vol3/iss2/art1

Bradford, M.J. 1995. Comparative review of Pacific salmon survival rates. Canadian Journal of Fisheries and Aquatic Sciences. 52:1327-1338.

Brandes PL, JS McLain. 2001. Juvenile chinook salmon abundance, distribution, and survival in the Sacramento-San Joaquin Estuary. In: Brown RL, editor. Contributions to the Biology of Central Valley Salmonids. Fish Bulletin 179(2). Sacramento (CA): California Department of Fish and Game. p 39-136.

Brown LR. 2003. Will tidal wetland restoration enhance populations of native fishes? In: Brown LR, editor. Issues in San Francisco Estuary tidal wetlands restoration. San Francisco Estuary and Watershed Science [Internet]. Available at: http://escholarship.org/uc/item/2cp4d8wk

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

California Department of Fish and Game. 2010a. Flows needed in the Delta to restore anadromous salmonid passage from the San Joaquin River at Vernalis to Chipps Island. Exhibit #3, Prepared for the Informational Proceeding to Develop Flow Criteria for the Delta Ecosystem Necessary to Protect Public Trust Resources Before the State Water Resources Control Board.

California Department of Fish and Game. 2010b. Quantifiable biological objectives and flow criteria for aquatic and terrestrial species of concern dependent on the Delta: Prepared pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=25987

Central Valley Regional Water Quality Control Board and California Bay Delta Authority 2006. Dissolved oxygen concentrations in the Stockton Deep Water Ship Channel: Biological and ecological effects model. Available at: http://www.sjrdotmdl.org/concept_model/bio-effects_model/lifestage.htm

California Department of Water Resources. Website at: http://baydeltaoffice.water.ca.gov/modeling/hydrology/CalSim/Downloads/CalSimDownloads/CalSim-IIStudies/Benchmark/index.cfm

[DWR 2003]. California Department of Water Resources**.** 2003. Redd dewatering and juvenile steelhead and Chinook salmon stranding in the lower Feather River, 2002-2003. Interim Report SP-F10, Task 3C, Oroville Facilities Relicensing FERC Project No. 2100. June 17, 2003. Available at: http://www.water.ca.gov/orovillerelicensing/docs/wg_study_reports_and_docs/EWG/F10_Task_3C_interim_report.pdf

Cavallo, B., J. Merz, and J. Setka. 2012. Effects of predator and flow manipulation on Chinook salmon (*Oncorhynchus tshawytscha*) survival in an imperiled sstuary. Environmental Biology of Fishes DOI 10.1007/s10641-012-9993-5.

Cloern, J. E. and A. D. Jassby. 2012. Drivers of Change in Estuarine-Coastal Ecosystems: Discoveries from Four Decades of Study in San Francisco Bay. Reviews in Geophysics 50, RG4001, DOI:10.1029/2012RG000397. 33pp.

Cloern, J. E., A. D. Jassby, J. Carstensen, W. A. Bennett, W. Kimmerer, R. Mac Nally, D. H. Schoellhamer, and M. Winder. 2012. Perils of correlating CUSUM-transformed variables to infer ecological relationships (Breton et al. 2006; Glibert 2010). Limnology and Oceanography, 57(2), 2012, 665–668.

Dege, M. and L.R. Brown. 2004. Effect of outflow on spring and summertime distribution and abundance of larval and juvenile fishes in the upper San Francisco Estuary. American Fisheries Society Symposium 39:49–66.

Delta Independent Science Board. Letter 2014**.** Review of the Draft BDCP EIR/EIS and the Draft BDCP. May 15, 2014. Conducted by the Delta Independent Science Board.

Delta Science Program. 2014. Independent Review Panel Report, BDCP Effects Analysis Review, Phase 3. A report to the Delta Science Program. March 2014. Prepared by A. Parker, C. Simenstad, T. George, N. Monsen, T. Parker, G. Ruggerone, and J. Skalski.

Delta Science Program. 2014. Delta Outflows and Related Stressors Panel Summary Report. May 5, 2014. Reed, D., J. Hollinbaugh, J. Korman, E. Peebles, K. Rose, P. Smith, P. Montagna. Workshop on Delta Outflows and Related Stressors Panel Summary Report.

