California Sportfishing Protection Alliance

"An Advocate for Fisheries, Habitat and Water Quality"

AQUALLIANCE

DEFENDING NORTHERN CALIFORNIA WATERS

October 14, 2010

Sent VIA EMAIL: cdibble@dfg.ca.gov

California Department of Fish and Game
Attn: Chad Dibble - Water Branch
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Subject: **California Department of Fish and Game Report on "Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta"**

Dear Mr. Dibble:

The California Water Impact Network (C-WIN), the California Sportfishing Protection Alliance (CSPA), and AquAlliance take this opportunity to thank the California Department of Fish and Game for developing and publishing recommended flow criteria and biological objectives for species of concern in the Bay-Delta Estuary, and our organizations congratulate the Department on a job well done.

The Department's report, required by mandate of the State Legislature in November 2009 as part of California Water Code Section 85084.5, addresses the question of "what flows do fish need?" The Department embarked on its own independent review of the best available scientific literature from academic, consulting and agency scientists, including but not limited to scientific evidence submitted to the State Water Resources Control Board earlier this year for its Delta flow criteria proceeding. Department scientists were among those who contributed original research to both efforts and applied other methods of analysis (e.g., a sophisticated numeric model of salmon production on the San Joaquin River) to arrive at flow criteria conclusions that are substantially similar to those developed by State Water Board scientists. C-WIN, CSPA and AquAlliance believe that this level of agreement speaks volumes about the compelling nature of the best available scientific evidence that has been assembled this year about Delta conditions and trends.

While C-WIN, CSPA, and AquAlliance support the Department's efforts in this report, we believe your conclusions have not gone far enough to:

- **Emphasize the relationship of flow to water quality and potential benefits** of increased flows to public trust species through water quality improvements.

- Acknowledge that **these new flow criteria from the Department also have historical precedent** and agree substantially with findings and recommendations by Department professionals in earlier evidentiary proceedings;
- **Confront squarely the issue of uncertainty**; and
- **Stress the necessity of compliance and enforcement with adopted standards and goals.**

Flow and Water Quality. The relationship of flow to water quality was thoroughly covered in the State Water Resources Control Board's panel discussions on March 24, 2010. Given the contaminant stressors present in Central Valley watershed rivers and streams that make up fresh water flows to the Bay-Delta estuary (e.g., pesticides, selenium, boron, arsenic, nitrates), low flows increase residence times of water and contaminant stressors in the Delta. Increased flows can reduce residence times, reduce contaminant concentrations, and improve water quality of aquatic habitat in the estuary. While our organizations do not endorse that truism that "the solution to all pollution is dilution," it remains true that increased river flows decrease contaminant concentrations and toxicities and thereby improve habitat for aquatic species. The Department recognizes this insight when it states, "Elevated flows during the [salmon] smolt outmigration period function as an environmental cue to trigger migration, facilitate transport of juveniles downstream, improve migration corridor conditions to inundate floodplains, reduce predation, and improve temperature, dissolved oxygen, and other water quality conditions. (p. 48)" In short, **river flows in the estuary context drive a range of phenomena that affect aquatic species**, as this quote indicates. **We urge the Department in its final report to emphasize this insight about the importance of flows in its executive summary.**

The Department's Historical Expertise and Previous Flow Recommendations. Our organizations appreciate seeing the Department of Fish and Game's mission included in the Executive Summary and on page 2 of the report, stating that the Department is the trustee agency for fishery resources in California and that it "has an interest in assuring water flow into and out of the Delta is maintained at levels which are adequate for long-term viability of native fish and the aquatic resources they depend on." We would also suggest that you acknowledge the many decades of work the Department's biologists have rendered to the people of California studying and protecting the public trust resources of the Bay-Delta estuary.

