From: Jon Rubin <Jon.Rubin@sldmwa.org>
Sent: Tuesday, July 29, 2014 2:26 PM
To: BDCP.COMMENTS@NOAA.GOV
Cc: Craig Manson (cmanson@westlandswater.org); Ren_Lohoefener@fws.gov; William W. Stelle (will.stelle@noaa.gov) (will.stelle@noaa.gov); Bonham, Chuck@Wildlife; Murillo, D@USBR; Cowin, Mark@DWR; Beck, Jim; jduerig@zone7water.com; bgoldie@valleywater.org; jkightlinger@mwdh2o.com
Subject: Draft Bay Delta Conservation Plan and Associated Draft Environmental Impact Report/Environmental Impact Statement
Attachments: Comments of SLDMWA and WWD on Draft BDCP and Draft EIR_S (7 29 14).pdf

Mr. Wulff:

The San Luis & Delta-Mendota Water Authority and Westlands Water District attach a single document that includes a comment letter and attachments. The index and DVD referenced in Attachment 4 have not been including in this electronic transmission. Hard copies of the letter and attachments, including the index and DVD, will be hand delivered to you this afternoon.

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San Luis & Delta-Mendota Water Authority

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July 29, 2014

BY EMAIL AND HAND DELIVERY

Bay Delta Conservation Plan Comments
Ryan Wulff, National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814
BDCP.COMMENTS@NOAA.GOV

Mr. Wulff:

The San Luis & Delta-Mendota Water Authority and Westlands Water District (collectively the "Participating CVP Public Water Agencies") support the efforts to develop the Bay Delta Conservation Plan ("BDCP") and Environmental Impact Report and Environmental Impact Statement ("EIR/S") and commit to continued collaboration toward finalizing these important documents. The extraordinary efforts of the California Department of Water Resources ("DWR"), California Department of Fish and Wildlife ("Cal. DFW"), United States Bureau of Reclamation ("Reclamation"), United States Fish and Wildlife ("USFWS"), and National Marine Fisheries Service ("NMFS") to prepare these documents will help to ensure California's continued prosperity and environmental health into the 21st Century. The State's Water Action Plan adopts a comprehensive approach to meeting the critical, future water needs of both the economy and the environment. But, importantly, the timely and successful implementation of the BDCP will provide the essential infrastructure and management strategy that are necessary to make the fulfillment of those needs possible.

At the outset, the Participating CVP Public Water Agencies commend DWR for preparing the thorough Draft BDCP. Without action, the widespread, devastating adverse impacts caused by insufficient water supplies will continue to be suffered by the communities served by the Participating CVP Public Water Agencies, including those with significant minority and low-income populations. Also, without action, the health of the San Francisco Bay/Sacramento-San Joaquin River Delta ("Bay-Delta") ecosystem will continue to decline. Simply put, a comprehensive, integrated approach, like that described in the Draft BDCP and analyzed in the

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Draft EIR/S, is an important step towards replacement of the current, failing water supply and environmental management strategies.

The BDCP is a multi-species conservation plan that proposes a comprehensive set of solutions at the scale of the landscape, natural communities and individual species. The BDCP's extensive series of conservation measures will ensure that the BDCP, to the maximum extent practicable, minimizes and mitigates potential take of protected species, as well as other covered species, and will not appreciably reduce the likelihood of their survival and recovery. The BDCP will also provide for the conservation of those species. While providing those protections and benefits to the covered species, the BDCP will enable projects that restore and protect water supply – provide water supplies at least to those levels projected under State Water Resources Control Board Decision 1641 ("D-1641"), if not more, and up to full contract amounts when hydrology allows, in addition to water available to the Participating CVP Public Water Agencies under transfer and exchange agreements (collectively "transfer and exchange water") or available from Reclamation, pursuant to section 215 of the Reclamation Reform Act of October 12, 1982 (Public Law 97-293), as non-storable or unmanageable flood flows of short duration ("Section 215 water").

The Draft BDCP is consistent with and responsive to what the California State Water Resources Control Board concluded in its 2010 Flow Criteria Report: "Best available science supports that it is important to directly address the negative effects of other stressors, including habitat, water quality, and invasive species, that contribute to higher demands for water to protect public trust resources. The flow criteria highlight the continued need for the BDCP to develop an integrated set of solutions and to implement non flow measures to protect public trust resources." (2010 Flow Criteria Report, p. 4.)

The BDCP's comprehensive set of solutions is also consistent with recommendations of the Delta Vision Program and the Delta Reform Act, both of which recommend simultaneously: (1) restoring a healthy ecosystem in part through creating large areas of habitats within the Delta, and (2) improving the quantity and reliability of water supply to meet the needs for reasonable and beneficial use in part through new and improved infrastructure. (See, e.g., Delta Vision, Blue Ribbon Task Force, Our Vision for the California Delta, pp. 12, 14; Wat. Code, §§ 85302, 85304.)

The result – the Draft BDCP presents a plan that will benefit water supply and the health of the Bay-Delta. Its actions exceed the criteria for issuance of permits under the federal Endangered Species Act ("ESA") and the California Natural Community Conservation Planning Act ("NCCPA"). Likewise, the Draft EIR/S thoroughly considers and adequately addresses the potential environmental concerns, as required and in satisfaction of the California Environmental Quality Act ("CEQA") and the National Environmental Protection Act ("NEPA"). For those reasons as well as others described herein and in the attached focused comments,[1] the Participating CVP Public Water Agencies are proud to support the lead agencies'

[1] The Participating CVP Public Water Agencies incorporate into this letter by this reference the focused comments in Exhibit 2, attached hereto.

development of the thorough and rigorous Draft BDCP and Draft EIR/S, as the next step in implementing a solution to this complex issue, and look forward to continuing to work to finalize these important documents. Below, the Participating CVP Public Water Agencies summarize the critical need to move forward on the BDCP and the thorough manner in which the Draft EIR/S takes a full and hard look at the environmental consequences.

The Planning Process For The Draft BDCP And Draft EIR/S Includes A Goal Of Advancing Projects That Restore And Protect Water Supply

The BDCP is critical to address the long-term decline in the quantity and reliability of CVP water supplied to the Participating CVP Public Water Agencies, as well as many others.[2] From the time Reclamation began delivering water to the Participating CVP Public Water Agencies in 1952 until 1989, Reclamation delivered in every year the full amount allowed under contracts, except during the critically dry 1977. However, over the past twenty-five plus years, more than 3.0 million acre-feet of CVP water has been reprioritized each year from municipal, industrial, and agricultural needs to actions intended to benefit fish and wildlife. By 2006, the quantity and reliability of CVP water had been significantly eroded for Westlands and other agricultural water service contractors located south of the Delta (within the membership of the San Luis & Delta-Mendota Water Authority), and, to a lesser degree, for the members of the Water Authority that are municipal and industrial water service contractors, San Joaquin River Exchange Contractors, and wildlife refuges.

The data are stark. As reflected in the following graph, for example, not only has there been significant reductions in the quantity of water available, but the amount of water allocated by Reclamation to agricultural water service contractors has become unrelated to the amount of water Reclamation is able to appropriate to storage, and the allocation unpredictably changes during the year from initial allocation in February to final allocation in May.

[2] The 2014 drought has and will likely continue to produce information that further demonstrates the harm caused by water shortages and the benefits of efforts that restore and protect ecosystem health and water supplies, benefits not only for the Participating CVP Public Water Agencies but for many others.

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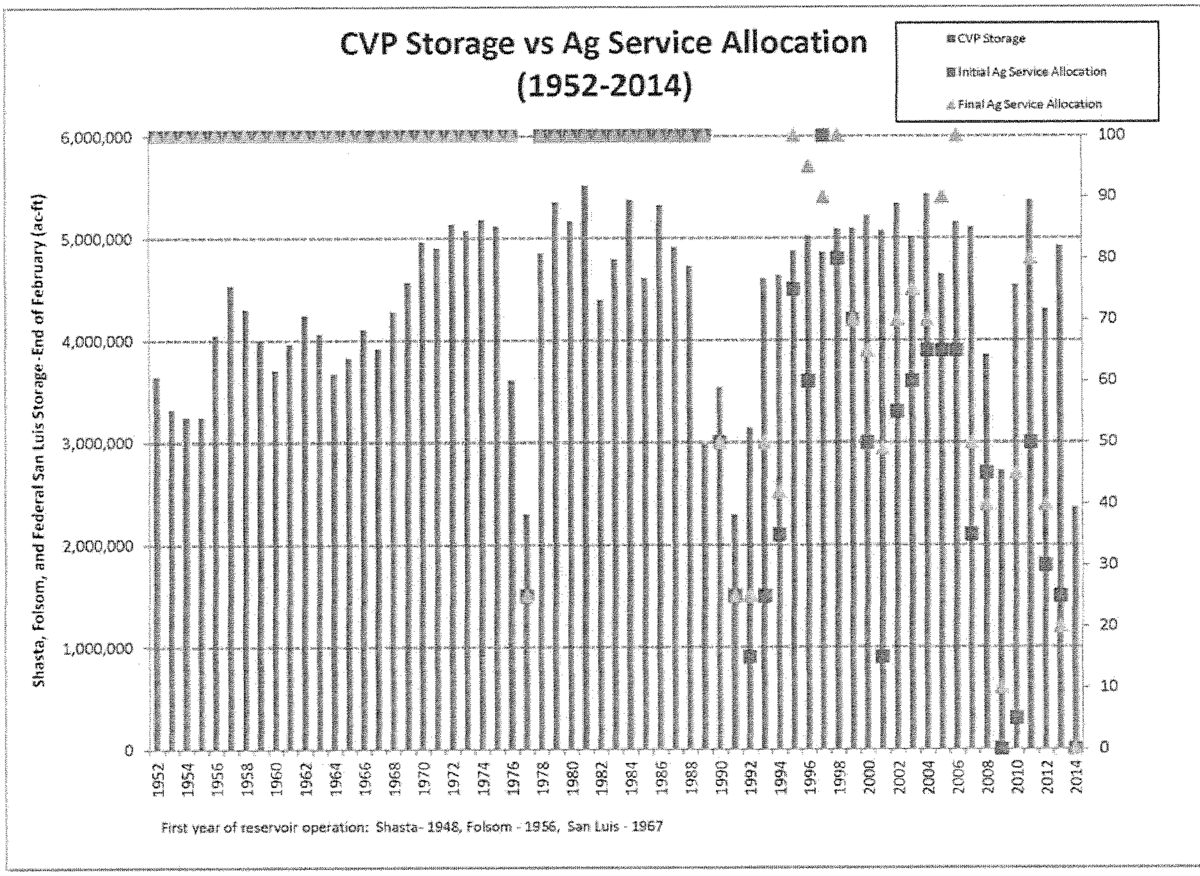

T. Boardman, SLDMWA
7/28/2014

The economic, social and environmental effects resulting from reduced quantity and reliability of CVP water have been extraordinary. And yet, those harmful effects have not produced any measureable improvement in the population levels of fish or wildlife.

In recognition of the need to avoid further irreparable harm to the communities, farms, and businesses served by the Participating CVP Public Water Agencies, as well as others, and to improve the ecological health of the Bay-Delta, the CEQA and NEPA lead agencies – DWR, Reclamation, USFWS, and NMFS – established, as the fundamental purpose of the BDCP, to make physical and operational improvements in the Bay-Delta necessary to restore and protect ecosystem health, water supplies of the SWP and CVP, and water quality within a stable regulatory framework. (Draft EIR/S, pp. 2-2, 2-5.) The benchmark to measure whether the BDCP will restore and protect water supplies was set in 2006, when those agencies, as well as other federal, state, and local agencies, including the Participating CVP Public Water Agencies, along with non-governmental organizations, executed the planning agreement for the BDCP ("BDCP Planning Agreement"). (BDCP Planning Agreement, § 3.) At that time, the Participating CVP Public Water Agencies made clear, and those that signed the BDCP Planning Agreement

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agreed, that to meet the purpose of the BDCP, the BDCP must allow for actions that provide water supplies at least to those levels projected under D-1641, if not more, and up to full contract amounts when hydrology allows. The full contract amounts require Reclamation to appropriate for the benefit of the Participating CVP Public Water Agencies, or those they represent, approximately 3.3 million acre-feet of water. Under D-1641, their contract allocations under average hydrology were approximately 75% for the agricultural water service contractors, 95% for municipal and industrial water service contractors, 100% for San Joaquin River Exchange Contractors and 100% for wildlife refuges. Those allocations require Reclamation to appropriate approximately 2.9 million acre-feet of water. The range from 2.9 (reduced per D-1641) to 3.3 (full contract) million acre-feet is in addition to transfer and exchange water and Section 215 water. The Draft BDCP and Draft EIR/S fully consider alternatives that would meet those water supply goals and the environmental goals, thus achieving the BDCP's fundamental purpose.

Inaction Will Have Widespread, Devastating Impacts On Communities Served By The Participating CVP Public Water Agencies, Including Those With Significant Minority And Low-Income Populations, And On The Environment

Failure to act will have devastating consequences. Communities served by the Participating CVP Public Water Agencies, including those with significant minority and low-income populations, are suffering disproportionately from chronic water supply shortages and the resulting lack of water supply reliability. The reductions in the quantity and reliability of water have also inhibited the government's ability to act fully in the public's greatest interest. Those impacts are discussed in the Draft BDCP and Draft EIR/S, particularly in Chapter 16 – Socioeconomics and Chapter 28 – Environmental Justice. The Final EIR/S should maintain, if not strengthen, its consideration of impacts, in those Chapters and others, to the areas served by the Participating CVP Public Water Agencies.

In 2012, Dr. David Sunding presented to the State Water Resources Control Board information concerning the economic impact of changes in water supply. He concluded that the cost from reductions in CVP and SWP water conveyed through the Delta amounted to $1,400,000,000 for every 100,000 acre-feet of water lost to urban sectors and $300,000 for every 100,000 acre-feet of water lost to agricultural sectors. (Sunding, Modeling the Economic Impact of Changes in Delta Water Supplies (2012).)

More recently, academic research by Auffhammer, Foreman and Sunding (2014) report that, in 2009, water deliveries from the CVP were only 10% and deliveries from the SWP were 40%. The authors conclude that 9,100 jobs were lost in 2009 relative to 2005 (a year of full irrigation supplies) as a result of reduced water deliveries. Crop fallowing in these same counties in 2009 (again relative to 2005) totaled approximately 240,000 acres.

Reduced water supply and reliability within the areas served by the Participating CVP Public Water Agencies have had socioeconomic and environmental impacts, including:

1. Reduced employee hours, lost wages and jobs, loss of tax revenue to fund municipal services such as fire and police protection, and the resulting reduction

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in staffing at the local government level, thereby contributing to family disruption and dislocation;

2. Adverse impacts to local schools from the relocation of farming-dependent families, lost school revenues, and additional social costs for schools, food shortages and increased demand for public services such as food banks, and an increased incidence of crime;

3. Loss of crops, including the destruction of permanent crops, which increases the amount of fallowed land that diminishes air quality due to dust and particulate matter;

4. Increased groundwater pumping, resulting in decreased water quality and impacts to crops from increased soil salinity, groundwater overdraft resulting in land subsidence and associated impacts to infrastructure, increased energy demand related to pumping and associated environmental impacts, and depletion of groundwater reserves.

Those significant adverse impacts, as well as other related impacts, are discussed under the No Project/No Action Alternatives. Those impacts, as well as other related impacts, are also discussed under the Action Alternatives. To reasonably minimize and mitigate for those impacts, the restoration and protection of the water supply for the Participating CVP Public Water Agencies, as outlined in this comment letter, is necessary.

Decades Of Study And Activities Within The Bay-Delta Support A Conservation Plan Developed Around Dual Conveyance

The framework proposed by the BDCP is the result of years of study and consideration of alternative water supply and environmental management strategies. More recently and prior to the BDCP, efforts to improve California's water supply conveyed through and the ecological health of the Bay-Delta were focused under the CalFed program. Approved in 2000, the CalFed program provided a 30-year, multi-staged plan that was intended to allow state and federal agencies to make more informed decisions on projects to improve water supply and protect the Delta. The CalFed program was founded on a "through-Delta approach" – an approach that relied exclusively on the CVP and SWP continuing to use natural channels to convey water from the Sacramento River watershed to areas south of the Delta. (CalFed ROD, p. 48.) However, even at the time the CalFed program was developed, the twenty-five state and federal participating agencies recognized that an alternative, isolated conveyance might have allowed the CalFed program to "technically perform better." (CalFed ROD, p. 27.) However, the agencies decided against development of the CalFed program with isolated conveyance at that time but acknowledged: "If the Program purposes cannot be fully achieved with the actions proposed in the Preferred Program Alternative, additional actions including an isolated conveyance facility will need to be considered in the future." (*Id.*)

In 2006, as the CalFed program was ending its first stage, the CalFed program staff began assessing CalFed program effectiveness. (See CalFed 10-Year Action Plan; CALFED End of

Stage 1 Report.) The CalFed program staff believed there was a heightened need for the assessment because of:

1. The continued decline of populations of certain Bay-Delta fish species;

2. The continued conflict over CVP and SWP operations;

3. Research conducted since the 1989 Loma Prieta earthquake, the 2004 Upper Jones Tract levee failure, the 2005 Hurricane Katrina and its impact on levees and the subsequent impact to both communities and the environment, and the results of the Delta Risk Management Strategy, which increased the concern over the aging levee system within the Delta; and

4. Then-new scientific studies that suggested climate change would likely alter the landscape and hydrology of the Bay-Delta.

The assessment led the CalFed program staff, as well as others, to conclude that sufficient justification existed to consider alternatives to the through-Delta conveyance approach. (See Draft CalFed End of Stage 1 Staff Report, p.i.)

The Decision To Develop A Conservation Plan With Dual Conveyance Achieves The Planning Goal Of Restoring And Protecting Water Supply, Water Quality, And Ecosystem Health Within A Stable Regulatory Framework

Following the CalFed assessment and starting with a July 28, 2006 memorandum of agreement ("2006 MOA"), federal, state, and local agencies initiated the effort to develop the BDCP. As explained in the 2006 MOA, the need for the BDCP resulted, in part, from changes in the CalFed program. (2006 MOA, p. 1.) By October 2006, those federal, state, and local agencies, including the Participating CVP Public Water Agencies, were joined by non-governmental organizations in executing the planning agreement for the BDCP. The BDCP Planning Agreement, as subsequently amended, provides the architecture for the planning process, explaining in part that a planning goal for the BDCP is to "[a]llow for projects to proceed that restore and protect water supply, water quality, and ecosystem health within a stable regulatory framework." (BDCP Planning Agreement, § 3.)

In November 2007, the Steering Committee formed to guide development of the BDCP agreed that "the most promising approach for achieving the BDCP conservation and water supply goals involves a conveyance system with … a new point (or points) of diversion in the north Delta on the Sacramento River and an isolated conveyance facility around the Delta." (The Bay Delta Conservation Plan: Points of Agreement for Continuing into the Planning Process, p. 3.) That point of agreement was reinforced by the Delta Vision Program, which recommended new facilities for conveyance, (Delta Vision, Blue Ribbon Task Force, Our Vision for the California Delta, pp. 12, 14) and the Delta Reform Act, which in part made it State policy to "improve the water conveyance system." (Wat. Code, § 85020.)

Over the next six years, the BDCP planning process continued. DWR, Reclamation, USFWS, NMFS, and Cal. DFW recognized the significant public interest in the BDCP, the complexity of the planning process, and the volume of information likely needed to support the Draft BDCP and Draft EIR/S. Accordingly, during the planning process, they collectively held more than 600 public meetings and stakeholder briefings. They published more than 3,000 documents, including a working draft BDCP, administrative drafts of the BDCP and EIR/S, posting all of them online, and solicited and considered input from interested parties and independent scientists. All of these actions facilitated and continue to facilitate public access, improved scientific analyses, greater government transparency, and better understanding by decision-makers and the public of the BDCP and its effects.

In October 2013, the BDCP planning process reached an important milestone, when the Participating CVP Public Water Agencies, Zone 7 of the Alameda County Flood Control and Water Conservation District, Kern County Water Agency, the Metropolitan Water District of Southern California, and the Santa Clara Valley Water District, (collectively the "Public Water Agencies"), along with DWR, applied to the USFWS and NMFS for incidental take permits under section 10 of the federal ESA and to Cal. DFW for an incidental take permit under the NCCPA. The Draft BDCP, including its draft Implementing Agreement, and the Draft EIR/S provide the necessary foundation for decisions by USFWS, NMFS, and Cal. DFW to permit and for DWR and Reclamation, along with the Public Water Agencies, to implement the BDCP.

The Draft BDCP And Draft EIR/S Allows For Projects That Restore And Protect Ecosystem Health, Water Supplies Of The SWP And CVP, And Water Quality

There are many reasons why the Draft BDCP and Draft EIR/S meet the core legal requirements, several of which we highlight in our Focused Comments attached to this letter. In particular:

The Draft EIR/S Considers A Range Of Alternatives That Is Reasonable, Particularly When Considered In The Context Of California's Long History Of Water Planning And Development

The Draft EIR/S analyzes a range of alternatives necessary to permit a reasonable choice and to foster meaningful public participation and informed decision-making. DWR, Reclamation, USFWS, and NMFS began with fifteen Action Alternatives and the No Action/Project Alternatives. Those alternatives were identified after considering approximately 3,000 comments received during the scoping process. Through a three-stage screening process, DWR, Reclamation, USFWS, and NMFS (1) eliminated from detailed analysis those alternatives that were not likely to achieve the CEQA objectives or NEPA purpose and need, and (2) maintained those alternatives that (a) were most likely to avoid or substantially lessen expected significant environmental effects and address significant issues, and (b) were most likely technically and economically feasible/practical. As a result of that screening, DWR, Reclamation, USFWS, and NMFS subjected to detailed analysis nine Action Alternatives and the No Action/No Project Alternatives. Those alternatives represent a reasonable range, as they differ in physical conveyance facility infrastructure/improvements, the locations of facilities, diversion capacities, operational criteria for water supply facilities, and the acreage of habitats that would be restored or enhanced.

As described in Appendix 3A to the Draft EIR/S, history supports the reasonableness of the range. For more than fifty years, DWR, Reclamation, USFWS, NMFS, and Cal. DFW have considered how best to restore and protect ecosystem health, water supplies of the SWP and CVP, and water quality. Most recently, DWR, Reclamation, USFWS, NMFS, and Cal. DFW evaluated hundreds of alternatives through the CalFed and Delta Vision programs. Through the CalFed Program, the twenty-five state and federal participating agencies considered one hundred alternatives intended to improve conditions for fisheries, water supply, water quality, land use, and flood protection. (See, e.g., CALFED Programmatic Record of Decision, Attachment 1, pp. 124-125; CalFed EIS/EIR, Common Responses, pp. 20-33.) Consideration of those alternatives, as discussed above, informed the Draft BDCP and Draft EIR/S. Likewise, the Delta Vision Program, initiated by then-Governor Arnold Schwarzenegger, identified a strategy for managing the Bay- Delta as a sustainable ecosystem that would continue to support environmental and economic functions that are critical to the people of California. After two years of consideration, the Delta Vision Program concluded that "Existing Delta water conveyance systems are inadequate and must be improved." (Delta Vision, Blue Ribbon Task Force, Our Vision for the California Delta, p. 12.) It recommended, in part, "[a]n assessment of a dual conveyance system as the preferred direction, focused on understanding the optimal combination of through-Delta and isolated facility improvements." (*Id*. at p. 14.)

The Use Of Science In The Draft BDCP And Draft EIR/S Is Appropriate: Existing Scientific Uncertainties Are Consistent With All Management Decisions And Conservation Plans

The Draft BDCP and Draft EIR/S include scientific analyses that support a CEQA project/NEPA action that will restore and protect water supplies, while providing environmental benefits. The Draft BDCP relies upon extensive scientific study and analysis of the Bay-Delta compiled over multiple decades, including new and ongoing research. To ensure a thorough scientific foundation, the Draft BDCP reflects substantial input from independent scientific advisors, who provided input throughout the planning process. Six BDCP Independent Science Advisory Panels provided reports that were used to inform development of the BDCP.

The scientific foundation for the BDCP includes a level of uncertainty. This uncertainty, however, does not weaken the ability of the USFWS, NMFS, and Cal. DFW to permit, and DWR and Reclamation, along with the Public Water Agencies, to implement the BDCP. Natural Community Conservation Plans and Habitat Conservation Plans are developed notwithstanding many uncertainties due, in part, to the difficulty in trying to understand complex biological and physical interactions in constantly changing natural and human environments. Indeed, uncertainty is the backdrop against which all decision-making must occur.