Delta Stewardship Council. July 11, 2013. Letter to Russell Stein, Re: 2013 Administrative Draft, Bay Delta Conservation Plan Environmental Impact Report/Environmental Impact Statement.

Dugdale, R. C., F. P. Wilkerson, V. E. Hogue, and A. Marchi. 2007. The Role of Ammonium and Nitrate in Spring Bloom Development in San Francisco Bay. Estuarine Coastal and Shelf Science 73:17–29.

Dugdale, R., F. Wilkerson, A. E. Parker, A. Marchi, and K. Taberski. 2012. River flow and ammonium discharge determine spring phytoplankton blooms in an urbanized estuary. Estuarine, Coastal and Shelf Science 115:187–199.

Dugdale, R.C., F.P. Wilkerson, and A.E. Parker. 2013. A biogeochemical model of phytoplankton productivity in an urban estuary: The importance of ammonium and freshwater flow. Ecological Modeling 263: 291–307.

Feyrer, F. M.L. Nobriga, T.R. Sommer. 2007. Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA. Canadian Journal Fisheries and Aquatic Sciences 64:723-734.

Gadomski, D.M. M.J. Parsley. 2005a. Effects of turbidity, light level, and cover on predation of white sturgeon larvae by prickly sculpins. Transactions of the American Fisheries Society 134: 369-374.

Gadomski, D.M. M.J. Parsley. 2005b. Laboratory studies on the vulnerability of young white sturgeon to predation. North American Journal of Fisheries Management 25: 667-674.

Gadomski, D.M. M.J. Parsley. 2005c. Vulnerability of young white sturgeon, Acipenser transmontanous, to predation in the presence of alternative prey. Environmental Biology of Fishes. 74: 389-396.

Glibert, P. M. 2010. Long-Term Changes in Nutrient Loading and Stoichiometry and Their Relationships with Changes in the Food Web and Dominant Pelagic Fish Species in the San Francisco Estuary. Reviews in Fisheries Science 18(2):211–232.

Glibert, P. M., D. Fullerton, J. M. Burkholder, J. C. Cornwell, and T. M. Kana. 2011. Ecological Stoichiometry, Biogeochemical Cycling, Invasive Species, and Aquatic Food Webs: San Francisco Estuary and Comparative Systems. Reviews in Fisheries Science 19(4):358–417.

Grimaldo, L. F., A. R. Stewart, and W. Kimmerer. 2009. Dietary Segregation of Pelagic and Littoral Fish Assemblages in a Highly Modified Tidal Freshwater Estuary. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 1:200–217.

Grimaldo, L. R.E. Miller, C.M. Peregrin, and Z. Hymanson 2012. Fish assemblages in reference and restored tidal freshwater marshes of the San Francisco Estuary. San Francisco Estuary and Watershed Science, 10(1):1-21. Available at: https://escholarship.org/uc/item/52t3x0hq

Gregory, R.S. 1993. Effects of turbidity on the predator avoidance behavior of juvenile Chinook salmon (*Oncorhynchus tshawytscha*). Canadian Journal of Fisheries and Aquatic Sciences. 50: 241-246.

Gregory, R.S. and C.D. Levings. 1998. Turbidity reduces predation on migrating Pacific salmon. Transactions of the American Fisheries Society 127:275-285.

Grossman, G.D., T. Essington, B. Johnson, J. Miller, N.E. Monsen, and T. Pearsons. 2013. Effects of Predation on salmonids in the Sacramento River-San Joaquin Delta and associated ecosystems. Prepared for the Delta Stewardship Council. Available at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Fish_Predation_Final_Report_9_30_13.pdf

Healey, M.C. 1982. Juvenile Pacific salmon in estuaries. *In* V.S. Kennedy, editor. Estuarine Comparisons. Academic Press, New York. pp. 315–341

Healey, MC. 1991. Life history of Chinook salmon (*Oncorhynchus tshawytscha*). *In* Groot, C., Margolis, L., editors. Pacific Salmon Life Histories. p. 311-394.