In 1978, 1987-88, and again in 1992, Department scientists produced scientific studies documenting the decline of Delta public trust species of concern as pumped exports grew. Their work was submitted as evidence to the State Water Resources Control Board in evidentiary proceedings. Department authors were placed under oath and their methods and results vetted carefully, and stood up to scrutiny. Our organizations applaud this rich history of scientific enterprise on behalf of the people of California and their public trust resources in the Delta. Today, we also commend the Department of Fish and Game for consistently describing to the State Water Resources Control Board and the larger water

community what flows fish need in the Delta. We are disappointed that the Department declined to recognize its own history in developing its biological objectives and flow criteria, and request that the Department insert language in this report addressing the historical continuity of its present flow criteria recommendations with its past efforts. The Department offered the State Board the best available science then, and has relied on the best available science using the best professional judgment of its scientists with long experience working in the Bay-Delta estuary to offer the State Board its flow recommendations now. **We urge the Department to buttress its final report by including narrative language acknowledging its long and formidable expertise working in this estuary, and its past contributions to the state of California's efforts to identify flows needed to protect public trust species of concern in the Delta.**

Uncertainty and Enforcement. The challenge for policy makers concerning the Delta's future is how to handle uncertainty in the knowledge we have of this estuary. The Department's approvingly quotes CalFED scientists on page 5 of its Delta flow criteria report that, "Good science provides knowledge for decision-making, but for complex environmental problems, new areas of uncertainty will continue to arise as learning continues." Unfortunately, this is the only substantive mention of uncertainty and the challenge it poses for action in the Department's draft flow criteria report. Our organizations believe more needs to be said in the Department's report.

In the Department's flow criteria and biological objectives report, as well as the State Water Resources Control Board's flow criteria report, the level of scientific sophistication and methodological rigor greatly exceeds what scientists 25 to 35 years ago could work with. Yet most of today's studies confirm the relationship of river flows to and through the Delta to species abundance and productivity, while continuing to deepen our contemporary understanding of the interactive mechanisms of flow and other factors that account for the strength of this now long-observed set of relationships. This means that there is considerable certainty available to both scientists and decision makers about what steps can be taken based on reliable (if also somewhat uncertain) information and knowledge about ecological relationships in the estuary.

The issue of uncertainty was seized on by state and federal water contractors and their consultants to sow doubt about the best available science assembled by the State Water Resources Control Board last March as a pretense to forestall action, as well as in their subsequent comments submitted earlier this month to the Board. The only interests benefiting from slowing down or obstructing action to protect the Delta are the contractors. **Avoiding action while striving for greater certainty will only bring continued decline and inevitable extinction of the species of concern.**

Sorry experience from the Klamath River eight years ago underscores the risks of inaction and lack of enforcement of laws protecting public trust resources: The National Academy of Sciences was invited to study the state of scientific knowledge on the fish resources of the

Klamath River basin. The Academy produced a report in 2002 concluding there was insufficient support for minimum flows as a means of enhancing and recovering coho salmon. This finding was used to justify a court injunction against additional releases from upstream reservoirs in the basin despite warnings from fishery agencies that conditions were ripe for massive fish deaths. Later in September 2002 when one of the largest fall runs of Chinook salmon massed in the lower reaches of the Klamath and Trinity rivers, extra cooling flows that could have stimulated upstream migration were withheld, water temperatures climbed in the midst of a heat wave, and several fish species including green sturgeon, American shad, steelhead, and Chinook salmon became infected with two opportunistic pathogens because of their dense packing in river channels. Some 34,000 fish perished in this perfect storm resulting from paralysis of action caused in part by an excess of concern for perfect scientific knowledge. It was far too high a price in fish lives to pay.

The Department should incorporate into its final report on biological objectives and flow criteria a Departmental recognition of the protective, and not paralytic, role uncertainty should play in protecting the public trust resources in the Bay-Delta estuary. When conditions are uncertain, natural resource managers must still act with appropriate precautions in place to maximize protections for vulnerable species. If conditions change and warrant changes to flow regimes or fishery management, then responsible agencies should follow the law with transparent procedures for making necessary adjustments. The State Water Resources Control Board on page 4 of its report courageously states that, "There is sufficient scientific information to support the need for increased flows to protect public trust resources; while there is uncertainty regarding specific numeric criteria, scientific certainty is not the standard for agency decision making." **We urge the Department to make a similar determination in its report, especially since the Department has relied extensively on the same information the State Water Board sought and used in reaching its determinations.**