The Draft BDCP, like all Natural Community Conservation Plans and Habitat Conservation Plans, manages the risk due to scientific uncertainty. The Draft BDCP does so by departing from past regulatory approaches that relied almost exclusively on iterative adjustments to the operations of the SWP and the CVP, and instead relying on a robust investment in conservation measures which address ecological functions and processes at a broad landscape scale. As recommended by multiple federal and state agencies, the Draft BDCP proposes fundamental, systemic, long-term physical changes to the Bay-Delta, including substantial alterations to water conveyance infrastructure and water management regimes; extensive restoration of natural communities; and measures specifically designed to offset ecological stressors on covered species. It does so by being designed to improve the understanding of the ecological systems, allowing adjustments in covered activities, associated federal actions, and the conservation strategy through an "Adaptive Management" framework. In addition, it includes provisions that address changed conditions and unforeseen circumstances. Critically, the Draft BDCP, through its draft implementation agreement, encourages investments that serve the needs of people, by providing DWR, Reclamation, and the Public Water Agencies with assurances that they will not be obligated to provide land, water, and financial resources beyond the obligations they assume.

Conclusion

The Participating CVP Public Water Agencies appreciate the time and effort invested in developing the Draft BDCP and Draft EIR/S. For all of the reasons expressed in this letter, we encourage USFWS, NMFS, and Cal. DFW to permit and DWR and Reclamation, along with the Public Water Agencies, to implement the BDCP to provide the intended benefits to the Bay-Delta ecosystem and in a manner that restores and protects water supplies at least to those levels projected under D-1641, if not more, and up to full contract amounts when hydrology allows, in addition to water supplies available to the Participating CVP Public Water Agencies under transfer and exchange agreements (collectively "transfer and exchange water") or available from Reclamation, pursuant to section 215 of the Reclamation Reform Act of October 12, 1982 (Public Law 97-293), as non-storable or unmanageable flood flows of short duration ("Section 215 water").

Thank you in advance for your consideration of these comments on the Draft BDCP, including its Implementation Agreement, and the Draft EIR/S.

Daniel Nelson
Executive Director
San Luis & Delta-Mendota
Water Authority

Thomas W. Birmingham
General Manager
Westlands Water District

Attachment 1 – Descriptions of the SLDMWA and WWD
Attachment 2 – Focused Comments
Attachment 3 – References Cited
Attachment 4 – Document Index and Library

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cc: By electronic mail, without index and DVD referenced in Attachment 4, to:
Chuck Bonham
Mark Cowin
Ren Lohoefener
David Murillo
William Stelle
Jim Beck
Jill Duerig
Beau Goldie
Jeff Kightlinger

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Attachment 1: Descriptions Of SLDMWA And WWD

The San Luis & Delta-Mendota Water Authority The Water Authority was formed in 1992 as a joint powers authority and consists of 28 member agencies, 26 of which contract with the United States for supply of water from the federal Central Valley Project. The Water Authority's member agencies collectively hold contracts with the United States for the delivery of approximately 3.3 million acre-feet of CVP water. The Water Authority member agencies are: Banta-Carbona Irrigation District; Broadview Water District; Byron Bethany Irrigation District (CVPSA); Central California Irrigation District; City of Tracy; Del Puerto Water District; Eagle Field Water District; Firebaugh Canal Water District; Fresno Slough Water District; Grassland Water District; Henry Miller Reclamation District #2131; James Irrigation District; Laguna Water District; Mercy Springs Water District; Oro Loma Water District; Pacheco Water District; Panoche Water District; Patterson Irrigation District; Pleasant Valley Water District; Reclamation District 1606; San Benito County Water District; San Luis Water District; Santa Clara Valley Water District; Tranquillity Irrigation District; Turner Island Water District; West Side Irrigation District; West Stanislaus Irrigation District; Westlands Water District. CVP water provided to the Water Authority's member agencies is currently conveyed through the Delta and used within areas of San Joaquin, Stanislaus, Merced, Fresno, Kings, San Benito, and Santa Clara Counties, California. The CVP water supports approximately 1.2 million acres of agricultural land, as well as more than 100,000 acres of managed wetlands, private and public, in California's Central Valley. The Water Authority's member agencies also use CVP water to serve more than 1 million people in the Silicon Valley and the Central Valley. In addition, the Water Authority is responsible for operating facilities of the CVP, including the C.W. "Bill" Jones Pumping Plant. The Water Authority has applied for incidental take permits, under the federal Endangered Species Act and California Natural Community Conservation Planning Act, based on the Draft BDCP and Draft EIR/S, and thus has a vital interest in the BDCP and the EIR/S.

Westlands Water District: Westlands is a member agency of the Water Authority. Westlands is a California water district formed pursuant to California Water Code sections 34000 et seq. Westlands holds vested contractual water rights to receive water from Reclamation, through the San Luis Unit of the CVP, for distribution and consumption within areas of Fresno and Kings Counties. Westlands' total contractual entitlement for CVP water under this contract is 1.15 million acre-feet per year. In addition, Westlands holds 45,383 acre-feet of water entitlement in the form of contract assignments from other Water Authority member agencies. Most of Westlands' CVP water supply is used for irrigation. Westlands encompasses approximately 600,000 acres, including some of the most productive agricultural lands in the world. Westlands has applied for incidental take permits, under the federal Endangered Species Acts and California Natural Community Conservation Planning Act, based on the Draft BDCP and Draft EIR/S, and thus has a vital interest in the BDCP and the EIR/S.

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Attachment 2

Focused Comments of the San Luis & Delta-Mendota Water Authority and Westlands Water District on the Draft Bay Delta Conservation Plan and Draft Environmental Impact Report/Statement

In this attachment, the San Luis & Delta-Mendota Water Authority and Westlands Water District (collectively the "Participating CVP Public Water Agencies") provide focused comments on nine areas. They are:

- The Legal Framework Of The Bay Delta Conservation Plan And Its Environmental Impact Report/Statement
- The CEQA Objectives And NEPA Purpose And Need Statements Appropriately Reflect The Necessity For The BDCP To Improve The CVP Delivery Capability At Least To Those Levels Projected Under State Water Resources Control Board Decision 1641, If Not More, And Up To Full Contract Amounts, Subject To Hydrologic And Other Conditions, And In Addition To Transfer, Exchange And 215 Water
- The Public Trust Doctrine Is Not Simply A Surrogate For Fish And Wildlife Resource Interests, But Rather Requires A Sophisticated Balance of Competing Values That The BDCP Successfully Achieves
- The Draft EIR/S Considers A Reasonable Range Of Alternatives
- The Draft EIR/S Properly Considers Potential Climate Change Impacts
- The Final BDCP And Final EIR/S Should Address The Differences In Relative Scientific Certainty Regarding Increased Outflow And Habitat Improvement Actions
- Adaptive Management Is An Appropriate And Well-Established Tool To Monitor And Adapt Implementation Of The BDCP
- The Draft BDCP And Draft EIR/S Apply A Comprehensive Approach To Address A Suite Of Environmental Stressors Affecting The Bay-Delta Ecosystem
- The California Legislature Required The Delta Plan To Conform To The BDCP

I. The Legal Framework Of The Bay Delta Conservation Plan And Its Environmental Impact Report/Statement

The California Department of Water Resources ("DWR") is preparing the Bay Delta Conservation Plan ("BDCP"), and DWR, as CEQA lead agency, and United State Bureau of Reclamation ("Reclamation"), United States Fish and Wildlife Service ("USFWS"), and Department of Commerce, National Marine Fisheries Service ("NMFS"), as NEPA co-lead agencies, are preparing the Environmental Impact Report/Statement ("EIR/S"). Their efforts seek a durable solution to the multiple challenges facing the water users dependent on State Water Project ("SWP") and Central Valley Project ("CVP") water and the environment. To implement the solution, compliance with the Natural Community Conservation Planning Act ("NCCPA"), the Endangered Species Act ("ESA"), the California Environmental Quality Act ("CEQA"), and the National Environmental Policy Act ("NEPA"), among other laws, is required.

A. <u>The California Natural Community Conservation Planning Act</u>

The NCCPA provides a mechanism to allow the California Department of Fish & Wildlife ("Cal. DFW") to authorize incidental take of species protected under the California Endangered Species Act ("CESA"). The primary objective of the natural community conservation plan ("NCCP") program is to implement, through NCCPs, ecosystem-based strategies to conserve natural communities while accommodating compatible use of resources. (Fish & G. Code, § 2801.) The program seeks to anticipate and prevent controversies associated with species protection by focusing on the long-term stability of wildlife and plant communities and including key interests in the process. (See, e.g, Fish & G. Code, § 2801, subd. (d).) An NCCP includes, among other things:

1. Activities to be covered by the conservation plan;
2. Measures that will minimize and mitigate for the environmental effects of covered activities and will provide for the conservation and management of covered species and their habitats;
3. Likely effects of implementing actions described in the plan on species and their habitats; and
4. Funding sources sufficient to implement the conservation plan.

To approve an NCCP and issue permits in accordance with the NCCPA, Cal. DFW must make findings that the plan provides protection of habitat, natural communities and species diversity at a landscape or ecosystem level, and that conservation measures in the plan area provide for the conservation of species. (Fish & G. Code, § 2820.) Cal. DFW bases such findings, in part, on the proposed plan's integration of adaptive management supported by a monitoring program, and a timeframe for implementation of conservation measures along with provisions that ensure adequate funding.

The NCCPA authorizes the Cal. DFW to provide assurances to participants in an NCCP. Specifically, section 2820 of the California Fish and Game Code provides: "The [D]epartment may provide assurances for plan participants commensurate with long-term conservation assurances and associated implementation measures." (Fish & G. Code, § 2820(f).)

B. The Endangered Species Act

Section 10 of the ESA provides for the "incidental take" of listed species under the ESA, allowing the "Secretary [of USFWS or Department of Commerce to] permit ... any taking otherwise prohibited by section 1538(a)(1)(B) ... if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." (16 U.S.C. § 1539(a)(1)(B).) In order to be granted an incidental take permit ("ITP"), the applicant must "submit[] to the Secretary a conservation plan[.]" (16 U.S.C. § 1539(a)(2)(A).) The conservation plan called for and envisioned in section 10 is a habitat conservation plan ("HCP"). The ESA allows the Secretary to issue an ITP for the incidental take of listed species if he or she concludes with respect to the HCP that:

1. The HCP will minimize the impacts of the taking to the maximum extent practicable;

2. The applicant insures that adequate funding for the plan will be provided; and

3. The taking will not reduce the likelihood of the survival and recovery of the listed species in the wild. (16 U.S.C. § 1539(a)(2)(B)(ii)-(iv).)

Section 10 permits include "assurances." In exchange for the commitment to implement the HCP, these assurances provide that "no additional land use restrictions or financial compensation will be required of the permit holder with respect to species covered by the permit[.]" (63 Fed.Reg. 8859 (Feb. 23, 1998).) Crucially, such assurances apply only to those species covered in an approved and properly implemented HCP.

C. The California Environmental Quality Act

The CEQA process is designed to identify and disclose to decision makers and the public the significant environmental impacts of a proposed project prior to its consideration and approval. This is accomplished by the preparation of CEQA documents such as environmental impact reports ("EIR"). "The purpose of an [EIR] is to provide public agencies and the public in general with detailed information about the effect which a proposed project is likely to have on the environment; to list ways in which the significant effects of a project might be minimized; and to indicate alternatives to such a project." (Pub. Resources Code, § 21061.) Under CEQA, "[t]he wisdom of approving ... any development project, a delicate task which requires a balancing of interests, is necessarily left to the sound discretion of the local officials and their constituents who are responsible for such decisions. The law ... simply requires those decisions to be informed, and therefore balanced." (*Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564.) Environmental impact reports provide specific information as to how a project may affect the environment; they involve the public in the decision-making process; they provide a means of agency accountability by requiring decision-makers to explain their balancing of environmental and economic considerations; and they offer general proposals for project modification through alternatives or mitigation measures. (Pub. Resources Code, §§ 21061, 21080.5, subd. (d)(2), 21091, subd. (d)(2).)

CEQA also imposes substantive requirements on the outcome of the environmental review process. CEQA not only requires detailed analysis and disclosure of significant environmental effects, but it also requires the lead agency to identify ways to reduce or avoid environmental harm. The environmental review required under CEQA imposes both procedural and substantive requirements because a project may not be approved as proposed if feasible alternatives or mitigation measures can avoid or substantially lessen the project's significant environmental impacts. (Pub. Resources Code, § 21002.)

D. The National Environmental Policy Act

NEPA ensures that federal agencies analyze the consequences of proposed major actions and consider alternatives before making a decision. (42 U.S.C. § 4332(c).) NEPA is solely a procedural statute. Hence, it does not impose any substantive requirements on decision-making nor dictate an outcome. (*Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council* (1978) 435 U.S. 519, 558.) Rather, NEPA merely ensures the decision-maker and public are informed of an action's potential impacts. (See *Theodore Roosevelt Conservation P'ship v. Salazar* (D.C. Cir. 2011) 616 F.3d 497, 503 [NEPA ensures "a fully informed and well-considered decision, not necessarily the best decision"].)

The process NEPA provides ensures that "federal agencies take a hard look at the environmental consequences of their actions." (*Neighbors of Cuddy Mountain v. Alexander* (9th Cir. 2002) 303 F.3d 1059, 1070.) A "hard look" does not mean an "encyclopedic" discussion of every conceivable issue, 40 C.F.R. § 1502.2(a), but full assessment using a "rule of reason." Hence, an agency must discuss significant aspects of probable environmental consequences, but lead agencies are given broad discretion to determine how much analysis is reasonably required. (See, e.g., *Swanson v. U.S. Forest Service* (9th Cir. 1996) 87 F.3d 339, 343 ["we may not 'fly-speck' the document and hold it insufficient on the basis of inconsequential, technical deficiencies"]; *City of Carmel by the Sea v. US Dep't. of Transp.* (9th Cir. 1997) 123 F.3d 1142, 1151 [NEPA "requires a 'reasonably thorough' discussion of the environmental consequences in question, not unanimity of opinion, expert or otherwise ... 'concerns' or criticism alone do not undermine the validity" of an EIS].)[3]

[3] "Just as NEPA is not a green Magna Carta, federal judges are not the barons at Runnymede. Because the statute directs agencies only to look hard at the environmental effects of their decisions, and not to take one type of action or another, federal judges correspondingly enforce the statute by ensuring that agencies comply with NEPA's procedures, and not by trying to coax agency decisionmakers to reach certain results." (*Citizens Against Burlington v. Busey* (D.C. Cir. 1991) 938 F.2d 190, 194.)

II. The CEQA Objectives And NEPA Purpose And Need Statements Appropriately Reflect The Necessity For The BDCP To Improve The CVP Delivery Capability At Least To Those Levels Projected Under State Water Resources Control Board Decision 1641, If Not More, And Up To Full Contract Amounts, Subject To Hydrologic And Other Conditions, And In Addition To Transfer, Exchange And 215 Water

A. The CEQA Objectives And NEPA Purpose And Need Statements Satisfy The Law

The California Environmental Quality Act ("CEQA") objectives and National Environmental Policy Act ("NEPA") purpose and need statements result from similar legal requirements which serve similar functions. Under CEQA, an environmental impact report ("EIR") must contain a "Statement of Objectives." (See 14 Cal. Code Regs., tit. 14, § 15124, subd. (b) ("CEQA Guidelines").) The CEQA Guidelines explain: A clearly written statement of objectives will help the lead agency develop a reasonable range of alternatives to evaluate in the EIR and will aid the decision-makers in preparing findings or a statement of overriding considerations, if necessary. The statement of objectives should include the underlying purpose of the project. (CEQA Guidelines, § 15124(b)). Likewise, under NEPA, an environmental impact statement ("EIS") must include a purpose and need statement that helps the agency propose alternatives that will begin the process of identifying a reasonable range of alternatives to be evaluated in detail in the environmental impact statement. (See 40 C.F.R. § 1502.13.) NEPA regulations provide that an environmental impact statement "shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." (*Id.*)

Because the Draft EIR/S is a joint CEQA/NEPA document, it contains both "Project Objectives" under CEQA (Draft EIR/S, § 2.3), and a "Purpose and Need Statement" under NEPA (*Id.* at § 2.4.). The California Department of Water Resources ("DWR") and United States Bureau of Reclamation ("Reclamation"), as project proponents, have "considerable discretion" when developing the CEQA objectives and NEPA purpose and need statements.[4] They are formulated as a matter of policy. (CEQA Guidelines, § 15124(b).)

One of the CEQA objectives is to "[r]estore and protect the ability of the State Water Project ("SWP") and the Central Valley Project ("CVP") to deliver up to full contract amounts, when hydrologic conditions result in the availability of sufficient water, consistent with the requirements of State and federal law and the terms and conditions of water delivery contracts and other existing applicable agreements." (Draft EIR/S, p. 2-3.) That objective, as well as all others, must achieve the underlying, fundamental purpose of the project, which is to "make physical and operational improvements to the SWP system in the Delta necessary to restore

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[4] See *Friends of Southeast's Future v. Morrison* (9th Cir. 1998) 153 F.3d 1059, 1066; see also *NW Resource Information Center v. NMFS* (9th Cir. 1995) 56 F.3d 1060,1064 [explaining that an agency must address in detail the purpose and need for the action and that the purposes of an EIS are to provide decision makers with sufficiently detailed information to aid in determining whether to proceed with the action]; see also The*odore Roosevelt Conservation Partnership v. Salazar* (D.C. Cir. 2011) 661 F.3d 66 [upholding the Bureau of Land Management's purpose and need as reasonably acting upon a project proponent's proposal for expanded oil and gas development].

and protect ecosystem health, water supplies of the SWP and CVP south-of-delta, and water quality within a stable regulatory framework, consistent with statutory and contractual obligations." (Draft EIR/S, p. 2-2.) Consistent with the CEQA objective cited above, including its fundamental purpose, United States Bureau of Reclamation ("Reclamation"), United States Fish and Wildlife Service ("USFWS"), and National Marine Fisheries Service ("NMFS"), as NEPA leads, explained a purpose in preparing the Bay Delta Conservation Plan ("BDCP") has been to:

> Restore and protect the ability of the SWP and CVP to deliver up to full contract amounts, when hydrologic conditions result in the availability of sufficient water, consistent with the requirements of state and federal law and the terms and conditions of water delivery contracts...

(Draft EIR/S, p. 2-4.)

B. <u>The CEQA Project Objectives And The NEPA Purpose And Need Statement Are Consistent</u>

The Draft EIR/S properly recognizes that the "[NEPA] purpose statement of the proposed action, and project need ... are consistent with the [CEQA] project objectives." (Draft EIR/S, p. 2-4.) Notwithstanding the consistency, the CEQA objectives and NEPA purpose and need statements contain differences in wording. Specifically, the NEPA purpose and need statement includes the following sentences that are not included with the CEQA objectives:

> The [ ] phrase — *restore and protect the ability of the SWP and CVP to deliver up to full contract amounts* — is related to the upper limit of legal CVP and SWP contractual water amounts and delineates an upper bound for development of EIR/EIS alternatives, not a target. It is not intended to imply that increased quantities of water will be delivered under the BDCP. As indicated by the "up to full contract amounts" phrase, alternatives need not be capable of delivering full contract amounts on average in order to meet the project purposes. Alternatives that depict design capacities or operational parameters that would result in deliveries of less than full contract amounts are consistent with this purpose.

(Draft EIR/S, p. 2-5.) This language supports the CEQA objective of restoring and protecting water supplies at least to the levels projected under State Water Resources Control Board Decision 1641. It makes clear that the NEPA lead agencies consider, as the upper bound for water availability under CVP contracts, the existing contract entitlements – that the BDCP is not intended to support – "increased quantities of water". To the extent one reads ambiguity into the NEPA purpose and need, the NEPA purpose and need and the CEQA objectives statements must be read in concert, with statements by the applicants controlling. (See *Louisiana Wildlife Federation v. York* (5th Cir. 1985) 761 F.3d 1044, 1048; *Greater Yellowstone Coalition v. Flowers* (10th Cir. 2004) 359 F.3d 1257, 1270; *City of Bridgeton v. FAA* (8th Cir. 2000) 212 F.3d 448, 457-58; *Citizens Against Burlington v. Busey* (D.C. Cir. 1991) 938 F.3d 190, 199.)

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C. <u>The Goal To Restore And Protect Supplies Up To Full Contract Amounts Is Appropriately Balanced By Hydrologic Conditions And Other Limitations</u>

The Draft BDCP and Draft EIR/S have properly and transparently struck a balance between water supply and the environment. The "contract amounts" are those water supplies to which the Participating CVP Public Water Agencies are entitled by law under long-established contracts. The Participating CVP Public Water Agencies do not expect to receive their full contract amounts every year. The Draft BDCP and Draft EIR/S reflect the CEQA objectives and NEPA purpose and need of <u>up to</u> full contract amounts. The Participating CVP Public Water Agencies thus acknowledge that the Draft BDCP and Draft EIR/S do not need to achieve the maximum contract amounts year in and year out regardless of any other conditions. Rather, they recognize and the Draft BDCP and the alternatives analyzed in the Draft EIR/S are tempered by hydrologic conditions.

D. <u>The Restore And Protect Water Supply CEQA Objectives And NEPA Purpose And Need Must Be Measured Against The Supply Available Under State Water Resources Control Board Decision 1641, In Addition To Transfer And Exchange Water And 215 Water</u>

By seeking to "restore and protect" water supplies to the Participating CVP Public Water Agencies, "up to full contract amounts," the Draft EIR/S has properly framed the CEQA objectives and NEPA purpose and need. The CEQA objectives and NEPA purpose and need do not support decreases in water conveyed south of the Delta. They support actions that result in water supplies at least to those levels projected under State Water Resources Control Board Decision 1641, if not more, and up to full contract amounts when hydrologic conditions allow, in addition to water available to the Participating CVP Public Water Agencies under transfer or exchange agreements (collectively "transfer and exchange water") or available from Reclamation, pursuant to section 215 of the Reclamation Reform Act of October 12, 1982 (Public Law 97-293), as non-storable or unmanageable flood flows of short duration ("Section 215 water"). To meet the CEQA objectives and NEPA purpose and need, the BDCP must result in Reclamation having capability of appropriating from 2.9 (reduced per D-1641) to 3.3 (full contract) million acre-feet, in addition to transfer and exchange water and water available under section 215 of the Reclamation Reform Act of October 12, 1982 (Public Law 97-293) as non-storable or unmanageable flood flows of short duration ("Section 215 water").

From the time Reclamation began delivering water to the Participating CVP Public Water Agencies in the 1950s, until the early 1990s, Reclamation delivered in every year – even after the SWP became operational – the full amount allowed under contracts, except during the critically dry 1977. However, over the past twenty-five plus years, more than 3.0 million acre-feet of CVP water have been reprioritized each year from serving municipal, industrial, and agricultural needs to actions intended to serve fish and wildlife needs. By 2006, the quantity and reliability of CVP water for the agricultural water service contractors had been significantly eroded; although, to a much lesser degree, impacts were also felt by the municipal and industrial water service contractors, exchange contractors, and refuges.

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Communities served by the Participating CVP Public Water Agencies, including those with large minority and low-income populations, are suffering from chronic water supply shortages and the resulting lack of water supply reliability. In 2012, Dr. David Sunding presented to the State Water Resources Control Board information concerning the economic impact of changes in water supply. After identifying many of the same effects discussed above and explaining the models used to assess economic impacts, he concluded that the cost from reductions in CVP and SWP water conveyed through the By-Delta to urban sectors amounted to $1,400,000,000 for every 100,000 acre-feet of water lost and that such water conveyed to agricultural sectors amounted to $300,000 for every 100,000 acre-feet of water lost. (Sunding, Modeling the Economic Impact of Changes in Delta Water Supplies (2012).)

More recently, academic research by Auffhammer, Foreman and Sunding (2014) examined the relationship between agricultural employment, cultivated acreage and water deliveries in counties that depend on water supplies from the Bay-Delta. They constructed a detailed dataset of water supplies, farm employment, and cultivated acreage in the counties of the San Joaquin Valley that receive water supplies from the Bay-Delta. They also considered a set of agricultural counties in California to serve as a "control" set.

The authors report that, in 2009, water deliveries from the CVP were only 10% and deliveries from the SWP were 40%. The authors conclude that 9,100 jobs were lost in 2009 relative to 2005 (a year of full irrigation supplies) as a result of reduced water deliveries. Crop fallowing in these same counties in 2009 (again relative to 2005) totaled approximately 240,000 acres. These results indicate that a 222.22 acre-foot reduction in water deliveries results in the loss of one farm job. Additionally, a reduction of 12.55 acre-feet will result in one acre being fallowed.