Herbold, B., D.M. Baltz, L. Brown, R. Grossinger, W. Kimmerer, P. Lehman, Peggy et al. 2014. The Role of tidal marsh restoration in fish management in the San Francisco Estuary. San Francisco Estuary and Watershed Science, 12(1). Available at: http://escholarship.org/uc/item/1147j4nz

Hobbs, J. A., W. A. Bennett, and J. E. Burton. 2006. Assessing nursery habitat quality for native smelts (Osmeridae) in the low-salinity zone of the San Francisco estuary. Journal of Fish Biology 69:907-922.

Hobbs, J.A., W.A. Bennett, J. Burton, and M. Gras. 2007. Classification of larval and adult delta smelt to nursery areas by use of trace elemental fingerprinting. Transactions of the American Fisheries Society 136:518–527.

Israel, J. A. and A. P. Klimley. 2008. Life History Conceptual Model for North American Green Sturgeon (Acipenser medirostris). Final. California Department of Fish and Game Delta Regional Ecosystem Restoration and Implementation Program.

Israel, J. A., A. M. Drauch, M. Gingras, and M. Donnellan. 2009. Life History Conceptual Model for White Sturgeon (*Acipenser transmontanus*). Final. California Department of Fish and Game Delta Regional Ecosystem Restoration and Implementation Program.

Jassby, A.D., W. J. Kimmerer, S. G. Monismith, C. Armour, J. E. Cloern, T. M. Powell, J. R. Schubel and T. J. Vendlinski. 1995. Isohaline position as a habitat indicator for estuarine populations. Ecological Applications 5:272-289.

Jassby, A. D., J. E. Cloern, and B. E. Cole. 2002. Annual Primary Production: Patterns and Mechanisms of Change in a Nutrient-Rich Tidal Ecosystem. Limnology and Oceanography. 47:698–712.

Jassby, A. D. and E. 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). Available at: http://escholarship.org/uc/item/0tb0f19p

Kimmerer, W. J. 2002a. Effects of freshwater flow on abundance of estuarine organisms: Physical effects or trophic linkages? Marine Ecology Progress Series, 243:39-55.

Kimmerer, WJ. 2002b. Physical, biological, and management responses to variable freshwater inflow into the San Francisco Estuary. Estuaries 25:1275-1290.

Kimmerer W.J. 2004. Open water processes of the San Francisco Estuary: from physical forcing to biological responses. San Francisco Estuary and Watershed Science [online serial]. 2(1): Article 1. Available at: http://repositories.cdlib.org/jmie/sfews/vol2/iss1/art1

Kimmerer, W. J. 2008. Losses of Sacramento River Chinook Salmon and Delta Smelt to Entrainment in Water Diversions in the Sacramento-San Joaquin Delta. San Francisco Estuary & Watershed Science 6(2):1–27.

Kimmerer, W. J. 2011. Modeling Delta Smelt Losses at the South Delta Export Facilities. San Francisco Estuary and Watershed Science 9(1), article 6.

Kimmerer, W. J., E. S. Gross, and M. L. MacWilliams. 2009. Is the Response of Estuarine Nekton to Freshwater Flow in the San Francisco Estuary Explained by Variation in Habitat Volume? Estuaries and Coasts 32:375-389.

Kimmerer, W.J., and M.L. Nobriga. 2008. Investigating particle transport and fate in the Sacramento-San Joaquin Delta using a particle tracking model. San Francisco Estuary and Watershed Science 6: http://repositories.cdlib.org/jmie/sfews/vol6/iss1/art4.

Kjelson, MA, PL Brandes. 1989. The use of smolt survival estimates to quantify the effects of habitat changes on salmonid stocks in the Sacramento-San Joaquin River, California, p. 100-115. In C.D. Levings, L.B. Holtby, and M.A. Henderson [ed.] Proceedings of the National Workshop on the effects of habitat alteration on salmonid stocks. Canadian Special Publication of Fisheries and Aquatic Sciences 105.

Kjelson, M. A., P. F. Raquel, and F. W. Fisher. 1982. Life History of Fall-Run Juvenile Chinook Salmon, Oncorhychus tshawytscha, in the Sacramento-San Joaquin Estuary, California. In: V. S. Kennedy (ed.). Estuarine Comparisons. Academic Press. New York, NY. Pages 393–411.