Uncertainty about the exact scientific mechanisms will always be with us, yet uncertainty is not sufficient reason to delay protective action in the Delta. C-WIN, CSPA, and AquAlliance also believe that both sets of Delta flow criteria produced this year by state agencies as required by recent legislation are being held to a far higher standard of scientific review than anything faced by the California Department of Water Resources and the US Bureau of Reclamation in justifying construction and operation of the State Water Project and the Central Valley Project. Our organizations are confident that if the standard of absolute scientific certainty about ecological functions and mechanisms underlying statistical relationships were applied to the projects themselves, they never would have been built to the size and scale that exists today. Indeed, they may never have been built, period. **We urge the Department to acknowledge and avoid the double standard of using a quest for greater "certainty" in scientific understanding of causal mechanisms in the estuary to delay protection of fisheries and water quality, when development and operation of the water projects themselves relied on far greater degrees of uncertainty about project impacts in the years before passage of the California**

Environmental Quality Act (under which careful and systematic disclosure of impacts of these water systems to the public would have been required)**.**

In the interim, the State Water Resources Control Board practiced a largely hands-off approach to regulating the Central Valley Project and the State Water Project until 1978, as shown in Attachment 1 to this letter, which the California Water Impact Network submitted originally to the State Water Resources Control Board as an exhibit to testimony concerning a proposed relaxation of a cease and desist order against the Department of Water Resources and the Bureau of Reclamation for southern Delta salinity violations by their Delta export pumps. Both Attachment 2 and the State Water Board's subsequent relaxation of compliance terms of the cease and desist order demonstrate the low standard of review applied to the projects in the past, and continuing today. **We urge the Department to acknowledge the manipulation of "uncertainty" and avoid applying a double standard when it comes to protection of water project operations in the Delta.**

Other the last few years, C-WIN, CSPA, and AquAlliance have watched in dismay as the acknowledged inadequate standards adopted to protect the Bay Delta estuary and its tributaries have been ignored and violated while no enforcement actions were taken. These include violations of Vernalis flow standards, the export red light, interior Delta water quality standards, inflow/export ratio and the use of the Joint Point of Diversion. We have also witnessed the Water Operations Management Team ignoring numerous recommendations to protect listed species made by the agency technical teams. The Department should make clear that biological objectives and flow criteria are relevant only if complied with and enforced. **Therefore, we urge the Department to include language specifying the consequences and options if standards are violated, including the identification of the pertinent enforcement authorities and mechanisms.**

There are other questions we believe the Department of Fish and Game ought to address as part of its final flow criteria report, which are summarized here and itemized in Attachment 2. This attachment presents a side-by-side comparison of the Board and Department's flow criteria. While it shows substantial similarity, this comparison reveals areas of divergence (intentional or not), and we submit the following questions for the Department to answer in its final flow criteria report:

- Concerning its Rio Vista criterion of 20,000 to 30,000 cubic feet per second (cfs) from April through June, would this criterion apply in all water year types, as the State Water Resources Control Board's criterion calls for?
- Does the Department intend to offer flow criteria for other salmon runs, as the State Water Resources Control Board's criterion calls for?
- Does the Department agree or disagree with State Water Resources Control Board flow criteria for net Delta outflow, and the Sacramento and San Joaquin Rivers that originate in the 2006 Bay-Delta Plan? The Department appears to have been silent on these criteria that were incorporated by the Board.