Reduced water supply and reliability within the areas served by the Participating CVP Public Water Agencies have resulted in:

1. Reduced employee hours, lost wages and jobs, loss of tax revenue to fund municipal services such as fire and police protection, and the resulting reduction in staffing at the local government level, thereby contributing to family disruption and dislocation;

2. Adverse impacts to local schools from the relocation of farming-dependent families, lost school revenues, and additional social costs for schools, food shortages and increased demand for public services such as food banks, and an increased incidence of crime;

3. Loss of crops, including the destruction of permanent crops, which increases the amount of fallowed land that diminishes air quality due to dust and particulate matter;

4. Increased groundwater pumping, resulting in decreased water quality and impacts to crops from increased soil salinity, groundwater overdraft resulting in land subsidence and associated impacts to infrastructure, increased energy

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demand related to pumping and associated environmental impacts, and depletion of groundwater reserves.

The restoration and protection of the water supply for the Participating CVP Public Water Agencies is necessary to minimize and mitigate for these significant adverse impacts.

The CVP water supply projections referenced above form the benchmark against which to measure the BDCP – whether it will restore and protect water supplies. The federal, state, and local agencies, including the Participating CVP Public Water Agencies, along with non-governmental organizations, that executed the planning agreement for the BDCP established that benchmark. In the planning agreement, those agencies and organizations agreed that a BDCP planning goal was to "[a]llow for projects to proceed that restore and protect water supply, water quality, and ecosystem health within a stable regulatory framework." (Planning Agreement, § 3.) As such, to meet its CEQA objective and NEPA purpose and need, the Draft BDCP must provide and the Draft EIR/S must analyze alternatives that result in water supplies at least to those levels projected under Decision 1641, if not more, and up to full contract amounts when hydrologic conditions allow, in addition to water available under transfer and exchange agreements and available Section 215 water.

The full contract amounts require Reclamation to appropriate for the benefit of the Participating CVP Public Water Agencies, or those they represent, approximately 3.3 million acre-feet of water. Under D-1641, their contract allocations under average hydrology were approximately 75% for the agricultural water service contractors, 95% for municipal and industrial water service contractors, 100% for San Joaquin River Exchange Contractors, and 100% for wildlife refuges. Those allocations require Reclamation to appropriate approximately 2.9 million acre-feet of water. The range from 2.9 (reduced per D-1641) to 3.3 (full contract) million acre-feet is in addition to transfer and exchange water and Section 215 water.

Without those supplies delivered reliably, which will likely be the result of no action, the substantial injuries to the communities served by the Participating CVP Public Water Agencies will continue.

III. The Public Trust Doctrine Is Not Simply A Surrogate For Fish And Wildlife Resource Interests, But Rather Requires A Sophisticated Balance of Competing Values That The BDCP Successfully Achieves

Often fish and wildlife are assumed to be the primary, if not sole, interests for consideration under the public trust doctrine. Such a narrow focus is inconsistent with the law. As courts and commentators have recognized, the public trust doctrine requires consideration of other resources and public values including impacts to the farm and agricultural operations in California. (See, e.g., *State Water Resources Control Bd. Cases* (2006) 136 Cal. App. 4th 674, 778 ["[A state agency] ha[s] a duty to consider and protect all of the other beneficial uses to be made of water in the [area], *including ... agricultural uses*."] [emphasis added].) Without ready and reliable access to water supplies, farmers may be forced to reduce their output – limiting food production and increasing food prices – and may in some circumstances be required to withdraw part or all of their lands from agricultural operations. All impacts on public trust values should be considered when applying the public trust doctrine.

The public trust doctrine, however, does not mandate that a state agency adopt any and all regulatory measures that might produce some conceivable or hypothetical benefit for specific elements of the environment. To the contrary, the doctrine holds only that, in assessing proposed regulatory measures, a state agency must "consider" the potential impacts of those measures on the environment and must "balance" those impacts against the other "diverse interests" that bear on the public welfare. (*Nat'l Audubon Soc'y v. Superior Court* (1983) 33 Cal.3d 419, 446-47; see also *Ctr. for Biological Diversity, Inc. v. FPL Group, Inc.* (2008) 166 Cal.App.4th 1349, 1369 ["[E]nvironmental values are not the only interests that must be considered. A delicate balancing of [other] conflicting [interests, including] demands for energy[,] ... must be made."].) When in the agency's view the public's interests would be best advanced by a particular course of action, notwithstanding any possible environmental risks, the agency can and should – commensurate with its public trust obligations – adopt that course.[5] This core principle is stated in decisions of the California Supreme Court and myriad other authorities.[6] This principle is also codified in state statute and the California Constitution, which directs that in administering resources subject to the public trust state agencies must act "with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare." (Cal. Const. art. X, § 2; see also Fish & G. Code, § 1801.)

The Draft BDCP and Draft EIR/S represent an appropriate response to reduced and unreliable water supply, as a balance against relevant environmental considerations, in accord with the public trust doctrine. The Draft EIR/S promotes covered activities and associated

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[5] See *Nat'l Audubon, supra*, 33 Cal.3d at p. 728; see also *id.* ["As a matter of practical necessity the state may have to approve [regulations in the public interest] despite foreseeable harm to public trust uses."]; *Citizens Legal Enforcement & Restoration v. Connor* (S.D. Cal. 2011) 762 F. Supp. 2d 1214, 1229 ["Th[e public trust] doctrine commands only that the public trust be 'take[n] .... into account' and only requires protection of that trust when 'feasible' ... [in] the agency's discretion."] [quoting *Nat'l Audubon*, 33 Cal.3d at p. 728].

[6] See, e.g., *Nat'l Audubon, supra*, 33 Cal.3d at p. 278; *Citizens Legal, supra,* 762 F. Supp. 2d at p. 1229; *see also* Jan S. Stevens, *The Public Trust: A Sovereign's Ancient Prerogative Becomes the People's Environmental Right*, 14 U.C. Davis L. Rev. 195, 224 (1980) ["[T]he public trust permits—indeed requires—the balancing of competing uses."].

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federal actions that restore and protect water supply while preserving and enhancing the health of the Bay-Delta for the benefit of fish and wildlife. For example, the Draft BDCP and Draft EIR/S offer other significant environmental benefits by avoiding the degradation of air quality associated with fallowed land and the adverse impacts caused by increased groundwater pumping (such as increased soil salinity, land subsidence, higher energy demand, and depletion of groundwater reserves). Particularly in light of this, and given that the potential harms that the BDCP is designed to address are so clear and pronounced, the public trust doctrine fully supports adoption of the Bay Delta Conservation Plan as a plan that in part restores and protects water supply.

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IV. The Draft EIR/S Considers A Reasonable Range Of Alternatives

The Draft EIR/S presents a wide range of alternatives for the Bay Delta Conservation Plan ("BDCP"), consistent with California Environmental Quality Act ("CEQA") and National Environmental Policy Act ("NEPA") requirements. (Draft EIR/S, Chapter 3.) In total, the Draft EIR/S evaluates nine integrated alternatives and additional, related sub-alternatives. The Draft EIR/S also considers the No Project (CEQA)/ No Action (NEPA) alternatives as required by law.

A. The Selection Of Considered Alternatives Complies With CEQA And NEPA

Under CEQA, an environmental impact report ("EIR") must include a discussion of both alternatives and mitigation measures so that decision-makers will be provided with adequate information about the range of options available to reduce or avoid environmental impacts. (Pub. Resources Code, § 21002; *Laurel Heights Improvement Assn. v. Regents* (1988) 47 Cal.3d 376, 403.) The EIR must describe a reasonable range of potentially feasible alternatives to the proposed project that could attain most of the project's basic objectives while reducing or avoiding any of its significant effects. (CEQA Guidelines, § 15126.6(a)-(f).) An environmental impact report need not, however, present alternatives that are incompatible with fundamental project objectives. (*California Oak Foundation v. Regents* (2010) 188 Cal.App.4th 227, 275.) "There is no ironclad rule governing the nature or scope of the alternatives to be discussed." (CEQA Guidelines, § 15126.6(a).) The agency's alternatives analysis will be upheld as long as there is a reasonable basis for the choices it has made. (*City of Maywood v. Los Angeles Unified School Dist.* (2012) 208 Cal.App.4th 362, 414, 416.)

The CEQA lead agency's task in preparing a draft environmental impact report is to identify a range of alternatives that could be found to satisfy basic project objectives while reducing significant impacts. Alternatives that are not at least "potentially feasible" typically are excluded at this stage because there is no point in studying alternatives that cannot be implemented or that will not succeed. (CEQA Guidelines, § 15126.6(a); *California Native Plant Society v. City of Santa Cruz* (2009) 177 Cal.App.4th 957, 982; *Mira Mar Mobile Community v. City of Oceanside* (2004) 119 Cal.App.4th 477, 489.) None of the factors relevant to a determination of potential feasibility, taken in isolation, "establishes a fixed limit on the scope of reasonable alternatives." (CEQA Guidelines, § 15126.6(f)(1).) A lead agency must weigh and balance the relevant factors when considering whether an alternative sufficiently appears that it may be feasible as to merit evaluation in an EIR. (*Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 566; *City of Long Beach v. L.A. Unified School Dist.* (2009) 176 Cal.App.4th 889, 919.)

Similarly, under NEPA, the lead agency must "study, develop, and describe appropriate alternatives to recommend courses of action" with respect to a proposed project. (42 U.S.C. § 4321(2)(E); see also 40 C.F.R. § 1502.1 [lead agency must identify and analyze "reasonable alternatives" to the proposed project "which would avoid or minimize adverse impacts…."].) In its guidance to federal agencies, the Council on Environmental Quality ("CEQ") explains that "[w]hat constitutes a reasonable range of alternatives depends on the nature of the proposal and the facts in each case." (CEQ, Forty Most Asked Questions Concerning CEQ's National

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Environmental Policy Act Regulations (Mar. 23, 1981) ("Forty Most Asked Questions") at 1.b.) Hence, under NEPA, the "nature of the proposal" drives the range of alternatives selected for analysis in an environmental impact statement ("EIS"). All "[p]roject alternatives derive from an Environmental Impact Statement's 'Purpose and Need' section," which defines the goals of the project. (*Carmel-By-the-Sea v. U.S. Dep't of Transp.* (9th Cir. 1997) 123 F.3d 1142, 1155 ["The stated goal of a project *necessarily dictates* the range of 'reasonable' alternatives."] [emphasis added]; see also *Idaho Conservation League v. Mumma* (9th Cir. 1992) 956 F.2d 1508, 1520 ["the range" of alternatives considered is "dictated by the 'nature and scope of the proposed action'"] [quoting *California v. Block* (9th Cir. 1982) 690 F.2d 753, 761].)

NEPA lead agencies do not, however, need to review "an infinite number of possible alternatives." (CEQ, Forty Most Asked Questions at 1.b.) The selection of appropriate and reasonable alternatives, as well as the depth of their analysis, is guided by the "rule of reason." [*Carmel-By-the-Sea*, 123 F.3d at 1155.] A lead agency need only consider "reasonable or feasible" alternatives. (*Id.* [citing 40 C.F.R. § 1502.14(a)(c)].) By limiting the selection of alternatives to those that are "appropriate," "reasonable," and "feasible" means that, with the exception of the No Action alternative that must be analyzed by law, considered alternatives are limited to those that could fulfill the project's Purpose and Need.[7]

The Draft EIR/S complies fully with these principles and fosters informed public participation and informed decision-making, particularly in light of the project objectives that have been developed over a period of many years and which necessarily dictate the range of reasonable alternatives to be considered. (See, e.g., *In re Bay-Delta Coordinated Proceedings* (2008) 43 Cal.4th 1143.) The fifteen alternatives, in addition to the No Project and No Action alternatives, analyzed within the Draft EIR/S were the product of a robust scoping and screening process.[8]

As summarized in Section 3.2 of the Draft EIR/S, a steering committee that included representatives from Public Water Agencies, environmental groups, state agencies, and other stakeholders developed alternative approaches at a conceptual level, settling on four conservation strategy options. (See Draft EIR/S, p. 3-6.) Appendices 3A and 3G of the Draft EIR/S describe the scoping processes in extensive detail. In response to the scoping process, DWR, Reclamation, USFWS, and NMFS received and considered approximately 3,000 comments

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[7] See, e.g., *Friends of Southeast's Future v. Morrison* (9th Cir. 1998) 153 F.3d 1059, 1067 [upholding lead agency's rejection of alternative "on the ground that it would not meet the purpose and need of the proposed project"]; *Seattle Audubon Society v. Moseley* (9th Cir. 1996) 80 F.3d 1401, 1404 [lead agencies need not "consider alternatives that are unlikely to be implemented or those inconsistent with its basic policy objectives"]; *Headwaters, Inc. v. Bureau of Land Mgm't.* (9th Cir. 1990) 914 F.2d 1174, 1180 ["Nor must an agency consider alternatives which are infeasible, ineffective, or inconsistent with the basic policy objectives for the management of the area."].

[8] The screening and scoping process built on the BDCP's rich historical context, which includes decades of consideration of how best to convey water to water users across California. This history is recounted in Draft EIR/S Appendix 1A, and includes the planning and development of the SWP and CVP, as well as the series of laws and regulations designed to protect and restore environmental resources that shape the way the SWP and CVP are managed and operated today.

on the proposed project. (*Id.* at p. 3-7.) This scoping process produced the 15 potential alternatives that were subjected to a three-stage screening process. (*Id.*) Level one identified those alternatives that may achieve the CEQA objectives and NEPA purpose and need; level two then eliminated those potential alternatives that failed to avoid or substantially reduce expected significant environmental impacts; and level three focused on the technical and economic feasibility of the remaining alternatives while screening out those that could result in the violation of state and federal law. (*Id.*) The result of the screening process left nine alternatives that were subjected to detailed analysis.

Those nine alternatives provide more than a reasonable range of alternatives for the consideration of decision-makers and the public, with a wide range of diversion capacities, conveyance alignments, and operating scenarios. Diversion capacity varies significantly throughout the alternatives, ranging from 3,000 cfs (Alternative 5) to 15,000 cfs (Alternatives 1, 2, 6, and 9). Several different types of conveyance alignments were included in the nine alternatives, including pipelines, tunnels, east canals, and west canals. Further, each alternative adopts one or more operating scenarios (therefore, several alternatives contain sub-alternatives based on a range of different operating scenarios) that consider a variety of rules controlling maximum allowable exports, such as permitted or physical limits, import to export ratios or reservoir storage capacities.

The alternatives presented in the Draft EIR/S certainly meet the legal requirement that they "foster[] informed decision-making and informed public participation." (See, e.g., *California v. Block* (9th Cir. 1982) 690 F.2d 753, 767.) As the Tenth Circuit has explained, "[a]gencies may not define a project's objectives so narrowly as to exclude all alternatives … [b]ut where a private party's proposal triggers a project, the agency may 'give substantial weight to the goals and objectives of that private actor.'" (*Biodiversity Conservation Alliance v. Bureau of Land Management* (10th Cir. 2010) 608 F.3d 709, 715.)

The alternatives provide a wide array of options, backed by a detailed explanation of those options, that allow the lead agencies to make an informed decision and for members of the public to understand the public process and provide comments. Although no alternative specifically evaluates a 12,000 cfs-sized conveyance, for example, its effects can be readily interpreted based on the combinations of size and operations that have been fully evaluated for both a 9,000 cfs and 15,000 cfs conveyance. Similarly, a range of operations can be interpreted since the 15,000 cfs and 9,000 cfs conveyances have been combined with different operations to produce Alternatives 1, 2,and 6, which also have been fully evaluated. Given the robust range of alternatives, additional alternatives need not be considered simply because there are still more potential permutations of diversion capacity, conveyance configurations, operational scenarios, and conservation measures. (*Westlands Water Dist. v. U.S. Dept. of the Interior* (9th Cir. 2004) 376 F.3d 853, 871.)

Nonetheless, alternatives with conveyance sized less than 9,000 cfs will result in water supplies for Participating CVP Public Water Agencies that are below the amounts forecasted under State Water Resources Control Board Decision 1641. Those alternatives would not meet the CEQA objective and NEPA purpose and needs. Additionally, for the range of operations evaluated, conveyance sizes equal to or greater than 9,000 cfs will (1) provide more environmentally favorable conditions in Old and Middle Rivers, (2) allow San Luis reservoir to refill on a more frequent basis, thereby reducing San Luis Reservoir low point concerns, and (3) allow for placement of intakes less susceptible to the possible impacts of climate change.

Further, conveyance construction activities contemplated by the alternatives would utilize means and methods that are within the scale and complexity of what has already been built and what is being constructed in North America and around the globe. Serious consideration needs to be given to evaluating the merits of the various project delivery methods as a way to better allocate risks between owner, engineer, and constructor and to allow construction to potentially complete sooner and/or for less cost. Examples of the activities contemplated by the alternatives within the scale and complexity of past and existing projects include:

1. *Tunnels*: The proposed forty-four foot outside diameter for the tunnel boring machines are within the capabilities of their manufacturers and within the management ability of the construction contractors. Based on information readily available in tunnel industry trade publications, the Participating CVP Public Agencies found twenty-four tunnel projects requiring thirty-seven boring machines, having a median outside diameter of forty-nine feet, which is larger than the forty-four foot proposed for Conservation Measure #1 ("CM1"). In addition, a number of these projects will have several of these machines working concurrently, which is similar to what is proposed for CM1.

2. *Shafts*: Large diameter, deep shafts to connect the tunnels to the forebays are comparable in size and depth to those being built by the wastewater industry to reduce combined sewer overflows. The methods are well understood and are being applied across the US in Portland and Indianapolis and abroad in the Thames Tideway.

3. *Forebays*: Both of the proposed forebays will utilize conventional earthwork techniques for both dry and in-water construction that have been commonly used in levee and embankment dam construction for decades. Recently completed flood control projects by the Sacramento Area Flood Control Agency and Three Rivers Levee Improvement Authority are of similar scale and complexity as what is being proposed for CM1.

4. *Intakes & Pumping Plants*: The design of each of the proposed 3,000 cfs screened on-bank intakes is based on the recently completed on-bank intake structure built on the Sacramento River at Red Bluff CA, which has a 2,500 cfs capacity.

5. *Power delivery*: The power requirements of the facilities that are proposed for construction as well as those that would be permanent are within the capability of the three electric grid operators located in and adjacent to the Bay-Delta – Sacramento Municipal Utility District, California Independent System

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Operator/Pacific Gas and Electric, and the Western Area Power Administration. They can provide adequate points of interconnection to their respective transmission networks.

For the above stated reasons, as well as others presented in the Draft EIR/S, the California Department of Water Resources ("DWR"), as lead CEQA agency and the United States Bureau of Reclamation ("Reclamation"), United States Fish and Wildlife Service ("USFWS"), and National Marine Fisheries Service ("NMFS"), as NEPA co-lead agencies, are not obligated to consider alternatives beyond the scope of the CEQA Objectives and NEPA Purpose and Need.[9] Here, the range of alternatives meet the requirements of NEPA and satisfy the rule of reason.

B. The Comparison Of Considered Alternatives Complies With CEQA And NEPA

NEPA requires that the proposed action and each of the alternatives be analyzed equally so that reviewers can compare their relative merits. (40 C.F.R. § 1502.14.) Under CEQA, the significant effects of alternatives can be evaluated in less detail than the effects of the proposed project; however, each environmental issue should be considered for each alternative to allow for a qualitative comparison of impacts. (CEQA Guidelines, § 15126.6, subd. (d); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 735.) CEQA also calls for a discussion of which alternative may be considered "environmentally superior," and to implement that alternative if feasible.

In considering alternatives, NEPA requires the agency to discuss all factors essential to the agency decision and discuss how those factors influenced the agency's final determination. (40 C.F.R. § 1505.2(b).) The agency must explain, "whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted and if not, why they were not." (40 C.F.R. § 1505.2(C).) The preferred alternative is not necessarily the environmentally superior alternative, however, even if it is found to be feasible (unlike CEQA, which requires the agency to approve the environmental superior alternative unless it can be shown to be infeasible). Nothing in NEPA requires that the agency's preferred alternative must have the least environmental impact.

In compliance with these requirements, the Draft BDCP and Draft EIR/S provide extensive discussion and comparison of alternatives that would either reduce the amount of take or increase the level of conservation of listed species, and describes in detail whether each alternative was found to be practicable and meet the BDCP's goals.

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[9] See *Carmel-By-the-Sea*, 123 F.3d at 1155; see *Laguna Greenbelt, Inc. v. U.S. Dep't of Transp.* (9th Cir. 1997) 42 F.3d 517, 524 [The "range of alternatives that must be considered in the EIS need not extend beyond those reasonably related to the purpose of the project."]; *Headwaters, Inc. v. Bureau of Land Management* (9th Cir. 1990) 914 F.2d 1174, 1180 [lead agency is not required to "consider alternatives which are …inconsistent with the basic policy objectives" of the project]; *In Re Bay-Delta Coordinated Proceedings* (2008) 43 Cal.4th 1143 ["an EIR need not study in detail an alternative that is infeasible or that the lead agency has reasonably determined cannot achieve the project's underlying fundamental purpose"]; *California Oak Foundation v. Regents* (2010) 188 Cal.App.4th 227, 275 [an EIR need not present alternatives that are incompatible with fundamental project objectives].

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The action alternatives described in the Draft EIR/S represent a combination of water conveyance configurations, capacities and operational criteria, habitat restoration and conservation targets, stressor reduction measures, and various avoidance and minimization measures. Each of the alternatives includes assumed changes in the existing operation of the State Water Project ("SWP") and Central Valley Project ("CVP") in the Bay-Delta to further protect fish populations and to accommodate new Delta facilities and proposed habitat restoration. The Draft EIR/S provides substantial information about each alternative and provides a qualitative comparison of the relative significance of the environmental impacts of the alternatives. (See, e.g., Draft EIR/S, pp. 3-1 – 3-212; ES-49 – ES-60, ES-61 – ES-132.) An essential element of compliance with both CEQA and NEPA is to compare alternatives, providing an analysis that illustrates any meaningful differences between and among the different alternatives. The analysis comparing the alternatives and associated impacts required under CEQA and NEPA is provided in the Draft EIR/S as well as in the Draft BDCP itself. (See, e.g., Draft EIR/S, pp. ES-34 – ES-35, ES-37, ES-49 – ES-60, ES-61 – ES-132, 3-14 – 3-16; Figures 3-1 – 3-25, 4-3, 31-45 – 31-86.) Key differences in the types and degree of potential effects between the BDCP alternatives, including the No Action Alternative, are provided by general resource types or categories. The environmental effects of implementing BDCP alternatives, any mitigation to reduce significant impacts, and their level of significance after mitigation are discussed and summarized throughout the documents. (See, e.g., p. ES-49.)

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V. The Draft EIR/S Properly Considers Potential Climate Change Impacts

The Draft EIR/S appropriately addresses the relationship between the BDCP and climate change. As discussed in the Draft EIR/S under the No Action/ No Project Alternative, the Bay-Delta will remain subject to increased temperatures, changes in runoff sequences, and increased salinity intrusion, among other impacts. (Draft EIR/S pp. 29-11 to 29-14; see also Table 29-1 (chart of potential climate change effects).) The distinction drawn in the Draft EIR/S between the effects of the Bay Delta Conservation Plan ("BDCP") and the effects of global climate change is important in order for readers to appreciate fully that one of the purposes of the BDCP is to provide resiliency to the impacts of global climate change, serving as a net benefit to the Bay-Delta ecosystem. From a climate change perspective, the Draft EIR/S properly provides readers with both the costs of the proposed project (Green House Gas ("GHG") emissions) and the benefits (resiliency).

A. <u>GHG Emissions From Construction, Operation, And Maintenance Are Not Significant Environmental Impacts</u>

The Draft EIR/S provides an extensive explanation of GHG emission estimates related to the construction, operation, and maintenance of each alternative. (E.g., Draft EIR/S pp. 22-254 to 22-266) (GHG emission estimates for Alternative 4). The National Environmental Policy Act ("NEPA"), however, only requires an environmental impact statement ("EIS") to identify "significant environmental impacts," (40 C.F.R. § 1502.1) and none of the GHG emissions approaches a level of significance under NEPA. Rather, as the Draft EIR/S correctly notes, the direct impacts of GHG emissions from any single project are miniscule in comparison to worldwide or even statewide GHG emissions. As such, it is nearly impossible to link GHG emissions from any discrete source, or group of sources, to any particular impact, a fact that Interior Department guidance has acknowledged and the courts agree.[10] Thus, as the identified emissions cannot possibly be traced to any identifiable impacts in the Bay-Delta ecosystem, they surely are not significant under NEPA.