Laurance, W.F., T.E. Lovejoy, H.L. Vasconcelos, E.M. Brauna, R.P. Didham, P.C. Stouffer, C. Gascon, R.O. Bierregaard, S.G. Laurance, and E. Sampaio. 2002. Ecosystem decay of Amazonian forest fragments: A 22-year investigation. Conservation Biology 16:605-618.

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 101:321-331.

Lindley, S.T., R.S. Schick, E. Mora, P.B. Adams, J.J. Anderson, S. Greene, C. Hanson, B.P. May, D.R. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin basin. San Francisco Estuary and Watershed

MacArthur, R. H. and Wilson, E. O. 1967. The Theory of Island Biogeography. Princeton, N.J.: Princeton University Press.

Mac Nally, R., J. R. Thomson, W. J. Kimmerer, F. Feyrer, K. B. Newman, A. Sih, W. A. Bennett, L. Brown, E. Fleishman, S. D. Culberson, and G. Castillo. 2010. Analysis of pelagic species decline in the upper San Francisco Estuary using multivariate autoregressive modeling (MAR). Ecological Applications 20:1417-1430. Available at: http://online.sfsu.edu/~modelds/Files/References/MacNallyetal2010EcoApps.pdf.

Marston, D., C. Mesick, A. Hubbard, D. Stanton, S. Fortmann-Roe, S. Tsao, and T. Heyne. 2012. Delta flow factors influencing stray rate of escaping adult San Joaquin River fall-run Chinook salmon (*Oncorhynchus tshawytscha*). San Francisco Estuary and Watershed Science 10(4). Available at: http://escholarship.org/uc/item/6f88q6pf

Maunder, M. N. and R. B. Deriso. 2011. A State-Space Multistage Life Cycle Model to Evaluate Population Impacts in the Presence of Density Dependence: Illustrated with Application to Delta Smelt (*Hypomesus transpacificus*). Canadian Journal of Fisheries and Aquatic Sciences 68:1285– 1306.

MBK Engineers and Dan Steiner, 2014. Report on Review of Bay Delta Conservation Program Modeling. June 20, 2014.

McCullough, D. A., S. Spalding, D. Sturdevant, and M. Hicks. Issue Paper 5. Summary of technical literature examining the physiological effects of temperature on salmonids. EPA-910-D-01-005, prepared as part of U.S. EPA Region 10 Temperature Water Quality Criteria Guidance Development Project (2001). http://yosemite.epa.gov/R10/WATER.NSF/6cb1a1df2c49e4968825688200712cb7/5eb9e547ee9e111f88256a03005bd665/$FILE/Paper%205-Literature%20Temp.pdf

McElhany, P., M. H. Rucklelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. NOAA

Technical Memorandum NMFS-NWFSC-42. Available at: http://www.nwfsc.noaa.gov/publications/techmemos/tm42/tm42.pdf

Meffe, G.K. and C.R. Carroll. 1994. Principles of Conservation Biology. Sinauer Associates, Inc. Sunderland, Mass.

Michel, C. 2010. River and estuarine survival and migration of yearling Sacramento River Chinook salmon (*Oncorhynchus tshawytscha*) smolts and the influence of environment. A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in Ecology and Evolutionary Biology. University of California, Santa Cruz.

Michel, C.J., A.J. Ammann, E.D. Chapman, P.T. Sandstrom, H.E. Fish, M.J. Thomas, G.P. Singer, S.T. Lindley, A.P. Klimley and R.B. MacFarlane. 2012. The effects of environmental factors on the migratory movement patterns of Sacramento River yearling late-fall run Chinook salmon (*Oncorhynchus tshawytscha*). Environmental Biology of Fishes. DOI: 10.1007/s10641-012-9990-8

Miller, J.A., A. Gray. And J. Merz. 2010. Quantifying the contribution of juvenile migratory phenotypes in a population of Chinook salmon *Oncorhynchus tshawytscha*. Marine Ecology Progress Series. 408:227-240.

[Mount and Saracino et al.] Mount, W. Fleenor, B. Gray, B. Herbold, W. Kimmerer. September 2013. Panel Review of the Draft Bay Delta Conservation Plan: Prepared for The Nature Conservancy and American Rivers.

Moyle, P. B. 2002. Inland Fishes of California. Revised and Expanded. Berkeley, CA: University of California Press.