- How does the Department's Vernalis juvenile salmon survival criterion differ in terms of flow magnitudes from the State Water Resources Control Board's criterion on the San Joaquin River (i.e., 60% of 14-day running average of unimpaired flows from February through June in all water years)? How different (if at all) are the median flow(s) and the range of flows embodied in the Department's salmon model relative to the Board's criterion flows?
- How does the Department justify its fall pulse flow criterion intended to attract adult salmon to the San Joaquin River being lower than what the State Water Resources Control Board adopted (1,000 cfs pulse flow with "up to 28 TAF additional flows for October average of 2,000 cfs")? What is the actual proposed duration of this pulse flow by the Department? Is it the same as the 10 days called for by the Board, or is it the entire month of October, or some other duration?
- Why does the Department omit inflow/export ratio and export/inflow ratio recommended criteria from its report (i.e., compared with the State Water Board's hydrodynamics criteria 1, 6, and 8)? The State Board's criteria are intended to buttress Old and Middle River criteria by more clearly regulating exports to achieve the target ratios that are to protect juvenile salmon from entrainment, reduce straying, and improve San Joaquin River home fidelity for adult salmon. In its vetted 1992 testimony, Department scientists testified that the export pumping rate should be zero from April through June. **Does the Department believe regulating Old and Middle River flows is sufficient as an approach, and if so, why? At this time, our organizations are concerned that DFG is unconcerned with entrainment of resident estuarine species of concern.**
- Why does the Department ignore potential benefits to upstream and estuarine fish like Sacramento splittail of floodplain inundation and activation actions?
- Both sets of flow criteria have criteria that limit the effect of a given criterion to "when salmon are present" in Delta channels. How would the Department determine when salmon are present? Would the Department recommend a specific threshold number of fish, or would these criteria be enforced on an "any or none" basis? There is a profound need in these vulnerable species of concern to ensure that the front and rear portions of migrating salmon smolts and adults be protected since these "bookends" clearly represent the larger spectrum of the genetic pool of the populations we have. To impose arbitrary thresholds that are too abrupt or too large in number could result in loss of genetic diversity to the salmon runs. A similar problem exists for resident estuarine species at risk of entrainment at the export pumps at different times of year.

In summary, our organizations are deeply concerned by state and federal water contractor arguments and objections that the need for greater certainty in scientific understanding of Delta estuarine ecological relationships and mechanisms must trump action to protect vulnerable species of concern. In short, they pose the "perfect" scientific understanding as the enemy of "good" solutions that would protect and recover Delta estuarine species of concern. As the State Water Resources Control Board has itself stated, scientific certainty is

not the standard for knowledge needed for action; the Board sought and received the "best available science" early this year and has employed it.

Again, C-WIN, CSPA, and AquAlliance thank you for your efforts to identify and recommend biological objectives and flow criteria for public trust species of concern in the Bay-Delta estuary. We appreciate your consideration of our suggestions and questions, and hope you will address them directly in the final version of the report that you submit to the State Water Resources Control Board in November. If you have questions concerning our comments, please contact us directly.

Sincerely,

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Attachments:

1. Chronology of State Water Board Activities and Related Studies Concerning Salinity Control and Fish Protection
2. Comparison of State Water Resources Control Board and Department of Fish and Game Delta Flow Criteria, Correlated with Ecological Function and Location/River System in the Bay-Delta Estuary

Attachment 1
Chronology of State Water Board Activities
and Related Studies Concerning Salinity Control and Fish Protection