Regardless, the GHG emissions associated with the BDCP are extremely small, and thus even if one were to assume a proposed alternative's GHG emissions could be considered a significant contribution to a cumulative environmental impact, that contribution would be

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[10] See Memo, Office of the Solicitor, Guidance on the Applicability of the Endangered Species Act's Consultation Requirements to Proposed Actions Involving the Emission of Greenhouse Gases (Oct. 3, 2008) [based on a review of "the best scientific and commercial data available," "[i]t is currently beyond the scope of existing science to identify a specific source of CO2 emissions and designate it as the cause of specific climate impacts at an exact location."]; *Washington Environmental Council v. Bellon* (9th Cir. 2013) 732 F.3d 1131, 1143 ["there is a natural disjunction between ... localized injuries and the greenhouse effect" because "once emitted from a specific source" GHGs "quickly mix and disperse in the global atmosphere and have a long atmospheric lifetime ... there is limited scientific capability in assessing, detecting, or measuring the relationship between a certain GHG emission source and localized climate impacts in a given region."]; *Native Village of Kivalina* (9th Cir. 2012) 696 F.3d 849, 868-869 [impacts from specific GHG emission sources cannot be distinguished from the "vast multitude of emitters worldwide whose emissions mix quickly, stay in the atmosphere for centuries, and, as a result, are undifferentiated in the global atmosphere."]

reduced below "significant" levels through mitigation measures. (See, e.g., *Wetlands Action Network v. U.S. Army Corps of Engineers* (9th Cir. 2000) 222 F.3d 1105, 1121-22 [upholding Finding of No Significant Impact due to plans for mitigation measures].) The Draft EIR/S has in fact identified a wide array of mitigation measures to be implemented to reduce and offset the already limited GHG emissions, ranging from renewable energy purchase agreements to developing biomass waste digesters. (See *id.* at 22-257 to 22-260.) These mitigation measures need only make substantial progress in reducing GHG emissions, not reduce or offset them completely. (See *Friends of Payette v. Horseshoe Bend Hydroelectric Co.* (9th Cir. 1993) 988 F.2d 989, 993 ["If significant measures are taken to mitigate the project's effects, they need not *completely compensate* for adverse environmental impacts."] [internal quotations omitted] [emphasis in original].)

Likewise under the California Environmental Quality Act ("CEQA"), the lead agency must analyze (qualitatively or quantitatively) and mitigate a project's potentially significant impacts related to climate change, such as GHG emissions and energy use. (CEQA Guidelines, §§ 15064.4, 15130, subd. (f); App. F.) The emissions from each project constitute an incremental contribution to the buildup of GHGs in the atmosphere and may have a significant environmental impact when analyzed on a cumulative basis. (See CEQA Guidelines, §15355, subd. (b).) The CEQA Guidelines therefore provide that evaluation of the potential significance of GHG emissions typically should be done as a cumulative impacts analysis. (CEQA Guidelines, §15130, subd. (f).) Whether the project's incremental effects are significant in relation to the cumulative context of climate change calls for a careful judgment by the lead agency in light of all the relevant factors. (CEQA Guidelines, §§ 15064, subd. (b), 15064.4.)

The Draft EIR/S considers these issues in detail in Chapter 22 (discussing the extent to which GHG emissions of alternatives might contribute to elevated GHG concentrations in the atmosphere), Chapter 29 (discussing how the alternatives affect the resiliency and adaptability of the Plan area to the effects of climate change), Appendix 29A (discussing the effects of sea-level rise on tidal flows and salinity), Appendix 29C (discussing climate change and its effects on reservoir operations and water temperature), Appendix 3E (discussing seismic and climate change risks associated with existing levee structures and other aspects of the Delta in its current physical conditions) and Chapter 2 (discussing the impacts of climate change on the Bay-Delta's natural communities as part of the description of Existing Conditions). In the Draft BDCP itself, section 5.2.4 of the Effects Analysis explains how climate change issues were incorporated into the assessment of the project's biological impacts. Climate change implications and assumptions are further detailed in Appendix 2C of the Draft BDCP, and Appendix 5A of the Draft BDCP provides detailed discussions of the ways in which climate change is likely to affect the Delta's aquatic and terrestrial species.

While the Draft BDCP and Draft EIR/S appropriately provide detailed information regarding existing risks within the Bay-Delta environment and the potential impacts of expected climate change on the project and resources in the BDCP area, such impacts are distinct from, and not to be confused with, BDCP impacts. For example, lead agencies must analyze potentially significant impacts associated with placing projects in hazardous locations, including

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locations potentially affected by climate change. (See CEQA Guidelines, § 15126.2, subd. (a).) As has been recognized, the anticipated hydrologic changes due to climate change (increased temperatures and more years of critical dryness, increased water temperatures, changes in precipitation and runoff patterns, sea level rise, and tidal variations) will constrain and challenge future water management practices across the state, with or without implementation of the BDCP. The overall environmental impacts of the project in relation to climate change are highly beneficial, however, as we discuss in further detail below, because implementation of the BDCP would improve stability and flexibility in the Bay-Delta as the effects of climate change increase.

B. The BDCP Will Be Resilient To Climate Change While Providing Substantial Climate Change Benefits To The Bay-Delta Ecosystem

The Participating CVP Public Water Agencies support the Draft EIR/S analysis of how the BDCP would be resilient to climate changes, as well as the benefits the BDCP would provide, including strengthening the resiliency of the Bay-Delta and its ability to adapt to the effects of climate change. (See generally Draft EIR/S 29-14 to 29-21.) For example, the Draft EIR/S discusses in detail the expected impacts of climate change in the Bay-Delta without the BDCP. As outlined in Appendices 3E, 29A, 29B, without the BDCP, the modeling predicts sea level increases of 6 inches by 2025 and 18 inches by 2060, dramatic changes in runoff sequencing, and increased salinity intrusion. (Draft EIR/S at 29-15.) As a result of these expected changes in the Bay-Delta, without the BDCP, aquatic species could be harmed and less water would be available for agricultural, municipal, and industrial users, resulting in significant economic consequences. (*Id.* at 29-15 to 29-16.)

Although no single public works project could possibly counter all of the anticipated impacts of climate change that are expected to occur regardless of the BDCP, most of the alternatives "would provide substantial resiliency and adaptation benefits over the No Action/No Project alternative…." (*Id.* at 29-16.) A dual conveyance is a necessary measure to protect water supplies against the effects of climate change, *id.*, while the proposed conservation measures will provide substantial relief from the expected stressors of climate change. As outlined in the Draft EIR/S, the wetlands and habitat restoration projects would provide great benefits to aquatic species of concern, terrestrial species, and migratory birds while simultaneously bolstering Delta levee stability and reliability. (*Id.* at 29-17 to 29-20.) The Participating CVP Public Water Agencies cannot emphasize enough that failing to proceed with the proposed project would leave the Bay-Delta ecosystem, and the surrounding communities, exposed to substantial environmental and economic harm in the coming decades.

VI. The Final BDCP And Final EIR/S Should Address The Differences In Relative Scientific Certainty Regarding Increased Outflow And Habitat Improvement Actions

One issue that must be addressed in the Final BDCP and Final EIR/S is the need to assess fully the actual uncertainty of achieving any demonstrable benefit to fish and wildlife by increased outflow and, by contrast, to assess more accurately the scientific certainty demonstrating the tangible and real benefits to fish and wildlife of increased habitat.[11]

The Final BDCP and Final EIR/S must acknowledge that the science purportedly linking increased Delta outflow to fish abundance is limited, uncertain, and speculative. As an example, an independent review panel on Delta Outflows and Related Stressors recently emphasized the need to disclose uncertainty in the relationships between X2, outflow, and species abundance to policy makers. (Delta Science Program 2014.) Recent studies do not identify fall X2 as strongly influencing delta smelt abundance. (Maunder et al. 2011; MacNally et al. 2010; Thomson et al. 2010; Miller et al. 2012.) Additionally, although some have noted a correlation between spring outflow and longfin smelt abundance, a recent independent scientific review has revealed that there is significant uncertainty regarding the asserted positive correlation between increased outflow and positive population growth. (Delta Science Program 2014; see Kimmerer 2009; NRC 2010; NRC 2012.)

It is axiomatic that an observed correlation in data does not establish causation. There remains considerable uncertainty regarding what physical and ecological processes underlie the observed correlations between outflow and species abundance; no mechanism has been identified. If, as other researchers believe, food availability, environmental conditions outside the low salinity zone ("LSZ"), or wet hydrology, and not Delta outflow, are the mechanisms underlying the observed changes in abundance, more spring outflow may not benefit abundance. Indeed, USFWS has itself acknowledged the effect of nutrients, among other factors, on longfin smelt abundance.

Outflow has historically been a primary tool for Bay-Delta ecosystem management. However, there is little evidence that it has been an effective tool for improving or protecting the health of the Bay-Delta. Consistent with the State Water Resources Control Board's and California Environmental Protection Agency's recommendations in a 2010 report titled "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem," a more comprehensive approach to protecting public trust resources is required. (State Water Res. Control Bd. and Cal. Envtl. Prot. Agency 2010 [also identifying contaminants, water quality parameters, future habitat restoration measures, water conveyance facilities modification, and the presence of non-native species as relevant factors].) As such, the Final BDCP and Final EIR/S should expressly acknowledge the limits in the available scientific data related to effects of additional outflow. Given the many stressors and changes in the Bay-Delta ecosystem, there is significant uncertainty about the potential benefits of increased outflow for delta smelt, longfin smelt, and several other species including white sturgeon and green sturgeon. (Delta Science Program 2014.) Numerous studies have concluded that more flow is not necessarily the

[11] This section is not intended to identify all of the factors within the Bay-Delta stressing the ecosystem. Stressors are discussed in section VIII below.

solution in highly altered systems. (Poff et al. 1997; Hart and Finelli 1999; Bunn and Arthington 2002; Poff and Zimmerman 2010.) Efficient or targeted use of flow is more likely to attain specific ecological benefits, particularly when paired with additional actions to address non-flow stressors.

Whereas the Draft BDCP and Draft EIR/S overstate the certainty of the benefit associated with increased flow, the drafts simultaneously understate the benefits of habitat improvements. Although habitat improvement has not historically been a widely used tool in the Bay-Delta, there is substantial scientific certainty regarding the benefits of habitat improvements on a moving forward basis. The direct and indirect benefits of large-scale habitat improvements, like those contemplated in the Draft BDCP and Draft EIR/S, are well-documented around the globe. (See, e.g., USFWS 2014, 79 Fed.Reg. 37078, 37089, 37095 (June 30, 2014) [documenting benefits of large-scale wetland restoration projects like Comprehensive Everglades Restoration Program, Kissimmee River Restoration Project, and Upper St. Johns Basin Restoration Project].)

Examples of successful habitat improvements (both locally and nationally) support the level of habitat improvement discussed in the Draft BDCP and Draft EIR/S. (Hobbs et al., 2012 [Alviso Marsh Complex, South Bay Salt Pond Restoration Program]; Howe et al., 2014 [North San Francisco Bay Tidal Marsh Channels]; Swenson et al, 2003 [Cosumnes River Preserve]; Dahl, 2006 [Upper Mississippi National Wildlife and Fish Refuge]; U.S. Fish and Wildlife Service 2014, 79 Fed. Reg. 37078, 37089 [Wetland Reserve Program in Florida, Alabama, Georgia, and South Carolina].) The feasibility of large-scale tidal marsh restoration projects is also supported. (Brand et al. 2012.) Further, there is relative certainty that key covered species, including longfin smelt, are found in tidal marsh habitat, and that tidal marsh habitats have high productivity and dense prey resources. (Hobbs et al. 2012; Merz et al., in review; Howe et al. 2014; Wouters and Cabral 2009.)

Moreover, the adaptive management program described in the Draft BDCP and Draft EIR/S provides opportunities to ensure that specific habitat improvement and conservation projects would be successful. Adaptive management is a well-established tool for structured decision-making that provides the ability to address scientific uncertainty and unexpected developments during project implementation. This structured and adaptive approach to habitat improvement should clearly be preferred over continuing to send crucial freshwater out to sea without either achieving success in restoring listed fish species or understanding why that approach continues to fail.

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VII. Adaptive Management Is An Appropriate And Well-Established Tool To Monitor And Adapt Implementation Of The BDCP

The Draft BDCP sets out a comprehensive conservation strategy designed to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework. An essential element of the Draft BDCP is adaptive management.

The Natural Community Conservation Planning Act ("NCCPA") requires that a conservation plan "integrate[] adaptive management strategies." (Fish & G. Code, § 2820(a)(2).) Under the NCCPA, adaptive management "means to use the results of new information gathered through the monitoring program of the plan and from other sources to adjust management strategies and practices to assist in providing for the conservation of covered species." (Fish & G. Code, § 2805, subd. (a).) An adaptive management approach is particularly appropriate for the BDCP, given that the goal of a natural community conservation plan ("NCCP") is to provide for the conservation of covered species and habitats through an approach that protects and restores the functionality of ecosystems. To accomplish this goal, the NCCPA emphasizes scientific understanding and promotes an adaptive management approach to conservation.

Adaptive management is a well-established tool authorized and encouraged by law that will allow the agencies to implement the Bay Delta Conservation Plan ("BDCP") based on the best data available at the time, rather than relying on predictions based on uncertain science that were made long before the project is even constructed. Pursuant to Fish and Game Code section 703.3, adopted by the Legislature in 2012, resource management decisions of the California Department of Fish and Wildlife ("Cal. DFW") should incorporate adaptive management to the extent possible. Cal. DFW is directed by statute to improve the management of biological resources over time by incorporating adaptive management principles and processes, as appropriate, into conservation planning and resource management. (Fish & G. Code, § 703.3.)

An adaptive management approach is likewise appropriate under the California Environmental Quality Act ("CEQA"). As noted above, it is a policy of the state to promote and encourage the use of adaptive management in connection with ecosystem-based conservation plans (see, e.g., Fish & G. Code, § 703.3), and CEQA is to be applied consistently with state policy. The comprehensive monitoring and management plan proposed in connection with the BDCP that adapts to changing scientific knowledge in order to achieve established performance criteria is consistent with CEQA. (See, e.g., CEQA Guidelines, § 15126.4, subd. (a)(1)(B); *Sacramento Old City Association v. City Council* (1991) 229 Cal.App.3d 1011.) Under these circumstances, the requirement that future research and monitoring be conducted concerning implementation of elements of the plan is not deferring an environmental decision – it is sound ecological management.

The use of adaptive management in the BDCP is consistent with agency guidance regarding implementation of the federal Endangered Species Act ("ESA"). As the Habitat Conservation Plan ("HCP") Handbook explains "[w]hen significant scientific uncertainty exists, it can be addressed through the incorporation and implementation of adaptive management measures into HCPs." (USFWS and NMFS, Habitat Conservation Planning Handbook, (1996), p. 3-24; see also Notice of Availability of a Final Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 65 Fed.Reg. 35242 (June 1, 2000).) "Adaptive management, if used properly, can provide a reliable means for assessing the mitigation and minimization strategies outlined in HCPs, producing better ecological knowledge, and developing appropriate modifications that would improve the mitigation strategy for the species." (HCP Handbook, p. 3-25.) Applying these foundational principles to the BDCP, the lead agencies have wisely chosen to use adaptive management. United States Department of Interior ("DOI") guidance identifies two conditions where adaptive management is best used: (1) "there must be a mandate to take action in the face of uncertainty" and (2) "there must be the institutional capacity and commitment to undertake and sustain an adaptive program" including "an institutional stability for long-term measurement and evaluation of outcomes." (DOI Technical Guidance, p. 9 [internal quotations omitted].) Both of these conditions are present here.

Adaptive management is also employed within the construct of the National Environmental Policy Act ("NEPA"). (See Council on Environmental Quality ("CEQ") NEPA Task Force, Modernizing NEPA Implementation at ix (2003) ("Modernizing NEPA Implementation").) Adaptive management is not a novel approach – but a well-established process that has been used since the 1970's to manage scientific uncertainties and improve the implementation of conservation measures in a complex ecosystem. It provides "a systematic approach for improving resource management by learning from management outcomes." (Dep't of Interior, Adaptive Management Technical Guide (2009 ed.) ("DOI Technical Guide") p. 1).

The CEQ, which is charged with issuing regulations and guidance for lead agencies implementing NEPA, has recommended that agencies use adaptive management tools to analyze and implement mitigation alternatives. (See Memorandum from Nancy H. Sutley, Chair, Council on Environmental Quality to Heads of Federal Departments and Agencies, "Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact" (Jan. 14, 2011), pp. 9-10.) The DOI likewise recommends using adaptive management where agencies must take action in the face of scientific uncertainty. (DOI Technical Guide, p. 8.[12])

The use of adaptive management presumes a certain level of scientific uncertainty in how ecological systems function. (DOI Technical Guide, p. 4.) This "is not a 'trial and error' process," but an approach that "emphasizes learning while doing." (*Id.*) Modeling, monitoring, and research are vital to learning how an ecosystem functions, while considering whether and how to implement a mitigation measure proposed in an EIR/S. (*Id.*) This is very different from

[12] Several courts have upheld the use of adaptive management under NEPA, rejecting claims that agencies are prohibited from modifying mitigation measures in the face of new data. (See, e.g., *Theodore Roosevelt Conservation Partnership v. Salazar* (D.C. Cir. 2010) 616 F.3d 497; *In re Operation of the Missouri River System Litigation* (D. Minn. 2004) 363 F. Supp. 2d 1145; *Oregon Natural Resources Council Action v. U.S. Forest Service* (W.D. Wash. 1999) 59 F. Supp. 2d 1085.)

the traditional "predict, mitigate and implement" environmental management model, which "does not account for unanticipated changes in environmental conditions, inaccurate predictions, or subsequent information that might affect the original environmental protections." (See Modernizing NEPA Implementation, p. 44; *id.*) Quite simply, the traditional approach will not perform well in complex ecosystems where interactions involve scientific uncertainty. By contrast, adaptive management's "model and adapt" approach provides "flexibility to address unanticipated results of project implementation and to adjust decisions for practical reasons." (*Id.* at p. 46.)

Adaptive management is appropriate for the Draft BDCP and Draft EIR/S. First, stakeholders agree that the *status quo* in the Bay-Delta is not working. The complexity of the Bay-Delta ecosystem, however, means that permitting and implementation decisions will be made in the face of scientific uncertainty. This uncertainty makes adaptive management more suitable than the inflexible "predict, mitigate, and implement" model which has already failed repeatedly. The Public Water Agencies and state agencies are committed to an adaptive management program that will use new information "to develop and potentially implement alternative strategies to achieve the biological goals and objectives" of the BDCP. (Draft Implementing Agreement for the Bay Delta Conservation Plan ("Draft Implementing Agreement"), p. 29.)

As a result, adaptive management will play a vital role in implementing the BDCP's goals and objectives and is necessary to achieve conservation planning goals under the NCCPA and ESA. The overall complexity of the Bay-Delta and scientific uncertainties involved in restoring species habitat makes adaptive management highly preferable over the traditional "predict, mitigate, and implement" environmental management model.

VIII. The Draft BDCP And Draft EIR/S Apply A Comprehensive Approach To Address A Suite Of Environmental Stressors Affecting The Bay-Delta Ecosystem

While the benefits of additional flow are subject to considerable scientific uncertainty, there is no question that multiple environmental stressors have contributed to the current degraded state of the Bay-Delta ecosystem and declines in native fish species. The best available science demonstrates that managing flow alone will not restore the highly degraded Bay-Delta ecosystem and its at-risk species. The best available science demonstrates that at least five "other (non-flow-related) stressors" are key factors in the current state of the Bay-Delta. Three of these stressors are addressed in the Draft BDCP and Draft EIR/S:

1. Changes in the composition of the food web that supports desired fish species;
2. Changes to the physical landscape; and
3. Increased predation by non-native fish species.

The two other stressors fall outside the scope of the Bay Delta Conservation Plan ("BDCP"): increases in water temperature and reductions in turbidity. For those stressors that can be controlled within the area covered by the Draft BDCP, the Draft EIR/S appropriately considers the effects of those stressors, and the BDCP includes more than twenty conservation measures to address them. For those stressors outside the areas covered by the BDCP, the Final BDCP and Final EIR/S should better recognize the importance of those stressors and identify the fact that they fall outside of the BDCP.

A. <u>The Draft BDCP And Draft EIR/S Address Three Of The Five Key Stressors Affecting The Bay-Delta Ecosystem</u>

Changes in the composition of the food web, changes to the physical landscape, and increased predation by non-native fish species are three important factors that have impacted the health of the Bay-Delta. Although they are not impacts of the State Water Project ("SWP") or Central Valley Project ("CVP"), they are addressed in the Draft BDCP and analyzed in the Draft EIR/S, given their importance to the overall health of the Bay-Delta.

1. <u>Changes To The Food Web</u>

Historic and recent changes to the composition of the food web in the Bay-Delta are key stressors on the ecosystem. There is agreement in the scientific community that the composition of the food web in the Bay-Delta now differs from that of decades ago. Not only has food quality changed, but food quantity has also declined; primary productivity and phytoplankton biomass decreased significantly between 1975 and 1995 and still remain low. There are a number of possible explanations for the changes. Regardless of the specific causes of the changes, however, research has established that a strong link exists between food availability and the growth and survival of fish species. Accordingly, addressing changes in the food web is a crucial component of the Draft BDCP and the larger effort to improve the health of the Bay-Delta.

There have been changes to the composition of the Bay-Delta food web in ways that are adverse to native species. For example, the dominant phytoplankton species have shifted from diatoms to less nutritious – and sometimes toxic – algal species (Lehman 2000; Lehman et al. 2005; Lehman et al. 2010; Jassby et al. 2002; Sommer et al. 2007; Glibert et al. 2011; Winder and Jassby 2010). Primary productivity and phytoplankton biomass in the Bay-Delta are among the lowest of all estuaries studied (Jassby et al. 2002). The larger calanoid copepods that have been identified as important prey for delta smelt and longfin smelt are now outnumbered by smaller cyclopoid copepods. Changes in primary and secondary production (phytoplankton and zooplankton) have also had significant effects on the abundance and distribution of several species (Cloern 2001). There is also scientific agreement regarding some of the causes of these changes to the food web, such as the invasion by the Amur River clam (*P. amurensis*) in the past, and changes to the Bay-Delta landscape in the long term (Kimmerer 2006). A number of other possible explanations for changes to the Bay-Delta food web are discussed in more detail in a submittal to the State Water Resources Control Board on Bay-Delta Stressors.

Research has established that a strong link exists between food availability and the growth and survival of fish species. In recent studies focused on the Bay-Delta, researchers now hypothesize that food quantity and quality are limiting the growth and survival of several fish species in the Bay-Delta (Winder and Jassby 2010; Rosenfield and Baxter 2007; Slaughter and Kimmerer 2010; Jassby et al. 2002; Kimmerer et al. 2012; Maunder and Deriso 2011; Miller et al. 2012). Species abundance and distribution change in response to changing food resources, including species moving to new locations, declines in total abundances, or changes in feeding habits (See Orsi et al. 1996; Feyrer et al. 2003; Kimmerer et al. 2000 [noting declines in species population abundance in response to food limitation]; Feyrer et al. 2003 [noting change in feeding habits]).

2. <u>Changes To The Bay-Delta's Physical Landscape</u>

Changes to the Bay-Delta landscape have been extensive and have reduced or eliminated many of the rearing, spawning, migration, and refuge functions associated with an unaltered estuary. In the past 160 years, approximately 1,334 miles of levees were constructed and in-Delta channels were widened, straightened, deepened, connected, and in some instances gated, which have collectively altered the pattern and extent of diurnal tidal flows. Most upstream rivers and many of the contributing streams have been modified with dams, diversions, or other "improvements" that have separated channels from their floodplains, changing inflow patterns, and reducing sediment and nutrient inputs to the ecosystem. The extensive changes to the Bay-Delta landscape have reduced, fragmented, and isolated Bay-Delta habitats. The effects on native species have been substantial. The Draft BDCP attempts to address some of these effects. Other efforts within the Bay-Delta are attempting to do more.

Floodplains, wetlands, and riparian habitat ordinarily provide valuable landscape features that can be used by desired fishes for rearing, spawning, migration, dispersal, and refuge from predators. For example, several studies support the conclusion that access to wetlands is important to the success of many of the Bay-Delta's desired fish species (Moyle et al. 1992; Lindberg and Marzuola 1993; McIvor et al. 1999), including the delta smelt (Hamilton and Murphy, in review). Floodplain inundation provides spawning and rearing habitat for fish that take advantage of the high productivity on the floodplain (Poff et al. 1997; Sommer et al. 2001a, b; Feyrer et al. 2004; Schramm and Eggleton 2006; Grosholz and Gallo 2006). The low-velocity, shallow, and vegetated conditions of the floodplain serve as a refuge from the fast, turbid waters of the river during high flows (Sommer et al. 2001a; Jeffres et al. 2008). Juvenile Chinook salmon also benefit from floodplains as foraging and refuge habitat (Moyle et al. 2007; Grosholz and Gallo 2006). Physical improvements are needed to restore landscape features and the functions they provided, in concert with a comprehensive approach addressing causes of the Bay-Delta's decline.