Moyle, P.,B. and W.A. Bennett, 2008. The Future of the Delta Ecosystem and Its Fish. Technical Appendix D. Comparing Futures for the Sacramento-San Joaquin Delta. Public Policy institute of California. San Francisco, CA 1-38.

Mussen, T.D., D. Cocherell, J. B. Poletto, J.S. Reardon, Z. Hockett, Ali Ercan , Hossein Bandeh, M. Levent Kavvas, Joseph J. Cech Jr., Nann A. Fangue. 2014. Unscreened Water-Diversion Pipes Pose an Entrainment Risk to the Threatened Green Sturgeon, *Acipenser medirostris*. PLOS ONE 9:1-9.

Myrick, C. A. and J. J. Cech, Jr. 2004. Temperature effects on juvenile anadromous salmonids in California's central valley: what don't we know? Reviews in Fish Biology and Fisheries 14:113-123.

Myrick, C. A., and J. J. Cech, Jr. 2005. Effects of temperature on the growth, food consumption and thermal tolerance of age-0 Nimbus-strain steelhead. North American Journal of Aquaculture 67(4): 324-330

National Research Council. 2010. A Scientific Assessment of Alternatives for Reducing Water Management Effects on Threatened and Endangered Fishes in California's Bay Delta. Washington, DC: National Academies Press.

National Marine Fisheries Service. 2009. Biological opinion and conference opinion on the long-term operations of the Central Valley Project. Available at: http://swr.nmfs.noaa.gov/ocap.htm

National Marine Fisheries Service. 2009. Public Draft Recovery Plan for the Evolutionary Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead. Sacramento Protected Resources Division. October 2009.

National Marine Fisheries Service. 2009. Exhibit 6 -- Essential Fish habitat Conservation Recommendations (June 2009). Submitted to the State Water Resources Control Board as part of testimony to the Informational Proceeding to Develop Flow Criteria for the Delta ecosystem necessary to Protect Public Trust Resources.

National Marine Fisheries Service. 2010. Exhibit 7 -- Residence of winter-run Chinook salmon in the Sacramento-San Joaquin Delta: the role of Sacramento River hydrology in driving juvenile abundance and migration patterns in the Delta. R.B. del Rosario, Y. J. Redler, and P. Brandes, Submitted to the State Water Resources Control Board as part of testimony to the Informational Proceeding to Develop Flow Criteria for the Delta ecosystem necessary to Protect Public Trust Resources.

National Marine Fisheries Service. 2010. Written Summary. Submitted to the State Water Resources Control Board as part of testimony to the Informational Proceeding to Develop Flow Criteria for the Delta ecosystem necessary to Protect Public Trust Resources.

National Marine Fisheries Service. 2014. Public Final Recovery Plan for the Evolutionary Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead. Sacramento Protected Resources Division. July 2014.

Newman, K.B., and Rice, J. 2002. Modeling the survival of chinook salmon smolts outmigrating through the lower Sacramento river system. Journal of the American Statistical Association, 97: 983--993.

Nickel, D.K., Brett, M.T. and Jassby, A.D. 2004. Factors regulating Shasta Lake (California) cold water accumulation, a resource for endangered salmon conservation. Water Resources Research 40. doi: 10.1029/2003WR002669. issn: 0043-1397.

Nobriga, M. and B. Herbold. 2009. The Little Fish in California's Water Supply: A Literature Review and Life-History Conceptual Model for Delta Smelt (Hypomesus transpacificus) for the Delta Regional Ecosystem Restoration and Implementation Plan (DRERIP).Delta Regional Ecosystem Restoration Implementation Plan (DRERIP). Sacramento, CA.

Nobriga, M.L., T.R. Sommer, F. Feyrer, and K. Fleming. 2008. Long-term Trends in summertime habitat suitability for Delta smelt (Hypomesus transpacificus). San Francisco Estuary and Watershed Science. 6(1): Article 1.

Null S.E. and Viers J.H. 2013. In bad waters: Water year classification in nonstationary climates. Water Resources Research. 49(February 2013):1137-1148.

Perry, R. W., J. R. Skalski, P. L. Brandes, P. T. Sandstrom, A. P. Klimley, A. Amman, and B. MacFarlane. 2010. Estimating survival and migration route probabilities of juvenile Chinook salmon in the Sacramento–San Joaquin River Delta. North American Journal of Fisheries Management 30:142-156.