Document/ Source/ Authority	Year	Purpose	Face Value	Points of Diversion	Comments
Central Valley Project Act (Stats.1933, Ch. 1042)	1933	Design and operation of the CVP	NA	Multiple	Salinity control in the Sacramento-San Joaquin Delta is one of the primary purposes of the Central Valley Project.
Effects of the CVP on the Southern Delta Water Supply, joint study by US Water and Power Resources Service (nee USBR) and South Delta Water Agency	1980; compared historical water quality and flow data as far back as 1930s.	"Comparing the average monthly TDS (over the entire year), load-flow regressions show a 1950-1969 increase of 43 percent--from 259 mg/L to 371 mg/L. For the 1950s alone the percentage increase is about 22 percent and for the 1960s, 65 percent....Thus, according to this analysis, in this first decade after the CVP went into operation, about 56 percent of the increase in average TDS was caused simply by a reduction in flow from upstream sources; the remaining 44 percent was a result of increased salt burden, perhaps associated with an expansion of irrigated lands in the basin. Similarly in the 1960s (compared to thee 1930s and 1940s) about 27 percent of the average increase in TDS...can be accounted for by a reduction in flow and 73 percent attributed to increased salt burden. It is of interest to note here that the absolute change apparently caused by reduction in flow changed relatively little from the 1950s to the 1960s...while that charged to an increase in salt burden incrased about four times [...]. This is consistent with other analyses that indicate a progressive buildup in salt load in the San Joaquin system." (p. 126.)			
D-893	1958	USBR – Appropriate water for operating American River CVP facilities	1,000,000 AF of storage, 8,000 cfs maximum diversion rate	Multiple	During a twelve-year period the State Water Board adopted six difference decisions (Decisions 893, 990, 1020, 1250, 1308, and 1356) approving permits for various components of the federal CVP operated by USBR. The permits issued as a result of the decisions included a term by which the Water Board reserved jurisdiction to revisit salinity control requirements. (Decision 893, p. 71, Condition 12; Decision 990, p. 86, Condition 25; Decision 1020, p. 21, Condition 9; Order Extending Time in Which to Formulate Terms and Conditions Relative to Salinity Control Pursuant to Decision 990 and Decision 1020, p. 2; Decision 1250, p. 5, Condition 9; Decision 1308, p. 11-12, Condition 8; Decision 1356, p. 17, Condition 21.)

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D-990	1961	USBR - Appropriate water for operating the CVP	8,022,000 AF of storage; 23,674 cfs maximum diversion rate	Multiple	Order reserved to the State Water Rights Board continuing jurisdiction over CVP permits for the purpose of formulating terms and conditions relative to salinity control in the Delta. Narrative noted 1500 cfs minimum flow needed to maintain 1000 ppm water quality at Antioch for irrigation purposes. Industrial interests preferred no more than 350 ppm at Antioch, preferred 150 to 250 ppm at Antioch. D-990 also stated that the State's water rights applications assigned to the Bureau of Reclamation for the CVP included salinity control as a purpose of the water rights.
D-1020	1961	USBR - Appropriate water for the San Luis Unit.	1,000,000 AF of storage; 4,200 cfs maximum diversion; 1500 cfs direct diversion	Old River	While the State Water Rights Board received testimony from Delta Water Users Association concerning south Delta salinity conditions deteriorating in the San Joaquin River north of Mendota Pool since 1950, the Board received no specific terms or conditions from the parties for this decision, and so established no salinity standard.
D-1250	1965	USBR - Appropriate water for power production at San Luis Reservoir	1,000,000 AF for off-stream storage; 4,200 cfs maximum diversion rate	Old River	Order reserved to the State Water Rights Board continuing jurisdiction over CVP permits for the purpose of formulating terms and conditions relative to salinity control in the Delta.
D-1275	1967	DWR - Appropriate water for operating the SWP	5,066,100 AF of storage; 30,060 cfs in direct diversions	Feather River, Delta Channels	Board found that "sufficient information is not available to finally determine the terms and conditions regarding water quality in the Delta which will reasonably protected vested rights without resulting in waste of water" and reserved its jurisdiction over permit terms and conditions while both USBR and DWR conducted studies regarding "the problem of water quality in the San Francisco Bay and the Delta for the purpose of determining what standards of water quality should be maintained and recommending how this is to be accomplished." (p. 18)

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D-1291	1970	DWR - Appropriate water for operating the SWP	same as D-1275, but adjusted seasons of diversion at sources	Feather River, Delta Channels	No amendments made to D-1275, Term 19 that reserves Board jurisdiction regarding water quality in the Delta.
D-1356	1970	USBR - Appropriate water for Eastside Division projects	Folsom and Auburn Dam projects	American River Basin	Order reserved to the State Water Rights Board continuing jurisdiction over CVP permits for the purpose of formulating terms and conditions relative to salinity control and fish and wildlife protection in the Delta.
D-1379	1971	To continue reserving jurisdiction on water quality and fish and wildlife issues relating to permits of the CVP and SWP	39 permits involving 10,000,000 AF	As identified for SWP and CVP	"...The Delta has become a man-made ecosystem which must be protected and managed intelligently to achieve a level of environmental quality that will meet all present and future needs." (p. 5) SWRCB saw its role as protecting vested water rights, as well as reserved jurisdiction pertaining to water quality and fish and wildlife protection. D-1379 established quantitative water quality standards largely for the western Delta, and narrative standards for fish and wildlife protection. The State Water Board's amendment of D-1379 (adopted October 1971) states that "The State Water Project cannot eliminate reverse flow in the San Joaquin River portion of the Delta or provide predominantly San Joaquin River water in the southeastern Delta in September, October and November prior to the operation of the Peripheral Canal....Prior to the operation of such a facility it is implicit in the Board's order that the permittees shall maintain the standard to the best of their ability with the facilities available."