3. <u>Increased Predation By Non-Native Fish Species</u>

A growing body of scientific evidence strongly suggests that predation of juvenile salmonids by the increasing numbers of largemouth bass and other non-native fish species in the Bay-Delta is a major factor contributing to reduced survival and abundance of Chinook salmon and Central Valley steelhead. A number of non-native predatory fish inhabit the Bay-Delta, including largemouth bass, striped bass, and sunfish. In recent years, fishery surveys have been used to better document the relationship between submerged aquatic vegetation (e.g., Egeria densa) and non-native predatory fish (Feyrer and Healey 2003; Brown and Michniut 2007; Nobriga and Feyrer 2007; Nobriga et al. 2005). The fishery survey results have shown an increasing abundance trend in largemouth bass and sunfish over the last three decades. Fish salvage monitoring at the SWP and CVP export facilities has also shown a substantial increase in the number of largemouth bass collected in recent years, particularly since the early 1990s (Nobriga 2009). Although the striped bass population has fluctuated in abundance over the past several decades, the increase in predatory fish abundance in the Bay-Delta appears to be primarily largemouth bass and sunfish.

The increasing non-native bass and sunfish abundance trend has contributed to a change in the Bay-Delta fish community's species composition. During surveys in 1981-1982 native fish comprised 18 percent of the fish collected. In recent years, the relative contribution of native fish to the Bay-Delta community has declined to approximately four percent, as reflected in surveys in 2009-2010.

It is well documented that larger bass prey primarily on cray fish and small fish (Conrad et al. 2010a), including salmonids. Largemouth and other bass represent a significant source of predation mortality for many of the forage fish inhabiting the Bay-Delta (e.g., juvenile Chinook salmon and steelhead, smelt, shad, and others). Predation mortality by striped bass and largemouth bass has been identified as a major factor reducing the survival of juvenile salmon and steelhead entering Clifton Court Forebay (Gingras 1997; Clark et al. 2009), at fish salvage release sites (Miranda et al. 2010), and at other locations within the Central Valley rivers and Bay-Delta such as the Head of Old River (Bowen et al. 2009, Bowen and Bark 2010). There is mounting scientific evidence that over the past decade predation mortality by non-native fish has become a major factor adversely impacting the survival and abundance of juvenile Chinook

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salmon and other native fish in the Bay-Delta. The Draft BDCP attempts to address the need to reduce predation.

B. Two Stressors Fall Outside Of The Draft BDCP And Draft EIR/S, But Should Be Recognized In The Final Documents

The Draft BDCP does not and cannot address two important stressors: in-Delta water temperature and turbidity. The Final BDCP and EIR/S should recognize these stressors – as they further demonstrate that regulating outflow alone cannot restore the health of the ecosystem.

1. Changes In Temperature

Water temperatures have warmed and are anticipated to continue to warm. Although annual trends in water temperature have not been observed in recent decades, significant changes in average monthly temperatures have been observed between 1983 and 2007 (Jassby 2008b). Moreover, researchers report that climate change is expected to result in further increases in water temperature in the estuary. (Cloern et al. 2011; Wagner et al. 2011.) Water temperature changes are important because the success of desirable and undesirable species can be highly temperature-dependent (Jassby 2008b; Nalewajko and Murphy 2001; Swanson et al. 2000). Specific examples of species of concern within the estuary at various points in the life cycles include salmonids (Myrick and Cech 2011), the Sacramento splittail (Moyle et al. 2004), and the delta smelt (Bennett 2005).

Temperature changes can have myriad adverse effects. A potentially serious effect on water temperature could result from a decrease in the cold water pool of upstream reservoirs as the snowmelt contribution to runoff declines (Cloern et al. 2011) or if reservoir storage is drawn down too low. Areas experiencing thermal maxima at or above lethal ranges for native species, such as delta smelt, may increase. Additionally, increased temperature could adversely affect aquatic invertebrates and alter wetland plant communities resulting in changes to available carbon.

Water temperatures provide an important constraint on ecological function, including effects on aquatic invertebrates (Vannote and Sweeney 1980) and effects on fish spawning (Myrick and Cech 2011), swimming performance (Myrick and Cech 2000), metabolism (Myrick and Cech 2011), and mortality (Parker et al. 2011). The biological implications of climate change effects on water temperatures may be profound, including increasing risk of extinction of native species and increasing dominance of nonnative species.

Water temperatures in the Bay-Delta are primarily driven by atmospheric influences, although thermal dispersion also influences water temperatures, and bathymetric features can influence site-specific water temperatures. Reservoir releases are unable to affect water temperatures in the Bay-Delta during the warmer summer and fall seasons when cooler water temperatures are most needed. A comprehensive look at the entire estuary must be taken to address the future health of the Bay-Delta in light of anticipated temperature changes. The Final BDCP and Final EIR/S should better recognize the importance of temperature in the context of all the stressors on the ecosystem, and the inability of the BDCP to address that factor.

2. Changes In Turbidity

Another important stressor is turbidity. Turbidity is a physical characteristic of water and is an expression of the optical property that causes light to be scattered and absorbed by particles and molecules rather than transmitted in straight lines through a water sample. It is caused by suspended matter or impurities that interfere with the clarity of the water. Monitoring by the California Department of Fish and Wildlife ("Cal. DFW") and Interagency Ecological Program ("IEP") in the Bay-Delta over the past 35 years have documented trends of increased water clarity (Moyle and Bennett 2008), reduced turbidity (Schoellhamer 2011), and declines in chl-*a* (Jassby 2008a; Jassby et al. 2002; Kimmerer et al. 1994). The clearing of the estuarine waters in the Bay-Delta has coincided with the decline in abundance of the Bay-Delta's desired fishes.

The changes in water clarity have significant implications for several Bay-Delta fish species, with particular significance for delta smelt. Clearer water with abundant submerged aquatic vegetation favors centrarchid fishes and is less desirable habitat for delta smelt (Moyle and Bennett 2008). Turbidity appears to be a critical factor for delta smelt larval feeding, providing better contrast between prey and their background, enabling larval predators to better locate their prey (Boehloert and Morgan 1985 in Lindberg et al. 2000). The physical components of "green" or turbid water rather than chemical properties of algal filtrate that contribute to turbidity appear to be important (Lindberg et al. 2000). Reservoirs on the major tributaries have reduced sediment input to the Bay-Delta and the sediment transport capacity of channels below these reservoirs decreases over time as the channels become incised and armored. While suspended sediment concentrations in the Bay-Delta rise following significant rainfall, releases from upstream reservoirs (i.e., increased inflow) are not an effective means of delivering suspended sediment to the Bay-Delta. Accordingly, the Draft BDCP does not and cannot manage turbidity of water in the Bay-Delta. The Final BDCP and Final EIR/S should better recognize the importance of turbidity as well as the inability of the BDCP to address that factor.

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IX. The California Legislature Required The Delta Plan To Conform To The BDCP

When the California Legislature enacted the 2009 Delta Reform Act ("DRA"), it expected the Bay Delta Conservation Plan ("BDCP") to be completed *prior* to the adoption of the Delta Plan. Consequently, the Delta Plan was viewed as a supplement to the BDCP, with the Delta Plan conforming to the BDCP. As evidence of this legislative intent and confirmation that the assumed timing was for the Delta Plan to *follow* the BDCP, see Wat. Code, § 85057.5 subd. (b)(7)(B), which states that "[a]ny project for which notice of approval or determination is filed on or after the date on which the final Bay Delta Conservation Plan becomes effective, and before the date on which the Delta Plan becomes effective, is not a covered action but shall be consistent with the Bay Delta Conservation Plan." (Wat. Code, § 85057.5, subd. (b)(7)(B)[emphasis added].)

The Delta Stewardship Council ("DSC") reads the DRA similarly. The attachment to the DSC's June 24, 2014 Draft EIR/S comment letter includes the following opening sentences under the heading "Delta Plan and Delta Reform Act Consistency":

> The Delta Reform Act requires that the BDCP shall be incorporated into the Delta Plan if it meets the Act's requirements. Thus, the Delta Plan may need to be revised if and when the BDCP is incorporated into it to eliminate any inconsistencies between BDCP and the Delta Plan.

As a result, the Delta Plan will be revised if necessary to be consistent with the BDCP, and hence by definition, all actions undertaken pursuant to the BDCP would be consistent with the Delta Plan.

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Attachment 3

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Cover Letter

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- *Theodore Roosevelt Conservation P'ship v. Salazar* (D.C. Cir. 2011) 616 F.3d 497
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- *Greater Yellowstone Coalition v. Flowers* (10th Cir. 2004) 359 F.3d 1257
- *Louisiana Wildlife Federation v. York* (5th Cir. 1985) 761 F.3d 1044
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Focused Comments: The Delta Plan

Statutes

- Wat. Code, § 85057.5

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Attachment 4

Document Index & Library[13]

The San Luis & Delta-Mendota Water Authority and Westlands Water District, to facilitate consideration of the comments, provide the enclosed index of reference documents and DVD containing electronic copies of the cited documents. To view the listed reference documents, please click on the document title within the Excel spreadsheet and the hyper-linked document will appear. If any of the hyper-links do not appear to be working or there are any other issues viewing a reference document, please contact us.

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[13] The Administrative Procedure Act ("APA") governs a court's review of an agency's compliance with the National Environmental Policy Act. *In Def. of Animals, Dreamcatcher Wild Horse & Burro Sanctuary v. U.S. Dep't of Interior* (9th Cir. 2014) 751 F.3d 1054, 1061. Judicial review of an agency action under the Administrative Procedure Act is based on the whole administrative record, which includes everything that was before the agency pertaining to the merits of its decision. 5 U.S.C. § 706; *Portland Audubon Soc'y v. Endangered Species Committee* (9th Cir.1993) 984 F.2d 1534, 1548; *Thompson v. United States Dep't of Labor* (9th Cir.1989) 885 F.2d 551, 555-56. "The whole administrative record, therefore, consists of all documents and materials directly or *indirectly* considered by agency decision-makers." *Thompson*, 885 F.2d at 555 (emphasis in original) (internal citations and quotation marks omitted). "The whole record is not necessarily those documents that the agency has compiled and submitted as the administrative record; the court must look to all the evidence that was before the decision-making body." *Public Power Council v. Johnson* (9th Cir.1982) 674 F.2d 791, 794 (internal citations and quotations marks omitted); *see* Env't and Natural Res. Div., U.S. Dept. of Justice, Guidance to Federal Agencies on Compiling the Administrative Record *(1999)* at 3 (federal agencies should include in the administrative record "all documents and materials prepared, reviewed, or *received by* agency personnel and used by *or available to* the decision-maker, even though the final decision-maker did not actually review or know about the documents and materials") (emphasis added); *see also* 40 C.F.R. § 1503.4 (an agency preparing a final environmental impact statement has the duty to assess, consider, and respond to all comments).

The administrative record for proceedings under the California Environmental Quality Act ("CEQA") must include, but is not limited to "[a]ll written evidence or correspondence submitted to, or transferred from, the respondent public agency with respect to compliance with this division or with respect to the project." Cal. Pub. Res. Code § 21167.6(e). A certified record in an action challenging the sufficiency of an EIS/EIR under CEQA is supposed to include all public comments and supporting documentation. Cal. Pub. Resources Code, § 21167.6, (e)(6)-(8), (10)-(11).)

WILDLIFE SPECIES

AUTHOR/SOURCE	DATE	TITLE
Block et al	2001	Design and implementation of monitoring studies to evaluate the success of ecological restoration on wildlife
Buckland et al	2004	State-space models for the dynamics of wild animal populations
Golet et al	2008	Wildlife Response to Riparian Restoration on the Sacramento River
Patterson et al	2008	State-space models of individual animal movement
Wood et al	2006	Overview of Cosumnes riparian bird study and recommendations for monitoring and management

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STURGEON: GREEN & WHITE		
AUTHOR/SOURCE	DATE	TITLE
Allen et al	2006	Growth of Larval to Juvenile Green Sturgeon in Elevated Temperature Regimes
Adams et al	2002	Status review for North American green sturgeon, Acipenser medirostris
Beamesderfer et al	2004	Historical and current information on green sturgeon occurrence in the Sacramento and San Joaquin rivers and tributaries
Beamesderfer et al	2007	Use of life history information in a population model for Sacramento green sturgeon
Boreman	1997	Sensitivity of North American sturgeons and paddlefish to fishing mortality
Dept. of Water Resources	2004	MATRIX OF LIFE HISTORY AND HABITAT REQUIREMENTS FOR FEATHER RIVER FISH SPECIES, SP-F3.2 TASK 2 - WHITE STURGEON
Duke et al	1999	Recovery plan for Kootenai River white sturgeon (Acipenser transmontanus)
Fish	2010	A White Sturgeon Year-Class Index for the San Francisco Estuary and Its Relation to Delta Outflow
Gadomski & Parsley	2005	Effects of Turbidity, Light Level, and Cover on Predation of White Sturgeon Larvae by Prickly Sculpins
Huff et al	2011	Green Sturgeon Physical Habitat Use in the Coastal Pacific Ocean
Kohlhorst	1991	ASPECTS OF THE STRUCTURE AND DYNAMICS OF AN EXPLOITED CENTRAL CALIFORNIA POPULATION OF WHITE STURGEON
Kohlhorst	2001	California's Living Marine Resources: A Status Report - Green Sturgeon
Kohlhorst & Cech	2001	California's Living Marine Resources: A Status Report - White Sturgeon
Mora et al	2009	Do impassable dams and flow regulation constrain the distribution of green sturgeon in the Sacramento River, California?
Moser and Lindley	2007	Use of Washington estuaries by subadult and adult green sturgeon
Muir et al	2000	Diet of First-Feeding Larval and Young-of-the-Year White Sturgeon in the Lower Columbia River
Mussen et al	2014	Unscreened water-diversion pipes pose an entrainment risk to the threatened green sturgeon, Acipenser medirostris
National Marine Fisheries Service	2005	Green sturgeon (Acipenser medirostris) status review update
National Marine Fisheries Service	2009	Designation of critical habitat for the Southern Distinct Population Segment of North American green sturgeon

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SPLITTAIL		
AUTHOR/SOURCE	DATE	TITLE
Feyrer et al	2007	Living in a dynamic environment: Variability in life History traits of age-0 splittail in tributaries of San Francisco Bay
Feyrer et al	2006	Managing floodplain inundation for native fish: production dynamics of age-0 splittail (Pogonichthys macrolepidotus) in California's Yolo Bypass
Feyrer et al	2010	Salinity Inhabited by Age-0 Splittail (Pogonichthys macrolepidotus) as Determined by Direct Field Observation and Retrospective Analyses with Otolith Chemistry
Feyrer et al	2005	Spatial-Temporal Distribution and Habitat Associations of Age-0 Splittail in the Lower San Francisco Estuary Watershed
Kurth & Nobriga	2001	Food Habits of Larval Splittail
Moyle et al	2004	Biology and population dynamics of Sacramento splittail in the San Francisco estuary, a review
Sommer et al		Resilience of splittail in the Sacramento-San Joaquin estuary
Sommer et al	1997	Splittail "delisting": A review of recent population trends and restoration activities
Sommer et al	2008	Habitat Associations and Behavior of Adult and Juvenile Splittail (Cyprinidae, Pogonichthys macrolepidotus) in a Managed Seasonal Floodplain Wetland
Sommer et al	2010	Splittail persistence in the Petaluma River
U.S. Fish & Wildlife Service	2007	Endangered and Threatened Wildlife and Plants, 12-month finding on a petition to list the Sacramento splittail as endangered or threatened
Young & Cech	1996	Environmental tolerances and requirements of splittail

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Perry & Skalski	2009	Survival and migration of juvenile Chinook salmon in the Sacramento-San Joaquin River Delta during the winter of 2007-2008
Perry et al	2010	Estimating Survival and Migration Route Probabilities of Juvenile Chinook Salmon in the Sacramento–San Joaquin River Delta
Perry et al	2012	Sensitivity of survival to migration routes used by juvenile Chinook salmon to negotiate the Sacramento-San Joaquin River Delta
Petersen & Kitchell	2000	Climate regimes and water temperature changes in the Columbia River: bioenergetic implications for predators of juvenile salmon
Pipal	2005	Summary of Monitoring Activities for ESA-Listed Salmonids in California's Central Valley
Puget Sound Energy, Inc.	2002	Baker River Hydroelectric Project: Biological Assessment of Proposed Interim Conservation Measures for Puget Sound Chinook Salmon Pending Relicensing
Pyper et al	2012	Implications of Mark-Selective Fishing for Ocean Harvest and Escapements of Sacramento River Fall Chinook Salmon Populations
Quinn et al	1997	Temperature, flow, and the migration of adult sockeye salmon (Oncorhynchus nerka) in the Columbia River
Reimers	1971	The length of residence of juvenile fall Chinook salmon in Sixes River, Oregon
Reiser & Bjornn	1979	Influence of Forest and Rangeland Management on Anadromous Fish Habitat in the Western United States and Canada
Rieman & Beamesderfer	1991	Estimated Loss of Juvenile Salmonids to Predation by Northern Squawfish, Walleyes, and Smallmouth Bass in John Day Reservoir, Columbia River
Rivot et al	2004	A Bayesian State-Space Modeling Framework for Fitting a Salmon Stage-Structured Population Dynamic Model to Multiple Time Series of Field Data
Roper & Scarnecchia	1996	A Comparison of Trap Efficiencies for Wild and Hatchery Age-0 Chinook Salmon
Rose et al	2011	Salmonid Integrated Life Cycle Models Workshop. Report of the Independent Workshop Panel
Ruckelshaus et al	2002	The Pacific Salmon Wars: What Science Brings to the Challenge of Recovering Species
Sandahl et al		A Sensory System at the Interface Between Urban Stormwater Runoff and Salmon Survival
Scheuerell & Williams	2005	Forecasting climate-induced changes in the survival of Snake River spring/summer Chinook salmon (Oncorhynchus tshawytscha)
Shelton	1955	The hatching of Chinook salmon eggs under simulated stream conditions
Sigler et al	1984	Effects of Chronic Turbidity on Density and Growth of Steelheads and Coho Salmon
Singer et al	2012	Interannual variation of reach specific migratory success for Sacramento River hatchery yearling late-fall run Chinook salmon (Oncorhynchus tshawytscha) and steelhead trout (Oncorhynchus mykiss)
Sloman et al	2002	Social interactions affect physiological consequences of sublethal copper exposure in rainbow trout, Oncorhynchus mykiss
Smith	1973	Development and Application of Spawning Velocity and Depth Criteria for Oregon Salmonids
Smith et al	2002	Factors Associated with Travel Tim and Survival of Migrant Yearling Chinook Salmon and Steelhead in the Lower Snake River
Sommer et al	2001	Factors Affecting Chinook Salmon Spawning in the Lower Feather River
Sommer et al	2005	Habitat use and stranding risk of juvenile Chinook salmon on a seasonal floodplain
Spence et al	1996	An ecosystem approach to salmonid conservation
Sutton et al	2007	Salmonid observations at a Klamath River thermal refuge under various hydrological and meteorological conditions
Sweeting et al	2003	Replacement of Wild Coho Salmon by Hatchery-Reared Coho Salmon in the Strait of Georgia over the Past Three Decades
Taylor	1991	A review of local adaptation in Salmonidae, with particular reference to Pacific and Atlantic salmon
Thompson et al	2012	Water Management Adaptations to Prevent Loss of Spring-Run Chinook Salmon in California under Climate Change
Tierney et al	2008	Salmon Olfaction is Impaired by an Environmentally Realistic Pesticide Mixture
Tomalty et al	2014	Examining the Causes and Consequences of Hybridization During Chinook Salmon Reintroductions: Using the San Joaquin River as a Restoration Case Study of Management Options
Tschaplinski	1988	The use of estuaries as rearing habitats by juvenile coho salmon
Turner et al	2007	Developmental rates, structural asymmetry, and metabolic fingerprints of steelhead trout (Oncorhynchus mykiss) eggs incubated at two temperatures
U.S. Bureau of Reclamation	2008	Central Valley Project and State Water Project operations criteria and plan Biological Assessment: Steelhead Baseline
U.S. Dept. of Energy	1996	Fall Chinook Salmon Survival and Supplementation Studies in the Snake River and Lower Snake River Reservoirs, 1996
U.S. Fish & Wildlife Service	1986	Species Profiles: Lit e Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest): CHINOOK SALMON
U.S. Fish & Wildlife Service	1996	Identification of the Instream Flow Requirements for Steelhead and Fall-Run Chinook Salmon Spawning in the Lower American River
U.S. Fish & Wildlife Service	2005	Flow-Habitat Relationships for Chinook Salmon Rearing in the Sacramento River Between Keswick Dam and Battle Creek
U.S. Fish & Wildlife Service	1995	Habitat Restoration Actions to Double Natural Production of Anadromous Fish in the Central Valley of California. Working Paper, Volumes 1-3
Vigg & Burley	1991	Temperature-Dependent Maximum Daily Consumption of Juvenile Salmonids by Northern Squawfish (Ptychocheilus oregonensis) from the Columbia River
Vigg et al	1991	Rates of Consumption of Juvenile Salmonids and Alternative Prey Fish by Northern Squawfish, Walleyes, Smallmouth Bass, and Channel Catfish in John Day Reservoir, Columbia River
Vogel	2011	Insights into the Problems, Progress and Potential Solutions for Sacramento River Basin Native Anadromous Fish Restoration
Vogel	2010	Evaluation of Acoustic-Tagged Juvenile Chinook Salmon Movements in the Sacramento-San Joaquin Delta during the 2009 Vernalis Adaptive Management Program
Wainwright & Kope	1999	Methods of extinction risk assessment developed for US West Coast salmon
Wainwright & Waples	1998	Prioritizing Pacific Salmon Stocks for Conservation: Response to Allendorf et al.
Waples et al	2001	Characterizing diversity in salmon from the Pacific Northwest
Wargo-Rub et al	2011	Estimated Survival of Adult Spring/Summer Chinook Salmon from the Mouth of the Columbia River to Bonneville Dam
Weber & Fausch	2003	Interactions between hatchery and wild salmonids in streams: differences in biology and evidence for competition
Wedemeyer et al	1980	Environmental Factors Affecting Smoltification and Early Marine Survival of Anadromous Salmonids
Weitkamp & Neely	2002	Coho salmon (Oncorhynchus kisutch) ocean migration patterns: insight from marine coded-wire tag recoveries
Welch et al	2008	Survival of Migrating Salmon Smolts in Large Rivers With and Without Dams
Wells et al	2008	Relationship between oceanic conditions and growth of Chinook salmon from California, Washington, and Alaska, USA
Wells et al	2006	Covariation Between the Average Lengths of Mature Coho (Oncorhynchus kisutch) and Chinook Salmon (O. tschawytscha)and the Ocean Environment
Whitmore et al	1960	Avoidance Reactions of Salmonid and Centrarchid Fishes to Low Oxygen Concentrations
Williams	2006	Central Valley Salmon: A Perspective on Chinook and Steelhead in the Central Valley of California
Williams	2012	Juvenile Chinook salmon (Oncorhynchustshawytscha) in and around the San Francisco Estuary
Wu	2000	Modeling embryo survival affected by sediment deposition into salmonid spawning gravels: Application to flushing flow prescriptions
Yoshiyama et al	1998	Historical Abundance and Decline of Chinook Salmon in the Central Valley Region of California
Zajanc et al	2013	Holding behavior of Chinook salmon (Oncorhynchus tshawytscha) and steelhead (O. mykiss) smolts, as influenced by habitat features of levee banks, in the highly modified lower Sacramento River
Zaugg & Wagner	1973	Gill ATPase activity related to parr-smolt transformation and migration in steelhead trout (Salmo gairdneri): influence of photoperiod and temperature
Zeug	2012	Application of a Life Cycle Simulation Model to Evaluate Impacts of Water Management and Conservation Actions on an Endangered Population of Chinook Salmon