Perry, R.W., P.L. Brandes, J.R. Burau , A.P. Klimley, B. MacFarlane, C. Michel, J.R. Skalski. 2012. Sensitivity of survival to migration routes used by juvenile Chinook salmon to negotiate the Sacramento-San Joaquin River Delta. Environmental Biology of Fishes. DOI 10.1007/s10641-012-9984-6

Quinn, T. P. 2005. The Behavior and Ecology of Pacific Salmon and Trout. University of Washington Press, Seattle.

Reese, C. D. and B. C. Harvey. 2002. Temperature-dependent interactions between juvenile steelhead and Sacramento pikeminnow in laboratory streams. Transactions of the American Fisheries Society 131:599-606.

Richter, A. and S. A. Kolmes. 2005. Maximum temperature limits for chinook, coho, and chum salmon, and steelhead trout in the Pacific Northwest. Reviews in Fisheries Science 13:23-49.

Roberts, J. and J. Laughlin. 2013. Benefits of Conservation Measure 17 Illegal Harvest Reduction. Memorandum from Jason Roberts, Senior Environmental Scientist, Water Branch, California Department of Fish and Wildlife; and John Laughlin, Lieutenant Warden, Delta-Bay Enhanced Enforcement Program, California Department of Fish and Wildlife; to Carl Wilcox, Special Advisor to the Director, California Department of Fish and Wildlife. March 26.

Rose, K. A., W. J. Kimmerer, K. P. Edwards, and W. A. Bennett. 2013a. Individual-Based Modeling of Delta Smelt Population Dynamics in the Upper San Francisco Estuary: I. Model Description and Baseline Results. Transactions of the American Fisheries Society 142(5):1238□1259.

Rose, K. A., W. J. Kimmerer, K. P. Edwards, and W. A. Bennett. 2013b. Individual-Based Modeling of Delta Smelt Population Dynamics in the Upper San Francisco Estuary: II. Alternative Baselines and Good versus Bad Years. Transactions of the American Fisheries Society 142(5):1260□1272.

Rosenfield, J. A. 2002. Pattern and process in the geographical ranges of freshwater fishes. Global Ecology and Biogeography 11:323-332.

Rosenfield, J.A. 2010. Conceptual life-history model for longfin smelt (Spirinchus thaleichthys) in the San Francisco Estuary. California Department of Fish and Game. Sacramento, CA. http://www.dfg.ca.gov/ERP/conceptual_models.asp.

Rosenfield, J. A. and R. D. Baxter. 2007. Population dynamics and distribution patterns of longfin smelt in the San Francisco estuary. Transactions of the American Fisheries Society 136:1577-1592.

SRTTG. California Department of Fish and Wildlife. 2013. Redd dewatering and juvenile stranding in the upper Sacramento River year 2012-2013. Prepared by R. Revnak and D. Killam. RBFO Technical Report No. 01-2013. Available at: http://www.calfish.org/Programs/CDFGUpperSacRiverBasinSalmonidMonitoring/tabid/222/Default.aspx

Simenstad, C.A., K.L Fresh, and O. Salo. 1982. The role of Puget Sound and Washington coastal estuaries in the life history of Pacific salmon: an unappreciated function. In Estuarine comparisons. Edited by V.S. Kennedy. Academic Press, New York. pp. 343–364.

Smith, G.R., J.A. Rosenfield, and J. Porterfield. 1995. Processes of origin and criteria for preservation of fish species. Pages 44-57 in J.L. Nielsen, P. Brouha, and D. Powers, eds.

Evolution and the aquatic ecosystem: Defining unique units in population conservation. American Fisheries Society special publication #17. Bethesda, MD

Sommer, T., C. Armor, R. Baxter, R. Breuer, L. Brown, M. Chotkowski, S. Culberson, F. Feyrer, M. Gingras, B. Herbold, W. Kimmerer, A. Mueller-Solger, M. Nobriga, and K. Souza. 2007. The collapse of pelagic fishes in the Upper San Francisco Estuary. Fisheries (Bethesda) 32:270-277.

State Water Resources Control Board. 2010. Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem. Prepared Pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009.