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Fritts & Pearsons	2004	Smallmouth Bass Predation on Hatchery and Wild Salmonids in the Yakima River, Washington
Garland et al	2002	Comparison of Subyearling Fall Chinook Salmon's Use of Riprap Revetments and Unaltered Habitats in Lake Wallula of the Columbia River
Giorgi et al	2002	Mainstem Passage Strategies in the Columbia River System: Transportation, Spill, and Flow Augmentation
Good et al	2007	Recovery Planning for Endangered Species Act-Listed Pacific Salmon: Using Science to Inform Goals and Strategies
Greene & Beechie	2004	Consequences of potential density-dependent mechanisms on recovery of ocean-type chinook salmon (Oncorhynchus tshawytscha)
Greig et al	2005	Impact of clay particles on the cutaneous exchange of oxygen across the chorion of Atlantic salmon eggs
Gresh et al	2000	An Estimation of Historic and Current Levels of Salmon Production in the Northeast Pacific Ecosystem: Evidence of a Nutrient Deficit in the Freshwater Systems of the Pacific Northwest
Grossman et al	2013	EFFECTS OF FISH PREDATION ON SALMONIDS IN THE SACRAMENTO RIVER – SAN JOAQUIN DELTA AND ASSOCIATED ECOSYSTEMS
Hanna	2008	Institutions for Managing Resilient Salmon (Oncorhynchus Spp.) Ecosystems: the Role of Incentives and Transaction Costs
Hansen et al	1999	Chinook salmon (Oncorhynchus tshawytscha) and rainbow trout (Oncorhynchus mykiss) exposed to copper: neurophysiological and histological effects on the olfactory system
Hansen et al	1999	Differences in neurobehavioral responses of Chinook salmon (Oncorhynchus tshawytscha) and rainbow trout (Oncorhynchus mykiss) exposed to copper and cobalt: behavioral avoidance
Hansen et al	2002	Relationship between exposure duration, tissue residues, growth, and mortality in rainbow trout (Oncorhynchus mykiss) juveniles sub-chronically exposed to copper
Hansen et al	2010	Salmonid predator–prey dynamics in Lake Pend Oreille, Idaho, USA
Hare et al	1999	Inverse Production Regimes: Alaska and West Coast Pacific Salmon
Healey	1991	Life history of Chinook salmon (Oncorhynchus tshawytscha). Pages 311–394 in C. Groot and L. Margolis, editors. Pacific salmon life histories
Hedgecock et al	1994	Conservation Biology of Endangered Pacific Salmonids: Introductory Remarks
Hendrix	2008	A Statistical Model of Central Valley Chinook Incorporating Uncertainty Description of Oncorhynchus Bayesian Analysis (OBAN) for winter run Chinook
Hilborn et al	2003	Biocomplexity and fisheries sustainability
Hilton	2001	An assessment of the potential for the application of two simple models to Atlantic salmon, Salmo salar, stock management in chalk rivers
Jager & Rose	2003	Designing Optimal Flow Patterns for Fall Chinook Salmon in a Central Valley, California, River
Jonsson	1997	A review of ecological and behavioural interactions between cultured and wild Atlantic salmon
Jonsson et al	2003	The marine survival and growth of wild and hatchery reared Atlantic salmon
Kondolf et al	1991	Distribution and Stability of Potential Salmonid Spawning Gravels in Steep Boulder-Bed Streams of the Eastern Sierra Nevada
Kostow	2004	Differences in juvenile phenotypes and survival between hatchery stocks and a natural population provide evidence for modified selection due to captive breeding
Kostow & Zhou	2006	The Effect of an Introduced Summer Steelhead Hatchery Stock on the Productivity of a Wild Winter Steelhead Population
Kostow et al	2003	Naturally Spawning Hatchery Steelhead Contribute to Smolt Production but Experience Low Reproductive Success
Lapointe et al	2004	Interactive effects of substrate sand and silt contents, redd-scale hydraulic gradients, and interstitial velocities on egg-to-emergence survival of Atlantic salmon (Salmo salar)
Leary et al	1984	Superior Developmental Stability of Heterozygotes at Enzyme Loci in Salmonid Fishes
Leet et al	1986	Pen Rearing Pacific Salmon, Oncorhynchus spp., in San Francisco Bay
Levasseur et al	2006	Effects of silt and very fine sand dynamics in Atlantic salmon (Salmo salar) redds on embryo hatching success
Levin & Tolimieri	2001	Differences in the impacts of dams on the dynamics of salmon populations
Levin et al	2001	The road to extinction is paved with good intentions: negative association of fish hatcheries with threatened salmon
Levings et al	1986	Differential use of the Campbell River estuary, British Columbia, by wild and hatchery-reared juvenile chinook salmon (Oncorhynchus eshawyrscha)
Levy & Northcote	1982	Juvenile Salmon Residency in a Marsh Area of the Fraser River Estuary
Limm & Marchetti	2009	Juvenile Chinook salmon (Oncorhynchus tshawytscha) growth in off-channel and main-channel habitats on the Sacramento River, CA using otolith increment widths
Lindley & Mohr	2003	Modeling the effectof striped bass (Moronesaxatalis) on the population viability of Sacramento River winter-run Chinook salmon (Oncorhynchustschawytscha)
Lindley et al	2007	Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin
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Low & White	2006	Relationship of Delta Cross Channel Gate Operations To Loss of Juvenile Winter-run Chinook Salmon at the CVP/SWP Delta Facilities
MacFarlane et al	2002	Physiological Ecology of Juvenile Chinook Salmon (Oncorhynchus tschawytscha) at the Southern End of Their Distribution, the San Francisco Estuary and Gulf of the Farallones, California
MacFarlane et al	2008	Survival and Migratory Patterns of Central Valley Juvenile Salmonids: Progress Report
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Mantua et al	1997	A Pacific interdecadal climate oscillation with impacts on salmon production
Marsh	2007	Historic and Present Distribution of Chinook Salmon and Steelhead in the Calaveras River
McEwan	2001	Central Valley Steelhead
McEwan & Jackson	1996	Steelhead Restoration and Management Plan for California
McGinnity et al	2003	Fitness reduction and potential extinction of wild populations of Atlantic salmon, Salmo salar, as a result of interactions with escaped farm salmon
McLean et al	2003	Differential reproductive success of sympatric, naturally spawning hatchery and wild steelhead trout (Oncorhynchus mykiss) through the adult stage
Meek et al	2014	Genetic considerations for sourcing steelhead reintroductions: investigating possibilities for the San Joaquin River
Mesick	2001	The Effects of San Joaquin River Flows and Delta Export Rates During October on the Number of Adult San Joaquin Chinook Salmon that Stray
Metcalfe et al	2003	The relative roles of domestication, rearing environment, prior residence and body size in deciding territorial contests between hatchery and wild juvenile salmon
Michel	2010	River and Estuarine Survival and Migration of Yearling Sacramento River Chinook Salmon (Oncorhynchus tschawytscha) Smolts and the Influence of Environment
Moore & Waring	2001	The effects of a synthetic pyrethroid pesticide on some aspects of reproduction in Atlantic salmon (Salmo salar L.)
Mote et al	2003	Preparing for climatic change: the water, salmon, and forests of the Pacific Northwest
Myers et al	1998	Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California
National Marine Fisheries Service	2010	Endangered Species Act Section 7 Consultation Biological Opinion. Authorization of Ocean Salmon Fisheries Pursuant to the Pacific Coast Fishery Management Plan and Additional Protective Measures as it affects Sacramento River Winter Chinook Salmon
National Marine Fisheries Service	2009	PUBLIC DRAFT RECOVERY PLAN FOR THE EVOLUTIONARILY SIGNIFICANT UNITS OF SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON AND CENTRAL VALLEY SPRING-RUN CHINOOK SALMON AND THE DISTINCT POPULATION SEGMENT OF CENTRAL VALLEY STEELHEAD
National Marine Fisheries Service	1996	Factors for Decline. A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act
Nehlsen et al	1991	Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington
Newcomb	2010	Low Dissolved Oxygen Levels in the Stockton Deep Water Shipping channel: Adverse Effects on Salmon and Steelhead and Potential Beneficial Effects of Raising Dissolved Oxygen Levels with the Aeration Facility
Newman	2008	An evaluation of four Sacramento-San Joaquin River Delta juvenile salmon survival studies
Newman & Brandes	2009	Hierarchical modeling of juvenile Chinook salmon survival as a function of Sacramento-San Joaquin Delta water exports
Newman & Rice	2002	Modeling the Survival of Chinook Salmon Smolts Outmigrating Through the Lower Sacramento River System
Newman & Rice	1997	A statistical model for the survival of Chinook salmon smolts outmigrating through the lower Sacramento-San Joaquin system
Newton & Brown	2004	Adult spring Chinook salmon monitoring in Clear Creek, California, 1999-2002
Noakes et al	1998	On the Coherence of Salmon Abundance Trends and Environmental Factors
Noble et al	2009	A Qualitative Model of the Salmon Lifecycle in the Context of River Rehabilitation
Pacific Fishery Management Council	2012	Preseason Report 1. Stock Abundance and Analysis and Environmental Assessment Part 1 for 2012 Ocean Salmon Fishery Regulations
Perry	2010	Route-Specific Survival of Juvenile Salmon Migrating through the Sacramento-San Joaquin Delta
Perry	2010	Survival and Migration Dynamics of Juvenile Chinook Salmon (Oncorhynchus tshawytscha) in the Sacramento-San Joaquin River Delta
Perry & Skalski	2008	Migration and Survival of Juvenile Chinook Salmon through the Sacramento-San Joaquin River Delta during the winter of 2006-2007

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AUTHOR/SOURCE	DATE	TITLE
Adams et al	1975	Inhibition of Salt Water Survival and Na-K-ATPase Elevation in Steelhead Trout (Salmo gairdneri) by Moderate Water Temperatures
Aitkin	1998	The Importance of Estuarine Habitats to Anadromous Salmonids of the Pacific Northwest: A Literature Review
Allen	1986	Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest)--chinook salmon
Allendorf et al	1997	Prioritizing Pacific Salmon Stocks for Conservation
Anadromous Fish Restoration Program	1995	Habitat Restoration Actions to Double Natural Production of Anadromous Fish in the Central Valley of California: Working Paper on Restoration Needs - Volume 1
Anadromous Fish Restoration Program	1995	Habitat Restoration Actions to Double Natural Production of Anadromous Fish in the Central Valley of California: Working Paper on Restoration Needs - Volume 2
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Anadromous Fish Restoration Program	2001	Final Restoration Plan for the Anadromous Fish Restoration Program
Anderson & Zabel	2005	Mean free-path length theory of predator-prey interactions: Application to juvenile salmon migration
Augerot & Smith	2010	Comparative Resilience in Five North Pacific Regional Salmon Fisheries
Baker & Morhardt	2001	Survival of Chinook Salmon Smolts in the Sacramento-San Joaquin Delta and Pacific Ocean
Baldwin et al	2009	A fish of many scales: extrapolating sublethal pesticide exposures to the productivity of wild salmon populations
Barnhart	1986	Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest)--steelhead
Bartholow	2004	Modeling Chinook Salmon with SALMOD on the Sacramento River, California
Bartholow et al	1998	October 1997 SALMOD: A Population Model for Salmonids: User's Manual. Version 2.0
Beamish & Bouillon	1993	Pacific Salmon Production Trends in Relation to Climate
Beamish et al	1997	Production of Fraser River sockeye salmon (Oncorhynchus nerka) in relation to decadal-scale changes in the climate and the ocean
Beamish et al	1997	Hatchery and wild production of Pacific salmon in relation to large-scale, natural shifts in the productivity of the marine environment
Becker et al	1982	Effects of Dewatering on Chinook Salmon Redds: Tolerance of Four Developmental Phases to Daily Dewaterings
Beechie et al	2006	Hydrologic regime and the conservation of salmon life history diversity
Bell & Duffy	2007	Previously Undocumented Two-Year Freshwater Residency of Juvenile Coho Salmon in Prairie Creek, California
Berejikian et al	2004	Effects of hatchery and wild ancestry and rearing environments on the development of agonistic behavior in steelhead trout (Oncorhynchus mykiss) fry
Bigler et al	1996	A review of size trends among North Pacific salmon (Oncorhynchus spp.)
Bisson et al	2009	Freshwater Ecosystems and Resilience of Pacific Salmon: Habitat Management Based on Natural Variability
Bjornn & Reiser	1991	Habitat Requirements of Salmonids in Streams
Blackwell & Juanes	1998	Predation on Atlantic Salmon Smolts by Striped Bass after Dam Passage
Blake et al	2012	Outmigration Behavior of Juvenile Chinook Salmon in a River Bend in the Sacramento River at Clarksburg California
Boles	1988	Outmigration Behavior of Juvenile Chinook Salmon in a River Bend in the Sacramento River at Clarksburg California
Botsford & Brittnacher	1996	Viability of Sacramento River Winter Run Chinook Salmon
Bottom et al	2011	Estuarine Habitat and Juvenile Salmon: Current and Historical Linkages in the Lower Columbia River and Estuary Final Report 2002-2008
Boydstun	2001	Ocean Salmon Fishery Management. Contributions to the Biology of Central Valley Salmonids
Bradford & Irvine	2000	Land use, fishing, climate change, and the decline of Thompson River, British Columbia, coho salmon
Brandes & McLain	2001	Juvenile Chinook Salmon Abundance, Distribution, and Survival in the Sacramento-San Joaquin Estuary
Brett	1952	Temperature Tolerance in Young Pacific Salmon, Genus Oncorhynchus
Brown & Moyle	1981	The Impact of Squawfish on Salmonid Populations: A Review
Brown (ed.)		Contributions to the Biology of Central Valley Salmonids
Buchanan	2013	Route Use and Survival of Juvenile Chinook Salmon through the San Joaquin River Delta
Buchanan & Skalski	2010	Evaluating Surrogacy of Hatchery Releases for the Performance of Wild Yearling Chinook Salmon from the Snake River Basin
Buchanan et al	2013	Route Use and Survival of Juvenile Chinook Salmon through the San Joaquin River Delta
Cal. Dept. of Fish & Game	2011	California Department of Fish and Game, Fisheries Branch Anadromous Resources Assessment Grand Tab California Central Valley Sacramento and San Joaquin River Systems Chinook Salmon Escapement Hatcheries and Natural Areas
Carlson & Quinn	2007	Ten years of varying lake level and selection on size-at-maturity in sockeye salmon
Cartwright et al	1998	Quantifying cutthroat trout (Oncorhynchusclarki) predation on sockeye salmon (Oncorhynchusnerka) fry using a bioenergetics approach
Cavallo et al	2012	Effects of predator and flow manipulation on Chinook salmon (Oncorhynchus tshawytscha) survival in an imperiled estuary
Cech & Myrick	1999	Steelhead and Chinook Salmon Bioenergetics: Temperature, Ration, and Genetic Effects
Cederholm et ak	1980	Cumulative effects of logging and road sediment on salmonid populations in the Clearwater River, Jefferson County, Washington
Chapman et al	2012	Diel movements of out-migrating Chinook salmon (Oncorhynchus tshawytscha) and steelhead trout (Oncorhynchus mykiss) smolts in the Sacramento/San Joaquin watershed
Chilcote	2003	Relationship between natural productivity and the frequency of wild fish in mixed spawning populations of wild and hatchery steelhead (Oncorhynchus mykiss)
Chinook Technical Committee	2008	Pacific Salmon Commission Joint Chinook Technical Committee Report: 2007 Annual report of catches and escapement, exploitation rate analysis and model calibration
Chinookprod	2011	Chinook Salmon Production Summaries for All Races and Streams
Clark et al	2009	Quantification of pre-screen loss of juvenile steelhead in Clifton Court Forebay
Clifford et al	2004	Synergistic Effects of Esfenvalerate an Infectious Hematopoietic Necrosis Virus on Juvenile Chinook Salmon Mortality
Cullon et al	2009	Persistent organic pollutants in Chinook salmon (Oncorhynchus tshawytscha): implications for resident killer whales of British Columbia and adjacent waters
Del Rosario & Redler		Residence of Juvenile Winter-Run Chinook Salmon in the Sacramento-San Joaquin Delta: Emigration Coincides with Pulse Flows and Floodplain Drainage
Delaney et al	2014	Stipulation Study: Steelhead Movement and Survival in the South Delta with Adaptive Management of Old and Middle River Flows
Demko & Cramer	1995	Effects of pulse flows on juvenile Chinook migration in the Stanislaus River, Annual Report for 1995
Demko & Cramer	2000	Outmigrant Trapping of Juvenile Salmonids in the Lower Stanislaus River, Caswell State Park Site 1999
Dettman et al	1987	The influence of flow on Central Valley salmon
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Fishery Foundation of California	2009	Final Report: San Francisco Bay Estuary Acclimation of Central Valley Hatchery Raised Chinook Salmon Project
Fleming et al	2000	Lifetime success and interactions of farm salmon invading a native population

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AUTHOR/SOURCE	DATE	TITLE
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Baxter et al	2009	Effects Analysis: State Water Project Effects on Longfin Smelt
Chigbu et al	1998	Abundance and distribution of Neomysis mercedis and a major predator, longfin smelt (Spirinchus thaleichthys) in Lake Washington.
Cowin et al	2013	We Can Do Better: Longfin Smelt and a Case Study in Collaborative Science
Foott et al	2006	Histological evaluation and viral survey of juvenile longfin smelt (Spirinchus thaleichthys) and threadfin shad (Dorosoma petenense) collected from the Sacramento-San Joaquin River Delta, April-November 2006
Foott et al	2008	Histological evaluation and viral survey of juvenile longfin smelt (Spirinchus thaleichthys) and threadfin shad (Dorosoma petenense) collected from the Sacramento-San Joaquin River Delta, April-November 2007
Gray	2012	METHODS TO PRODUCE MAPS OF DISTRIBUTION OF LONGFIN SMELT
Hobbs et. al.	2014	Field, laboratory, and data analyses to investigate the distribution and abundance of Longfin Smelt in the San-Francisco Estuary: Final Study Plan
Merz et al	2013	Longfin Smelt: Spatial Dynamics and Ontogeny in the San Francisco Estuary
Public Water Agencies	2012	Review of Draft Exploratory Analysis of Relationship Between Delta Outflow and Longfin Smelt Population Growth
Rosenfield	2010	Life history conceptual model and sub-models for longfin smelt, San Francisco Estuary population.
Rosenfield & Baxter	2007	Population dynamics and distribution patterns of longfin smelt in the San Francisco Estuary
Slater	2008	Feeding Habits of Longfin Smelt in the Upper San Francisco Estuary
Stanford et al	2009	Summary report: Green sturgeon, longfin smelt, and dredging in the San Francisco estuary
U.S. EPA	2012	Endangered and Threatened Wildlife and Plants; 12-month Finding on a Petition to List the San Francisco Bay-Delta Population of the Longfin Smelt as Endangered or Threatened

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AUTHOR/SOURCE	DATE	TITLE
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Baskerville-Bridges et al	2004	The Effect of Light Intensity, Alga Concentration, and Prey Density on the Feeding Behavior of Delta Smelt Larvae
Bennett	2005	Critical assessment of the delta smelt population in the San Francisco Estuary, California
Bennett et al	2008	Interplay of environmental forcing and growth selective mortality in the poor year-class success of delta smelt in 2005
Burnham	2011	Delta Smelt Cases: Declaration of Kenneth Burnham In Support of Plaintiffs' Motion for Injunctive Relief
Burnham	2011	Delta Smelt Cases: Reply Declaration of Kenneth Burnham In Support of Plaintiffs' Motion for Injunctive Relief
CA Dept. of Fish & Game	2008	A status review of the threatened delta smelt (Hypomesus transpacificus) in California
Cavallo et al	2011	Use of real-time quantitative polymerase chain reaction to detect delta smelt DNA in the stomach contents of predators
Connon et al	2009	Linking mechanistic and behavioral responses to sublethal esfenvalerate exposure in the endangered delta smelt; Hypomesus transpacificus (Fam. Osmeriadae)
Contreras	2011	2011 Summer Townet Survey Delta Smelt Index
Deriso	2011	Declaration of Dr. Richard B. Deriso in support of Plantiffs' motion for injunctive relief dated 01/28/2011. Delta smelt consolidated cases 1:09-cv-00407-OWW-DLB
Deriso	2011	Delta Smelt Cases: Declaration of Dr. Richard Deriso In Support of Plaintiffs' Motion for Injunctive Relief
Enright & Culberson	2010	Salinity trends, variability, and control in the northern reach of the San Francisco Estuary
Feyrer et al	2013	SmeltCam: Underwater Video Codend for Trawled Nets with an Application to the Distribution of the Imperiled Delta Smelt
Fox et al	1991	Long-term Annual and Seasonal Trends in Surface Salinity of San Francisco Bay
Hanson	2011	Delta Smelt Cases: Declaration of Charles Hanson In Support of Plaintiffs' Motion for Injunctive Relief
Hasenbein et al	2013	Turbidity and Salinity Affect Feeding Performance and Physiological Stress in the Endangered Delta Smelt
Hobbs	2010	Otolith growth and microchemistry to determine variability in recruitment success of delta smelt
Kuivilia & Moon	2004	Potential Exposure of Larval and Juvenile Delta Smelt to Dissolved Pesticides in the Sacramento–San Joaquin Delta, California
Lindberg et al	2000	Update on delta smelt culture with and emphasis on larval feeding behavior
Lott	1998	Feeding Habits of Juvenile and Adult Delta Smelt from the Sacramento-San Joaquin River Estuary
Maunder & 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 (Hyposmesus transpacificus)
Merz et al	2012	Spatial perspective for delta smelt: a summary of contemporary survey data
Miller et al	2012	An Investigation of Factors Affecting the Decline of Delta Smelt (Hypomesus transpacificus) in the Sacramento- San Joaquin Estuary)
Moyle et al	1992	Life history of delta smelt in the Sacramento-San Joaquin Estuary, California
Murphy & Hamilton	2013	Eastward migration of marshward dispersal: exercising survey data to elicit an understanding of seasonal movement of Delta Smelt
Nobriga	2002	Larval delta smelt diet composition and feeding incidence: environmental and ontogenetic influences.
Nobriga et al	2008	Long-term trends in summertime habitat suitability for delta smelt (Hypomesus transpacificus)
Osborn	2011	2012 Summer Townet Survey age-0 delta smelt index
Resource Management Associates	2012	Turbidity and Adult Delta Smelt Modeling with RMA 2-D Models: November 2011 – February 2012
Resource Management Associates	2013	HISTORICAL VALIDATION OF ADULT DELTA SMELT BEHAVIORAL MODEL FOR WATER YEARS 1981, 1982, AND 1988
Rose et al	2013	Individual-based modeling of Delta Smelt population dynamics in the upper San Francisco Estuary: II. Alternative Baselines and Good Versus Bad Years
Sommer & Mejia	2013	A place to call home: A synthesis of delta smelt habitat in the upper San Francisco estuary
Swanson et al	1998	Swimming performance of delta smelt: Maximum performance, and behavioral, and kinematic limitations on swimming at submaximal velocities
Swanson et al	2000	Comparative environmental tolerances of threatened delta smelt (Hypomesus transpacificus) and introduced wakasagi (H.nipponensis) in an altered California estuary
Sweetnam	1999	Status of delta smelt in the Sacramento-San Joaquin estuary
Tetra Tech Inc.	2014	Modeling Salinity in Suisun Bay and the Western Delta Using Artificial Neural Networks: Final Report
Tetra Tech Inc.	2014	Modeling Salinity in Suisun Bay and the Western Delta Using Artificial Neural Networks: Final Report - Appendix A
Tetra Tech Inc.	2014	Modeling Salinity in Suisun Bay and the Western Delta Using Artificial Neural Networks: Final Report - Appendix B
Tetra Tech Inc.	2014	Modeling Salinity in Suisun Bay and the Western Delta Using Artificial Neural Networks: Final Report - Appendix C
Tetra Tech Inc.	2014	Salinity Trends in Suisun Bay and the Western Delta: October 1921 - September 2012
Tetra Tech Inc.	2014	Salinity Trends in Suisun Bay and the Western Delta: October 1921 - September 2012 - Appendix A
U.S. Bureau of Reclamation	2011	Adaptive management of fall outflow for delta smelt protection and water supply reliability, milestone draft
U.S. Fish & Widlife Service	2013	Working Draft: Supplemental monitoring and quantitative approaches for improving the assessment of Delta Smelt abundance and distribution
University of California, Davis	2012	2011 delta smelt predation project update
Wang et al	2005	Using morphometric characteristics to identify the early life stages of two sympatric osmerids (delta smelt and wakasagi—Hypomesus transpacificus and Hypomesus nipponensis) in the Sacramento-San Joaquin Delta, California
Weston et al	2014	URBAN AND AGRICULTURAL PESTICIDE INPUTS TO A CRITICAL HABITAT FOR THE THREATENED DELTA SMELT (HYPOMESUS TRANSPACIFICUS)

DELTA FISH: GENERALLY		
AUTHOR/SOURCE	DATE	TITLE
Baxter	2008	Pelagic Organism Decline Progress Report: 2007 Synthesis of Results
Baxter	2008	Interagency Ecological Program 2008 Work Plan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary
Baxter et al	2010	pelagic organism decline work plan and synthesis of results
Baxter et al	1999	Report on the 1980-1995 fish, shrimp, and crab sampling in the San Francisco Estuary, California
Baxter et al	2010	2010 pelagic organism decline work plan and synthesis of results
Bennett & Moyle	1996	Where have all the fishes gone? Interactive factors producing fish declines in the Sacramento-San Joaquin Delta
Bennett et al	2000	Plasticity in vertical migration by native and exotic estuarine fishes in a dynamic low-salinity zone
Bertness et al	2005	Review Panel Report: San Francisco Estuary Sacramento-San Joaquin Delta Interagency Ecological Program on Pelagic Organism Decline
Bisson et al	2002	Hatchery Surpluses in the Pacific Northwest
Brooks et al	2012	Life histories, salinity zones, and sublethal contributions of contaminants to pelagic fish declines illustrated with a case study of San Francisco Estuary, California, USA
Cal. Dept. of Fish and Game	2010	A Report to the California Fish and Game Commission on Stressors Impacting Delta Related Organisms
California Hatchery Scientific Review Group	2012	California Hatchery Review Report
Feyrer and Healey	2002	Structure, sampling gear and environmental associations, and historical changes in the fish assemblage of the Southern Sacramento-San Joaquin Delta
Ford	2002	Selection in Captivity during Supportive Breeding May Reduce Fitness in the Wild
Goodyear	1993	Spawning Stock Biomass Per Recruit in Fisheries Management Foundation and Current Use
Herbold & Moyle	1989	The ecology of the Sacramento-San Joaquin Delta: A community profile
Hieb & Fleming	1996	Report on the 1980-1995 fish, shrimp and crab sampling in the San Francisco Estuary, California
Hindar et al	1991	Genetic Effects of Cultured Fish on Natural Fish Populations
Hobbs et al	2006	Assessing nursery habitat quality for native smelts (Osmeridae) in the low-salinity zone of the San Francisco estuary
Honey et al	2004	IEP Long-term Fish Monitoring Program Element Review
Jassby et al	1995	Isohaline position as a habitat indicator for estuarine populations
Johnson & Stein	1986	Competition for Open-Access Resources: A Class Exercise that Demonstrates the Tragedy of the Commons
Kimmerer et al	2005	Variability in Length–Weight Relationships Used to Estimate Biomass of Estuarine Fish from Survey Data
Kucas et al	1986	Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) - northern anchovy
Lam et al	2007	Modeling seasonal distribution of pelagic marine fishes and squids
Latour	2014	Drivers of Fish Abundance the Sacramento-San Joaquin Delta
Lawson & Hilborn	1983	Equilibrium yields and yield isopleths from a general agestructured model of harvested populations
Leidy	2007	Ecology, assemblage, structure, distribution, and status of fishes in streams tributary to the San Francisco estuary
MacNally et al	2010	Analysis of pelagic species decline in the upper San Francisco Estuary using multivariate autoregressive modeling
Meeuwig et al	2005	Effects of Temperature on Survival and Development of Early Life Stage Pacific and Western Brook Lampreys
Meng et al	1994	Changes in Abundance and Distribution of Native and Introduced Fishes of Suisun Marsh
Mount et al	2012	Aquatic Ecosystem Stressors in the Sacramento–San Joaquin Delta
Myrick & Cech	2001	Swimming performances of four California stream fishes: Temperature effects
National Marine Fisheries Service	2010	Report to Cal. Fish & Game Comm'n re Stressors Impacting Delta Related Organisms
Niwa	2007	Random-walk dynamics of exploited fish populations
Nobriga et al	2005	Fish community ecology in an altered river delta: spatial patterns in species composition, life history strategies, and biomass
Reimschuessel	2000	A Fish Model of Renal Regeneration and Development
Siegfried	1989	Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) – Crangonid shrimp
Sommer et al	2007	The collapse of pelagic fishes in the upper San Francisco Estuary
Thomson et al	2010	Bayesian change point analysis of abundance trends for pelagic fishes in the upper San Francisco Estuary
Townsend et al	2010	An ecosystem model for testing potential causes of the San Francisco Estuary pelagic organism decline
U.S. Fish & Wildlife Service	1996	Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes
Wang	1985	Fishes of the Sacramento-San Joaquin estuary and adjacent waters, California: A guide to the early life histories

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Skorupski et al	2012	Native Fish Response to Nonnative Fish Removal from 2005-2008 in the Middle Green River, Utah
Sommer et al	2011	Long-Term Shifts in the Lateral Distribution of Age-0 Striped Bass in the San Francisco Estuary
Stevens	1966	Distribution and food habits of striped bass, Roccus Saxatilis, in the Sacramento-San Joaquin Delta
Stevens et al	1987	American Shad and Striped Bass in California's Sacramento-San Joaquin River System
Stevens et al	1985	The Decline of Striped Bass in the Sacramento San Joaquin Estuary, California
Sullivan	2002	Illegal Angling Harvest of Walleyes Protected by Length Limits in Alberta
Sullivan	2010	Prey selection of larval and juvenile planktivorous fish in the San Francisco estuary
Thomas	1967	The diet of juvenile and adultstriped bass, Roccussaxatilis, in the Sacramento-San Joaquin river system
Tucker et al	2003	Spatial and Temporal Distribution of Sacramento Pikeminnow and Striped Bass at the Red Bluff Diversion Complex, Including the Research Pumping Plant, Sacramento River, California: January 1997 to August, 1998
Tucker et al	1998	Abundance, Food Habits and Life History Aspects of Sacramento Squawfish and Striped Bass at the Red Bluff Diversion Complex, Including the Research Pumping Plant, Sacramento River, California, 1994-1996
Tyus & Saunders	2000	Nonnative fish control and endangered fish recovery: Lessons from the Colorado River
Wallmo & Genter	2008	Catch-and-Release Fishing: A Comparison of Intended & Actual Behavior of Marine Anglers
Walsh	2011	Habitat Use of Striped Bass (Morone saxatilis) in the San Francisco Estuary and its Effect on Total Mercury and Heavy Metal Body Burden upon Capture
Ward & Zimmerman	1999	Response of Smallmouth Bass to Sustained Removals of Northern Pikeminnow in the Lower Columbia and Snake Rivers
Ward et al	1995	Index of Predation on Juvenile Salmonids by Northern Squawfish in the Lower and Middle Columbia River and in the Lower Snake River
Wells et al	2008	Untangling the relationships among climate, prey and top predators in an ocean ecosystem
Wilde	1997	Largemouth Bass Fishery Responses to Length Limits
Wright	1992	Guidelines for Selecting Regulations to Manage Open-Access Fisheries for Natural Populations of Anadromous and Resident Trout in Stream Habitats
Wrona & Dixon	1991	GROUP SIZE AND PREDATION RISK: A FIELD ANALYSIS OF ENCOUNTER AND DILUTION EFFECTS

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AUTHOR/SOURCE	DATE	TITLE
Allen et al	2000	Detecting Fish Population Responses to a Minimum Length Limit: Effects of Variable Recruitment and Duration of Evaluation
Atlantic State Marine Fisheries Commission	1981	Interstate fisheries management plan for the striped bass
Baerwald et al	2012	Detection of threatened delta smelt in the gut contents of the invasive Mississippi silverside in the San Francisco estuary using TaqMan assays
Beamesderfer	2000	Managing Fish Predators and Competitors: Deciding When Intervention is Effective and Appropriate
Beard et al	2003	Impacts of daily bag limit reductions on angler effort in Wisconsin Walleye Lakes
Bestgen et al	2007	Native fish responses to removal of non-native predator fish in the Yampa River, Colorado
Bryant & Arnold	2007	Diets of Age-0 Striped Bass in the San Francisco Estuary, 1973-2002
Buckel & Conover	1996	Gastric Evacuation Rates of Piscivorous Young-of-the-Year Bluefish
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Killgore and Hoover	2001	Effects of Hypoxia on Fish Assemblages in a Vegetated Waterbody
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AQUATIC HABITAT: NUTRIENTS & PRODUCTIVITY		
AUTHOR/SOURCE	**DATE**	**TITLE**
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Alpine & Cloern	1992	Trophic interactions and direct physical effects control phytoplankton biomass and production in an estuary
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Anderson et al	2002	Harmful algal blooms and eutrophication: Nutrient sources, composition, and consequences.
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Arts et al	2001	"Essential fatty acids" in aquatic ecosystems: a crucial link between diet and human health and evolution
Ball & Arthur	1979	Planktonic chlorophyll dynamics in the Northern San Francisco Bay and Delta
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Biggs	1995	The contribution of flood disturbance, catchment geology and land use to the habitat template of periphyton in stream ecosystems
Biggs & Gerbeaux	1993	Periphyton development in relation to macro-scale (geology) and micro-scale (velocity) limiters in two gravel-bed rivers, New Zealand
Boersma & Elser	2006	Too much of a good thing: on stoichiometrically balanced diets and maximal growth
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Britto	2002	NH4+ toxicity in higher plants: a critical review
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Brown	2009	Phytoplankton community composition: The rise of the flagellates
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Central Valley RWQCB (2012)	2012	California State Water Resources Control Board. ORDER WQ 2012-0013, In the Matter of Own Motion Review of Waste Discharge Requirements, ORDER No. R5-2010-0114 [NPDES No. CA0077682] for Sacramento Regional Wastewater Treatment Plant, Issued by the Californ
Central Valley RWQCB (2013)	2013	Central Valley Regional Water Quality Control Board. Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins to Establish a Drinking Water Policy for Surface Waters of the Sacramento-San Joaquin Delta and Upstream
Charnov	1976	Optimal Foraging, the Marginal Value Theorem
Chassot et al	2010	Global marine primary production constrains fisheries catches
Chavez et al	2003	From Anchovies to Sardines and Back: Multidecadal Change in the Pacific Ocean
Cloern	2001	Our evolving conceptual model of the coastal eutrophication problem
Cloern	1979	Phytoplankton ecology of the San Francisco Bay system: the status of our current understanding
Cloern	1999	The relative importance of light and nutrient limitation of phytoplankton growth: a simple index of coastal ecosystem sensitivity to nutrient enrichment
Cloern & Cheng	1981	Simulation model of Skeletonema costatum population dynamics in Northern San Francisco Bay, California
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Cloern et al	2007	A cold phase of the East Pacific triggers new phytoplankton blooms in San Francisco Bay
Cole & Cloern	1984	Significance of biomass and light availability to phytoplankton productivity in San Francisco Bay
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Dugdale & Goering	1967	Uptake of new and regenerated forms of nitrogen in primary productivity
Dugdale et al	2007	The role of ammonium and nitrate in spring bloom development in San Francisco Bay
Dugdale et al	2011	Brief report in response to selected issues raised by Sacramento Regional County Sanitation District in petition for review of discharge permit issued by the Central Valley Regional Water Quality Control Board
Dugdale et al	2012	River flow and ammonium discharge determine spring phytoplankton blooms in an urbanized estuary
Dugdale et al	2013	A biogeochemical model of phytoplankton productivity in an urban estuary: The importance of ammonium and freshwater flow
DWR monitoring data	2010	Department of Water Resources (DWR) monitoring data, 2008-2009, attached to, Department of Water Resources Office Memo from Sal Batmanghilich, Chief Real-time Monitoring Section to Kathleen Harder, Central Water Quality Control Board re Hood water quality
Dyhrman et al	2008	Molecular approaches to diagnosing nutritional physiology in harmful algae: Implications for studying the effects of eutrophication
Elser	2007	Stoichiometry and the New Biology: The Future Is Now
Eppley & Peterson	1979	Particulate organic flux and planktonic new production in the deep ocean
Faerovig & Hessen	2003	Allocation strategies in custacean stoichiometry: the potential role of phosphorus in the limitation of reproduction
Feijoo et al	2002	Nutrient absorption by the submerged macrophyte Egeria densa planch.: effect of ammonium and phosphorus availability in the water column on growth and nutrient uptake
Feyrer et al	2003	Dietary shifts in a stressed fish assemblage: Consequences of a bivalve invasion in the San Francisco Estuary
Finkel et al	2010	Phytoplankton in a changing world: Cells size and elemental stoichiometry
Flow Science (2008a) Dye Study	2008	Results of November 2007 Dye Study of Effluent Discharge to the Sacramento River at Freeport, California. Prepared for Sacramento Regional County Sanitation District

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AQUATIC HABITAT: SEDIMENT & TURBIDITY		
AUTHOR/SOURCE	**DATE**	**TITLE**
Arthur and Ball	1978	Entrapment of Suspended Materials in the San Francisco Bay-Delta Estuary
Arthur and Ball	1979	Factors Influencing the Entrapment of Suspended Material in the San Francisco Bay-Delta Estuary
Boehloert & Morgan	1985	Turbidity enhances feeding abilities of larval Pacific herring, Clupea harengus pallasi
Bowker	2007	Biological Soil Crust Rehabilitation in Theory and Practice: An Underexploited Opportunity
Callaway et al	2012	Carbon Sequestration and Sediment Accretion in San Francisco Bay Tidal Wetlands
Cappiella et al	1999	Sedimentation and bathymetry changes in Suisun Bay: 1867-1990
Cloern	1987	Turbidity as a control on phytoplankton biomass and productivity in estuaries
Cordone and Kelley	1961	The influences of inorganic sediment on the aquatic life of streams
Florsheim & Mount	2003	Changes in lowland floodplain sedimentation processes: predisturbance to post-rehabilitation, Cosumnes River, California
Hutton	2012	Forecasting Delta Turbidity Conditions with Artificial Neural Networks
Hutton	2012	Modeling Delta Flow-Turbidity Relationships with Artifical Neural Networks
Jaffe et al	1998	Sedimentation and bathymetric change in San Pablo Bay: 1856-1983
Kimmerer	2004	Open water processes of the San Francisco Estuary: From physical forcing to biological responses
McKee et al	2006	Estimates of suspended sediment entering San Francisco Bay from the Sacramento and San Joaquin Delta, San Francisco Bay, California
Monismith et al	1996	Stratification dynamics and gravitational circulation in northern San Francisco Bay
Morgan-King and Schoellhamer	2013	Suspended-Sediment Flux and Retention in a Backwater Tidal Slough Complex near the Landward Boundary of an Estuary
Nixon	1988	Physical Energy Inputs and the Comparative Ecology of Lake and Marine Ecosystems
Oltmann et al	1999	Sediment inflow to the Sacramento-San Joaquin Delta and the San Francisco Bay
Reed et al	1999	Marsh surface sediment deposition and the role of tidal creeks: Implications for created and managed coastal marshes
Resource Management Associates	2012	RMA/Systech Collaboration to Improve WARMF Model Turbidity Estimates
Resource Management Associates	2013	Turbidity Modeling with DSM2-QUAL: 2013 QUAL Recalibration, Updated Historical Model and Analysis of the Potential for Turbidity Bridge Formation
Resource Management Associates	2013	Turbidity Modeling with DSM2-QUAL: QUAL Recalibration and Historical Models
Ruhl & Schoellhamer	2004	Spatial and temporal variability of suspended sediment concentrations in a shallow estuarine environment
Schloss	2002	Murky waters: Gaining clarity on water transparency measurements
Schoellhamer	2011	Sudden Clearing of Estuarine Waters upon Crossing the Threshold from Transport to Supply Regulation of Sediment Transport as an Erodible Sediment Pool is Depleted: San Francisco Bay, 1999
Schoellhamer	2001	Influence of salinity, bottom topography, and tides on locations of estuarine turbidity maxima in northern San Francisco Bay
Schoellhamer	2002	Variability of suspended-sediment concentration at tidal to annual time scales in San Francisco Bay, USA
Schoellhamer	1996	Factors affecting suspended-solids concentrations in South San Francisco Bay, California
Schoellhamer et al	2002	Ten years of continuous suspended-sediment concentration monitoring in San Francisco Bay and Delta
Schoellhamer et al	2005	Bay sediment budgets: Sediment accounting 101
Systech Water Resources, Inc.	2012	Addition of Turbidity to CALSIM Delta Boundary Conditions
Tetra Tech	2014	Delta Turbidity ANN Model (DASM-T) Development Using DSM2: Phase 3 Results
Tetra Tech	2014	Delta Turbidity ANN Model (DASM-T) Development Using DSM-2: Phase 3 Results - Appendices
Van Geen & Luoma	1999	The impact of human activities on sediments of San Francisco Bay, California: An overview
Wright & Schoelhammer	2004	Trends in the sediment yield of the Sacramento River, California, 1957-2001

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Stansby	1976	Chemical Characteristics of Fish Caught in the Northeast Pacific Ocean
Tanner and Knuth	1996	Effects of Esfenvalerate on the Reproductive Success of the Bluegill Sunfish, Lepomis macrochirus in Littoral Enclosures
Tierney et al	2009	Olfactory toxicity in fishes
U.S. Environmental Protection Agency	2010	Clean Water Act 303(d) List of Water Quality Limited Segments Still Requiring Total Maximum Daily Loads
U.S. Environmental Protection Agency	2011	Unabridged Advanced Notice of Proposed Rulemaking for Water Quality Challenges in the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary
Ward et al	2007	Scents and Scents-ability: pollution disrupts chemical social recognition and shoaling in fish
Weis & Weis	1995	Effects of Embryonic Exposure to Methylmercury on larval prey-capture ability in the Mummichog
Werner et al	2002	Effects of dietary exposure to the pyrethroid pesticide esfenvalerate on medaka (Oryzias latipes)
Werner et al	2010	Monitoring acute and chronic water column toxicity in the northern Sacramento-San Joaquin estuary using the euryhaline amphipod, Hyalella azteca, 2006-2007
Weston & Lydy	2010	Urban and Agricultural Sources of Pyrethroid Insecticides to the Sacramento-San Joaquin Delta of California
Weston & Lydy	2012	Stormwater input of pyrethroid insecticides to an urban river
Weston et al	2005	Aquatic Toxicity Due to Residential Use of Pyrethroid Insecticides
Weston et al	2004	Distribution and toxicity of sediment-associated pesticides in agriculture-dominated water bodies of California's Central Valley
Wright-Walters & Volz	00/00/2009	Municipal wastewater concentrations of pharmaceutical and xeno-estrogens: Wildlife and human health implications
Wright-Walters & Volz	2007	Municipal wastewater concentrations of pharmaceutical and xeno-estrogens: wildlife and human health implications
Yee et al	2008	Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems
Zidek et al	1996	Causality, Measurement Error and Multicollinearity in Epidemiology

AQUATIC HABITAT: **CONTAMINANTS**		
AUTHOR/SOURCE	**DATE**	**TITLE**
Amweg et al	2006	Pyrethroid Insecticides and Sediment Toxicity in Urban Creeks from California and Tennessee
Amweg et al	2005	Use and Toxicity of Pyrethroid Pesticides in the Central Valley, California, USA
Aquatic Ecosystems Analysis Laboratory, U.C. Davis	2009	Pharmaceuticals and Personal Care Products in Surface Water- Occurrence, Fate and Transport, and Effect on Aquatic Organisms
Beggel et al	2010	Sublethal toxicity of commercial insecticide formulations and their active ingredients to larval fathead minnow (Pimephales promelas)
Birge et al	1977	Toxicity of Organic Chemicals to Embryo-Larval Stages of Fish
Brander et al	2009	Toxicity of a dissolved pyrethroid mixture to Hyalella azteca at environmentally relevant concentrations
Brander et al	2013	From 'omics to otoliths: Responses of an estuarine fish to endocrine disrupting compounds across biological scales
Conaway et al	2008	Mercury in the San Francisco Estuary
Cripe et al	2009	Multigenerational exposure of the estuarine sheepshead minnow (Cyprinodon Variegatus) to 17b-estradiol. I. organism-level effects over three generations
Daughton	2003	Cradle-to-Cradle Stewardship of Drugs for Minimizing Their Environmental Disposition While Promoting Human Health. II. Drug Disposal, Waste Reduction, and Future Directions
Daughton	2003	Cradle-to-Cradle Stewardship of Drugs for Minimizing Their Environmental Disposition While Promoting Human Health. I. Rationale for and Avenues toward a Green Pharmacy
Davis et al	2012	Reducing methylmercury accumulation in the food webs of San Francisco Bay and its local watersheds
Domagalski et al	2004	Mercury and methylmercury concentrations and loads in the Cache Creek watershed, California
Dussasult et al	2007	Toxicity of human pharmaceuticals and personal care products to Benthic invertebrates
Dwyer et al	1999	Assessing contaminant sensitivity of American shad, Atlantic sturgeon, and shortnose sturgeon: Interim Report
Dwyer et al	2005	Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals
Dwyer et al	2005	Assessing contaminant sensitivity of endangered and threatened aquatic species: Part III. Effluent toxicity tests
Ensminger & Kelley	2011	Monitoring Urban Pesticide Runoff in Northern California, 2009-2010
Fleck et al	2007	Mercury cycling in agricultural and non-agricultural wetlands in the Yolo bypass wildlife area, California: Water column processes (abstract)
Giddings et al	2000	Ecological Risks of Diazinon from Agricultural Use in the Sacramento-San Joaquin River Basins, California
Graneli and Flynn	2005	Chemical and physical factors influencing toxin content
Greenfield et al	2006	Control Costs, Operation, and Permitting Issues for Non-chemical Plant Control: Case Studies in the San Francisco Bay-Delta Region, California
Guo & Goh	2007	Evaluation of sources and loading of pesticides to the Sacramento River, California, USA, during a storm event of Winter 2005
Hall	2009	Brief Summary of Chlorpyrifos Temporal Trends Analysis from Surface Water Monitoring Data fro the Westside Coalition from 2004-2009
Hall	2010	Brief Summary of Diazinon Temporal Trends Analysis from Surface Water Monitoring Data fro the Westside Coalition from 2004-2009
Hall	2010	Brief Summary of Water Column and Sediment Toxicity Temporal Trends Analysis for the Westside Coalition from 2004-2009
Heim et al	2009	Assessment of Methylmercury Contributions from Sacramento-San Joaquin Delta Farmed Islands
Holmes & Lean	2006	Factors that influence methylmercury flux rates from wetland sediments
Huang & Sedlak	2001	Analysis of estrogenic hormones in municipal wastewater effluent and surface water using enzyme-linked immunosorbent assay and gas chromatography/tandem mass spectrometry
Iwanowicz et al	2008	Reproductive health of bass in the Potomac, USA, drainage: Part 1. Exploring the effects of proximity to wastewater treatment plant discharge
Kidd et al	2007	Collapse of a Fish Population After Exposure to a Synthetic Estrogen
Kimmerer	2005	Long-term changes in apparent uptake of silica in the San Francisco estuary
Kolpin et al	2002	Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance
Kooser et al	1861	Committee Report- Committee Nos. 1 and 2 on Farms and Orchards
Kuivila & Hladik	2008	Understanding the occurrence and transport of current-use pesticides in the San Francisco Estuary Watershed
Kusler	2009	Copepods of the San Francisco Estuary: potential effects of environmental toxicants
Martinovic et al	2007	Environmental estrogens suppress hormones, behavior, and reproductive fitness in male fathead minnows
Marvin-DiPasquale and Agee	2003	Microbial Mercury Cycling in Sediments of the San Francisco Bay-Delta
Munoz et al	2009	Pharmaceuticals and Personal Care Products in the Environment: Bridging levels of pharmaceuticals in river water with biological community structure in the Llobregat River Basin
National Water Research Institute	2010	Source, Fate, and Transport of Endocrine Disruptors, Pharmaceuticals, and Personal Care Products in Drinking Water Sources in California
Oros & Werner	2005	Pyrethroid insecticides: an analysis of use patterns, distributions, potential toxicity and fate in the Sacramento-San Joaquin Delta and Central Valley
Ostrach et al	2008	Maternal transfer of xenobiotics and effects on larval striped bass in the San Francisco Estuary
Ostrach et al	2008	The role of contaminants, within the context of multiple stressors, in the collapse of the striped bass population in the San Francisco estuary and its Watershed
Raloff	2005	Aquatic Non-Scents: Repercussions of Water Pollutants that Mute Smell
Riddle et al	2002	Field, Laboratory, and X-ray Absorption Spectroscopic Studies of Mercury Accumulation by Water Hyacinths
Riordan & Bales	2008	In-situ exposure of fish for biomarker experimentation at Department of Water Resources (DWR) real-time monitoring sites
Rodgers & Beamish	1982	Dynamics of dietary methylmercury in rainbow trout
Roseboom & Richey	1966	Acute Toxicity of Residual Chlorine and Ammonia to Some Native Illinois Fishes
Sandahl et al	2004	Odor-evoked field potentials as indicators of sublethal neurotoxicity in juvenile coho salmon exposed to copper, chlorpyrifos, or esfenvalerate
Schaefer & Johnson	2009	Pharmaceuticals and Personal Care Products in the Sacramento River. Final Report: Activities from May – June 2008
Spies et al	1988	Effects of organic contaminants on reproduction of the starry flounder Platichthys stellatus in San Francisco Bay

AQUATIC HABITAT: **INVASIVE SPECIES**		
AUTHOR/SOURCE	**DATE**	**TITLE**
Anderson	1999	Egeria Invades the Sacramento-San Joaquin Delta
Archbald & Boyer	2014	Distribution and Invasion Potential of Limonium ramosissimum subsp. provinciale in San Francisco Estuary Salt Marshes
Brown & Michniuk	2007	Littoral fish assemblages of the alien-dominated Sacramento-San Joaquin Delta, California, 1980-1983 and 2001-2003
Carey et al	2012	Native invaders – challenges for science, management, policy, and society
Carlton et al	1990	Remarkable invasion of San Francisco Bay (California, USA) by the Asian clam Potamocorbula amurensis
Cohen and Moyle	2004	Summary of data and analyses indicating that exotic species have impaired the beneficial uses of certain California waters
Conrad et al	2010	Rising abundance of largemouth bass in the littoral zone of Sacramento –San Joaquin Delta: the role of Egeria densa
Conrad et al	2011	Invaders Helping Invaders: Expansion of Largemouth Bass in the Sacramento-San Joaquin Delta Facilitated by Brazilian Waterweed, Egeria Densa
Dept. of Boating & Waterways	2006	Egeria densa Control Program (EDCP)
Dresler & Cory	1980	The Asiatic clam, Corbicula fluminea (Müller), in the tidal Potomac River, Maryland
Greene et al	2010	Grazing impact of the invasive clam Corbula amurensis on the microplankton assemblage of the northern San Francisco Estuary
Hestir	2010	Trends in Estuarine Water Quality and Submerged Aquatic Vegetation Invasion
Johansson & Graneli	1999	Cell density, chemical composition and toxicity of Chrysochromulina polylepis (Haptophyta) in relation to different N:P supply ratios
Kimmerer	2006	Response of anchovies dampens effects of the invasive bivalve Corbula amurensis on the San Francisco estuary foodweb
Kimmerer et al	1994	Predation by an introduced clam as the likely cause of substantial declines in zooplankton of San Francisco Bay
Lehman et al	2005	Distribution and toxicity of a new colonial Microcystis aeruginosa bloom in the San Francisco Bay Estuary, California
Lehman et al	2010	Initial impacts of Microcystis aeruginosa blooms on the aquatic food web in the San Francisco Estuary
Lehman et al	2014	Characterization of the Microcystis bloom and its nitrogen supply in San Francisco Estuary using stable isotopes
Lehman et al	2005	Distribution and toxicity of a new colonial Microcystis aeruginosa in the San Francisco Bay Estuary
Lehman et al	2009	Initial impacts of Microcystis aeruginosa blooms on the aquatic food web in the San Francisco Estuary
Noonburg & Byers	2005	More harm than good: When invader vulnerability to predators enhances impact on native species
Oh et al	2000	Microcystin production by Microcystis aeruginosa in a phosphorus-limited chemostat
Oh et al	2001	Microcystin production by Microcystis aeruginosa in a phosphorus-limited chemostat
Parchaso & Thompson	2002	Influence of hydrologic processes on reproduction of the introduced bivalve Potamocorbula amurensis in Northern San Francisco Bay, California
Strayer et al	2004	Effects of an invasive bivalve (Dresseina polymorpha) on fish in the Hudson River estuary
Yarrow et al	2009	The ecology of Egeria densa Planchón (Liliopsida: Alismatales): A wetland ecosystem engineer?
Yarrow et al	2009	The ecology of Egeria densa Planchón (Liliopsida: Alismatales): A wetland ecosystem engineer?