Stevens, D. E. and L. W. Miller. 1983. Effects of river flow on abundance of young chinook salmon, American shad, longfin smelt, and Delta smelt in the Sacramento-San Joaquin river system. N. Am. J. Fish. Manage. 3:425-437.

Teh, S. Fall X2 fish health study: contrasts in health indices, growth and reproductive fitness of delta smelt and other pelagic fishes rearing in the low salinity zone and Cache Slough regions. Progress Report to Environmental Restoration Program, California Department of Fish and Game, Sacramento, CA

The Bay Institute, Natural Resources Defense Council, American Rivers, Natural Heritage Institute (TBI et al. 2010 exhibits 1-4). 2010. Written Testimony of Jonathan Rosenfield, Christina Swanson, John Cain, et al. Before the State Water Resources Control Board, Exhibits 1-4, summary, and closing comments. Available at: http://www.bay.org/publications/flowcriteria-for-the-delta-ecosystem.

The Bay Institute. 2011. Collateral damage: A citizen's guide to fish kills and habitat degradation at the state and federal water project pumps in the Delta, 19pp. Novato, CA. Available at: http://www.bay.org/publications/collateral-damage

Thompson et al 2012; Going with the flow: the distribution, biomass and grazing rate of *Potamocorbula* and *Corbicula* with varying freshwater flow (May and October 2009-2011), Progress Report to U.S. Bureau of Reclamation, Sacramento, CA.

Thomson, J. R., W. J. Kimmerer, L. R. Brown, K. B. Newman, R. Mac Nally, W. A. Bennett, F. Feyrer, and E. Fleishman. 2010. Bayesian change point analysis of abundance trends for pelagic fishes in the upper San Francisco Estuary. Ecological Applications 20:1431-1448. Available at: http://online.sfsu.edu/~modelds/Files/References/ThomsonEtal2010EcoApps.pdf

USDOI. U.S. Department of Interior. 2011. Comments on the Review of and Potential Modifications to the San Joaquin River Flow and Southern Delta Salinity Objectives Included in the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, submitted to the California State Water Resources Control Board, February 8, 2011 55 pp.

USFWS. U.S. Fish and Wildlife Service. 1996. Sacramento-San Joaquin Delta native fishes recovery plan. Portland (OR): U.S. Fish and Wildlife Service. Available at: http://ecos.fws.gov/docs/recovery_plans/1996/961126.pdf

USFWS. U.S. Fish and Wildlife Service. 2011. First Draft 2011 Formal Endangered Species Act Consultation on the Proposed. San Francisco Bay-Delta Fish and Wildlife Office. https://www.usbr.gov/mp/BayDeltaOffice/docs/Signed_FINAL%202011-F-0043_%20SWP-CVP%20BO%20Dec%2014%20FIRST%20DRAFT.pdf

VAMP Panel Report. Dauble, D., D. Hankin, J.J. Pizzimenti, and P. Smith. 2010. The Vernalis Adaptive Management Program (VAMP): Report of the 2010 Review Panel. Prepared for the Delta Science Program. 45pp.

Wang, J.C.S. 2007. Tracy Fish Facility Studies, California: Spawning, early life stages, and early life histories of the Osmerids found in the Sacramento-San Joaquin Delta of California. Volume 38. U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region.

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(3):Article 2. Available at: http://repositories.cdlib.org/jmie/sfews/vol4/iss3/art2

Williams, G. J. 2010. Life History Conceptual Model for Chinook salmon and Steelhead. DRERIP Delta Conceptual Model. Sacramento (CA): Delta Regional Ecosystem Restoration Implementation Plan. Available at: http://www.dfg.ca.gov/ERP/drerip_conceptual_models.asp

Winder, M., A.D. Jassby, and R. Mac Nally. 2011. Synergies between climate anomalies and hydrological modifications facilitate estuarine biotic invasions. Ecology Letters 14: 749–757.

Yoshiyama, R. M., E. R. Gerstung, and F. W. Fisher. 2001. Historical and present distribution of Chinook salmon in the Central Valley drainage of California. In Brown, R. L. editor, Contributions to the Biology of Central Valley Salmonids. Sacramento, CA: California Department of Fish and Game, pp 71-176.