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Stevens & Miller	1980	Effects of river flow on abundance of young Chinook salmon, American shad, longfin smelt, and delta smelt in the Sacramento-San Joaquin River system
Stewart et al	2005	Changes toward Earlier Streamflow Timing across Western North America
Stillwater Sciences	2009	Lower Tuolumne River Instream Flow Studies Final Study Plan
Tennant	1976	Instream flow regimens for fish, wildlife, recreation and related environmental resources
Tharme	2003	A global perspective on environmental flow assessment: emerging trends in the development and application of environmental flow methodologies for rivers
Tockner & Stanford	2002	Riverine flood plains: present state and future trends
Tockner et al	2000	An extension of the flood pulse concept
U.S. Fish and Wildlife Service	2011	Flow-habitat relationships for fall-run Chinook salmon and steelhead/rainbow trout spawning in Clear Creek between Clear Creek Road and the Sacramento River
Van Kirk & Naman	2008	Relative effects of climate and water use on base-flow trends in the lower Klamath basin
Ward	2002	Inundation dynamics in braided floodplains

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Kimmerer	2002	Effects of freshwater flow on abundance of estuarine organisms: physical effects or trophic linkages?
Kimmerer	2002	Physical, biological, and management responses to variable freshwater flow into the San Francisco Estuary
Kimmerer	2004	Open water processes of the San Francisco Estuary: From physical forcing to biological responses
Kimmerer	2008	Losses of Sacramento River Chinook Salmon and Delta Smelt to Entrainment in Water Diversions in the Sacramento-San Joaquin Delta
Kimmerer et al	2009	Is the response of estuarine nekton to freshwater flow in the San Francisco Estuary explained by variation in habitat volume?
Kimmerer et al	2013	Variation of fish habitat and extent of the low-salinity zone with freshwater flow in the San Francisco Estuary
Knowles	2002	Natural and management influences on freshwater inflows and salinity in the San Francisco Estuary at monthly to interannual scales
Kondolf et al	2006	Process-based ecological river restoration: visualizing three-dimensional connectivity and dynamic vectors to recover lost linkages
Konrad et al	2011	Large-scale Flow Experiments for Managing River Systems
Latour	2012	Data Analyses in Relation to Water Flow for Species in the Sacramento-San Joaquin Delta (Presentation)
Latour	2012	Data Analyses in Relation to Water Flow for Species in the Sacramento-San Joaquin Delta (Report)
Ligon et al	1995	Downstream Ecological Effects of Dams
Mahoney & Rood	1998	Streamflow requirements for cottonwood seedling recruitment: an integrative model
Molles et al	1995	Effects of an Experimental Flood on Litter Dynamics in the Middle of the Rio Grande Riparian Ecosystem
Moyle et al	1998	Fish Health and Diversity: Justifying Flows for a California Stream
Moyle et al	2011	Improving environmental flow methods used in California FERC licensing
MWH	2014	Central Valley Natural Flow Hydrology
MWH	2014	Natural Flow Routing Model
National Research Council	2012	Sustainable water and environmental management in the California Bay-Delta
National Research Council	2010	A Scientific Assessment of Alternatives for Reducing Water Management Effects of Threatened and Endangered Fishes in California's Bay Delta
Naughton et al	2007	EXPERIMENTAL EVALUATION OF FISHWAY MODIFICATIONS ON THE PASSAGE BEHAVIOUR OF ADULT CHINOOK SALMON AND STEELHEAD AT LOWER GRANITE DAM, SNAKE RIVER, USA
Pagano & Garen	2005	A Recent Increase in Western U.S. Streamflow Variability and Persistence
Pierson et al	2002	Environmental Water Requirements to Maintain Estuarine Processes
Poff & Zimmerman	2010	Ecological responses to altered flow regimes: A literature review to inform the science and management of environmental flows
Poff et al	2009	The ecological limits of hydrologic alteration (ELOHA): a new framework for developing regional environmental flow standards
Poff et al	2006	Placing global stream flow variability in geographic and geomorphic contexts
Poff et al	2003	River flows and water wars: emerging science for environmental decision making
Poff et al	1997	The Natural Flow Regime: A Paradigm for River Conservation and Restoration
Propst et al	2008	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems
Resource Management Associates	2014	OMR Flow Analysis WY2009 to WY2013: Comparison of CDEC/USGS and Hutton/MWD Index Methods
Resource Management Associates, Inc.	2014	Development of the 3D Natural Delta Model
Resource Management Associates, Inc.	2014	HYDRODYNAMIC AND SALINITY TRANSPORT MODELING OF THE HISTORICAL BAY-DELTA SYSTEM
Richter et al	2003	Ecologically Sustainable Water Management: Managing River Flows for Ecological Integrity
Richter et al	2006	A Collaborative and Adaptive Process for Developing Environmental Flow Recommendations
Richter et al	1996	A Method for Assessing Hydrologic Alteration within Ecosystems
Rood et al	1995	Instream Flows and the Decline of Riparian Cottonwoods Along the St. Mary River, Alberta. Can
Sacramento River Watershed Program		http://www.sacriver.org/aboutwatershed/roadmap/projects/red-bluff-diversion-dam-fish-passage-improvement
San Francisco Estuary Institute	2014	Generating a Historical Bathymetric-Topographic Digital Elevation Model
San Francisco Estuary Institute	2014	Natural Flow Hydrodynamic Modeling Technology Support Phase 1 Technical Memorandum
San Luis & Delta-Mendota Water Authority et al	2014	Delta Outflows and Other Stressors
San Luis & Delta-Mendota Water Authority et al	2014	Delta Interior Flows and Related Stressors
Schramm & Eggleton	2006	Applicability of the flood-pulse concept in a temperate floodplain river ecosystem: thermal and temporal components
Shelton	1987	Irrigation induced change in vegetation and evapotranspiration in the Central Valley of California
Sommer et al	2004	Effects of flow variation on channel and floodplain biota and habitats of the Sacramento River, California, USA
Stevens & 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

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AQUATIC HABITAT: **FLOW & PASSAGE**		
AUTHOR/SOURCE	**DATE**	**TITLE**
Ahearn et al	2006	Priming the productivity pump: flood pulse driven trends in suspended algal biomass distribution across a restored floodplain
Anderson et al	2010	Report of the 2010 Independent Review Panel (IRP) on the Reasonable and Prudent Alternative (RPA) Actions Affecting the Operations Criteria and Plan (OCAP) for State/Federal Water Operations
Anderson et al	2007	Upstream Fish Passage at a Resistance Board Weir Using Infrared and Digital Technology in the Lower Stanislaus River, California: 2006-2007 Annual Data Report
Anderson et al	2009	Independent Review of a Draft Version of the 2009 NMFS OCAP Biological Opinion
Bennett et al	2010	Key Points on Delta Environmental Flows for the State Water Resources Control Board
Booth et al	2006	Hydrologic variability of the Cosumnes River floodplain
Bowen & Bark	2010	2010 Effectiveness of a Non-Physical Fish Barrier at the Divergence of the Old and San Joaquin Rivers (CA)
Bowen et al	2009	2009 Effectiveness of a Non-Physical Fish Barrier at the Divergence of the Old and San Joaquin Rivers (CA)
Brown & Bauer	2009	Effects of Hydrologic Infrastructure on Flow Regimes of California's Central Valley Rivers: Implications for Fish Populations
Brown et al	2009	Managing Water to Protect Fish: A Review of California's Environmental Water Account, 2001–2005
Brown et al	1996	An evaluation of the effectiveness of fish salvage operations at the intake of the California Aqueduct, 1979-1993
Bunn & Arthington	2002	Basic Principles and Ecological Consequences of Altered Flow Regimes for Aquatic Bidiversity
Cain et al	1993	San Joaquin Basin Ecological Flow Analysis
Carlson et al	2001	Observations of the Behavior and Distribution of Fish in Relation to the Columbia River Navigation Channel and Channel Maintenance Activities
Clabough et al	2009	EVALUATION OF FISHWAY MODIFICATIONS TO IMPROVE PASSAGE OF ADULT CHINOOK SALMON AND STEELHEAD THROUGH THE TRANSITION POOL AT LOWER GRANITE DAM, 2008
Clipperton et al	2002	Highwood River instream flow needs: technical working group final report
Clipperton et al	2003	Instream Flow Needs Determinations for the South Saskatchewan River Basin, Alberta, Canada
Collier et al	1997	Experimental Flooding in the Grand Canyon
Committee on Natural Resources	2007	Extinction is not a sustainable water policy: the Bay-Delta crisis and the implications for California water management (oversight field hearing)
Cummins et al	2008	Listen to the River: An Independent Review of the CVPIA Fisheries Program
Dege & Brown	2003	Effect of outflow on spring and summertime distribution and abundance of larval and juvenile fishes in the upper San Francisco estuary
Demko et al	2000	Effects of Pulse Flows on Juvenile Chinook Migration in the Stanislaus River. Annual Report for 1999
Demko et al	2001	Effects of Pulse Flows on Juvenile Chinook Migration in the Stanislaus River. Annual Report for 2000
Dept. of Water Resources	2014	Simulated 1922-2009 Daily Inflows to the Sacramento – San Joaquin Delta under Predevelopment Conditions using Precipitation – Runoff Models and C2VSIM: Preliminary Results
Dept. of Water Resources	2001	Estimating California Central Valley Unimpaired Flows
Dept. of Water Resources	2012	2011 Georgiana Slough Non-Physical Barrier Performance Evaluation Project Report
Dettinger and Cayan	2003	Interseasonal covariability of Sierra Nevada streamflow and San Francisco Bay salinity
Doyle et al	2005	Effective discharge analysis of ecological processes in streams
Famiglietti et al	2011	Satellites measure recent rates of groundwater depletion in California's Central Valley
Feyrer et al	2010	Modeling the Effects of Future Outflow on the Abiotic Habitat of an Imperiled Estuarine Fish
Flannery et al	2002	A Percent-of-flow Approach for Managing Reductions of Freshwater Inflows from Unimpounded Rivers to Southwest Florida Estuaries
Fox	1987	Freshwater Inflow to San Francisco Bay Under Natural Flow Conditions
Fox & Sears	2014	Natural Vegetation in the Central Valley of California
Fox et al	1990	Trends in Freshwater Inflow to San Francisco Bay From the Sacramento-San Joaquin Delta
French & Chambers	1997	Reducing flows in the Nechako River (British Columbia, Canada): potential response of the macrophyte community
Gingras	1997	Mark/recapture experiments in Clifton Court Forebay to estimate pre-screening loss to juvenile fish: 1976-1993
Gore & Nestler	1988	Instream Flow Studies in Perspective
Graf	2006	Downstream hydrologic and geomorphic effects of large dams on American rivers
Hamlet & Lettenmaier	1999	Columbia River streamflow forecasting based on ENSO and PDO climate signals
Hart & Finelli	1999	Physical-Biological Coupling in Streams: The Pervasive Effects of Flow on Benthic Organisms
Howes & Pasquet	2013	Grass referenced based vegetation coefficients for estimating evapotranspiration for a variety of natural vegetation
Howes et al	2014	Evapotranspiration from Natural Vegetation in the Central Valley of California
Hutton	2008	A Model to Estimate Combined Old & Middle River Flows
Hutton	2014	Overview of Recent Efforts to Characterize Natural Delta Outflow
Hutton et al	2014	Natural Delta Outflow Water Balance
Junk et al	1989	The flood pulse concept in river-floodplain systems
Keppeler & Brown	1998	Subsurface Drainage Processes and Management Impacts
Kiernan & Moyle	2012	Flows, droughts, and aliens: factors affecting the fish assemblage in a Sierra Nevada, California, stream

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CLIMATE & CLIMATE CHANGE		
AUTHOR/SOURCE	DATE	TITLE
Beamish & Mahnken	2001	climate change
Cloern et al	2011	Projected evolution of California's San Francisco Bay-Delta river system in a century of climate change
Crozier et al	2008	Predicting differential effects of climate change at the population level with life-cycle models of spring Chinook salmon
Dettinger & Cayan	2014	Drought and the California Delta—A Matter of Extremes
Dettinger et al	2004	Simulated hydrologic responses to climate variations and change in the Merced, Carson, and American River Basins, Sierra Nevada, California, 1900-2099
Gleick & Chalecki	1999	The impacts of climatic changes for water resources of the Colorado and Sacramento-San Joaquin River basins
Huang and Liu	2001	Temperature Trend of the Last 40 Yr in the Upper Pacific Ocean
Komoroske et al	2014	Ontogeny influences sensitivity to climate change stressors in an endangered fish
Komoroske et al	2014	Ontogeny influences sensitivity to climate change stressors in an endangered fish
Lehman	2004	The Influence of Climate on Mechanistic Pathways that Affect Lower Food Web Production in Northern San Francisco Bay Estuary
Lehman	2000	The influence of climate on phytoplankton community biomass in San Francisco Bay Estuary
Lenarz et al	1995	Explorations of El Nino events and associated biological population dynamics off Central California
Mantua & Hare	2002	The Pacific Decadal Oscillation
Mayer	2008	Analysis of Trends and Changes in Upper Klamath Lake Hydroclimatology
Meko et al	2014	Klamath/San Joaquin/Sacramento Hydroclimatic Reconstructions from Tree Rings
Micheli et al	2012	Downscaling Future Climate Projections to the Watershed Scale: a North San Francisco Bay Estuary Case Study
Minobe	1997	A 50-70 year climatic oscillation over the North Pacific and North America
Mote	2006	Climate-Driven Variability and Trends in Mountain Snowpack in Western North America
Parker et al	2011	Climate change and the San Francisco Bay-Delta tidal wetlands
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Chamberlain and Barnhart	1993	Early Use by Fish of a Mitigation Salt Marsh, Humboldt Bay, California
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Dahl	2006	Status and Trends of Wetlands in the Conterminous United States 1998 to 2004
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Florsheim & Mount	2002	Restoration of floodplain topography by sand-splay complex formation in response to intentional levee breaches, lower Cosumnes River, California.
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Myrick & Cech	2011	Temperature effects on Chinook salmon and steelhead: A review focusing on California's Central Valley populations
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Plater	2004	Endangered Species Act Lessons Over 30 Years and the Legacy of the Snail Darter, a Small Fish in a Porkbarrel
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AUTHOR/SOURCE	**DATE**	**TITLE**
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Anderson	2000	A vitality based model relating stressors and environmental properties to organism survival
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Bartholow	2000	The Stream Segment and Stream Network Temperature Models: A Self-Study Course, Version 2.0
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Becker	1991	Recommended guidelines for measuring conventional marine watercolumn variables in Puget Sound
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Dunham	2002	Influences of temperature and environmental variables on the distribution of bull trout within streams at the southern margin of its range
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AUTHOR/SOURCE	DATE	TITLE
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CALFED	2000	Ecosystem Restoration Program Plan, Volume 1: Ecological Attributes of the San Francisco Bay-Delta Watershed
CALFED Bay-Delta Program	2000	Programmatic Record of Decision
CALFED Bay-Delta Program	2006	10-Year Action Plan
CALFED Bay-Delta Program	2007	CALFED End of Stage 1 Staff Report
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Executive Summary
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report -
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Implementation Plan
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Ecosystem Restoration Program Plan Vol. I: Ecological Attributes of the San Francisco Bay-Delta Watershed
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Ecosystem Restoration Program Plan Vol. II: Ecological Management Zone Visions
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Ecosystem Restoration Program Plan - Strategic Plan for Ecosystem Restoration
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Ecosystem Restoration Program Plan - Maps
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Levee System Integrity Program Plan
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Water Quality Program Plan
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Water Use Efficiency Program Plan
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CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Multi Species Conservation Strategy
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Comprehensive Monitoring, Assessment and Research Program
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Phase II Report
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Response to Commments Vol. I: Impact Analysis
CALFED Bay-Delta Program	2000	Final Programmatic Environmental Impact Statement/Environmental Impact Report - Response to Commments Vol. II: Technical Appendices
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Ludy	2009	Before the flood: Misperception of flood risk in the Sacramento-San Joaquin Delta
Metropolitan Water District of Southern California	02/00/2007	Delta Emergency Preparedness: A Feasibility Plan for Protecting the State's Water Resources During a Large Earthquake Causing the Catastrophic Collapse of Multiple Delta Islands
Metropolitan Water District of Southern California	2011	Comments on Draft Delta Risk Management Strategy Phase 2 Report
Rutenberg	2011	Testimony on Behalf of the National Association of Home Builders Before the U.S. House of Rep., Financial Services Subcommittee on Housing and Community Opportunity: Legislative Proposals to Reform the National Flood Insurance Program
Smardon et al	1996	Protecting Floodplain Resources – A Guidebook for Communities
State Water Contractors	2014	Letter Re Delt Flood Emergency Management Plan
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URS	2013	SEISMIC HAZARD ANALYSES OF THE EMERGENCY FRESHWATER PATHWAY
USGS	2003	Earthquake Probabilities in the San Francisco Bay Region: 2002–2031

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Dept. of Water Resources	2008	Delta Risk Management Strategy (DRMS) Phase 1 - Risk Analysis Final Report - Section 12: Consequences Modeling
Dept. of Water Resources	2008	Delta Risk Management Strategy (DRMS) Phase 1 - Risk Analysis Final Report - Section 13: Risk Analysis 2005 Base Year Results
Dept. of Water Resources	2008	Delta Risk Management Strategy (DRMS) Phase 1 - Risk Analysis Final Report - Section 14: Risk Analysis for Future Years
Dept. of Water Resources	2008	Delta Risk Management Strategy (DRMS) Phase 1 - Risk Analysis Final Report - Section 15: Assumptions and Limitations
Dept. of Water Resources	2008	Delta Risk Management Strategy (DRMS) Phase 1 - Risk Analysis Final Report - Section 16: References
Dept. of Water Resources	2009	Delta Risk Management Strategy - Phase 1 - Executive Summary
Dept. of Water Resources	2008	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Climate Change
Dept. of Water Resources	2008	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Economic Consequences
Dept. of Water Resources	2008	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Emergency Response and Repair
Dept. of Water Resources	2008	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Flood Hazard
Dept. of Water Resources	2007	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Delta Geomorphology
Dept. of Water Resources	2008	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Impact to Ecosystem
Dept. of Water Resources	2007	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Impact to Infrastructure
Dept. of Water Resources	2008	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Levee Vulnerability
Dept. of Water Resources	2007	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Seismology
Dept. of Water Resources	2007	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Subsidence
Dept. of Water Resources	2007	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Water Analysis Module (WAM)
Dept. of Water Resources	2008	Technical Memorandum: Delta Risk Management Strategy (DRMS) Phase 1 - Wind-Wave Hazard
Dept. of Water Resources	2011	Transmittal Letter for Delta Risk Management Strategy (DRMS) Phase 2 Report
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Executive Summary
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Table of Contents
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 1: Introduction
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 2: Building Blocks and Scenarios
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 3: Building Block 1.1: Improved Delta Levee Maintenance
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 4: Building Block 1.2: Upgraded Delta Levees
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 5: Building Block 1.3: Enhanced Emergency Preparedness/Response
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 6: Building Block 1.4: Pre-Flooding of Selected Islands
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 7: Building Block 1.5: Land Use Changes to Reduce Island Subsidence
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 8: Building Block 1.6: Armored "Pathway" (Through-Delta Conveyance)
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 9: Building Block 1.7: Isolated Conveyance Facility Alternatives
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 10: Building Block 1.8: San Joaquin Bypass
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 11: Building Block 2.1: Raise State Highways
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 12: Building Block 2.2: Armored Infrastructure Corridor
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 13: Building Block 3.1: Suisun Marsh Tidal Wetland Restoration and Managed Wetland Enhancements
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 14: Building Block 3.2: Tidal Marsh Cache Slough Restoration
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 15: Building Block 3.3: Install Fish Screens
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 16: Building Block 3.4: Setback Levee to Restore Shaded Riverine Habitat
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 17: Building Block 3.6: Reduce Water Exports From the Delta
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 18: Scenario Evaluation
Dept. of Water Resources	2011	Delta Risk Management Strategy Phase II Report - Section 19: Results and Observations

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AUTHOR/SOURCE	DATE	TITLE
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Am. Institutes Research	2005	A Chronology of Major Events Affecting the National Flood Insurance Program
Am. Institutes Research	2005	The Developmental and Environmental Impacts of the National Flood Insurance Program: A Review of Literature
Am. Institutes Research	2005	The National Flood Insurance Program's Mandatory Purchase Requirement: Policies, Processes, and Stakeholders
Am. Institutes Research	2006	An Evaluation of Compliance with the National Flood Insurance Program Part A: Achieving Community Compliance
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Am. Institutes Research	2006	Assessing the Adequacy of the National Flood Insurance Program's 1 Percent Flood Standard
Am. Institutes Research	2006	Costs and Consequences of Flooding and the Impact of the National Flood Insurance Program
Am. Institutes Research	2006	Evaluation of the National Flood Insurance Program's Building Standards
Am. Institutes Research	2006	Evaluation of the National Flood Insurance Program: Recommendations from the Individual Reports
Am. Institutes Research	2006	Managing Future Development Conditions in the National Flood Insurance Program
Am. Institutes Research	2006	Performance Assessment and Evaluation Measures for Periodic Use by the National Flood Insurance Program
Am. Institutes Research	2006	State Roles and Responsibilities in the National Flood Insurance Program
Am. Institutes Research	2006	The Developmental and Environmental Impact of the National Flood Insurance Program: A Summary Research Report
Am. Institutes Research	2006	The Evaluation of the National Flood Insurance Program Final Report
Am. Institutes Research	2006	The National Flood Insurance Program's Market Penetration Rate: Estimates and Policy Implications
Am. Institutes Research	2006	The Role of Actuarial Soundness in the National Flood Insurance Program
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