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1978 Water Quality Control Plan	1978	State Water Board Adopts 1978 Plan and Decision 1485: Based on the conclusions of the University of California crop study, the State Water Board, in the 1978 Plan, established the salinity objectives in effect today. Specifically, it found that to protect southern Delta agriculture it was necessary to maintain a 30-day running average salinity objective of 0.7 mmhos/cm EC from April through August and 1.0 mmhos/cm EC from September through March at four locations in the southern Delta: (1) the San Joaquin River at Vernalis, (2) San Joaquin River at Brandt Bridge, (3) Old River near Middle River, and (4) Old River at Tracy Road. (1978 Plan, p. VI-29.) The State Water Board did not allocate responsibility for the 1978 Plan southern Delta EC objectives in Decision 1485. The 1978 Plan and Decision 1485 state that if contracts to ensure the water supplies and facilities mentioned above are not executed by January 1, 1980, the State Water Board will take appropriate enforcement actions to prevent encroachment on riparian rights in the southern Delta. (1978 Plan, p. VI-6; Decision 1485, p.28, Condition 8.) Contracts were not negotiated, but SDWA asked the State Water Board to delay taking action.			
Draft 1988 Water Quality Control Plan	1988 (not adopted)	This plan was not adopted due to intense objections to its proposed water ethic and reliance on several flow-related objectives. Retains the 1978 WQCP southern Delta salinity standards, but does not assign responsibility for their being met. Narrative of this Draft WQCP for southern Delta agriculture (pp. 7-4 to 7-5) noted that: water quality degraded in the Delta near Vernalis in the last 50 years, with salt concentrations having more than doubled during that time due to increased salt loading from agricultural drainage and decreased flows from upstream water development; called for implementation of the 1978 southern Delta salinity objectives, but noted that "decisive action is needed." This draft plan also stated that two aspects of these objectives needed review: "First, the mean monthly monitoring frequency contained in the Delta Plan [1978] is too long, as explained by the South Delta Water Agency, and should be reduced to a 14-day running average consistent with western and interior Delta objectives. Second, the objectives need to be tested to see if they would be attained during unimpaired flow conditions. This analysis indicates that the 0.7 mmhos/cm EC set forth in the objectives during the primary irrigation season of April through August generally would be available under unimpaired runoff conditions during all water year types. This analysis used water quality to flow relationships for the San Joaquin River that existed prior to 1945 [prior to completion and operation of the Friant Dam and Delta Cross Channel]." The draft plan adds that, "During the secondary irrigation season, September through March, the 1.0 mmhos/cm EC provides water quality sufficient to protect crops irrigated during this time of year e.g., alfalfa, pasture, and sugar beets. This quality protects the seedling stages of these crops and is sufficient for winter leaching. Also, analysis shows that 1.0 mmhos/cm EC generally would be achieved during these months under unimpaired runoff conditions. These objectives are used for each set of water quality objectives and are shown in detail in the recommended objectives presented later in this chapter."			

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	1988	Concerning Chinook salmon protection, the draft plan states that "San Joaquin River salmon populations fluctuate markedly, partly in response to spring flow conditions, and range from less than one to 26 percent of the Central Valley salmon population….One race was eliminated from the San Joaquin Basin by the construction of Friant Dam. Sufficient evidence was presented in the Phase I Hearing to determine Delta protectioins needed for the fall run salmon but not the other races of Chinook salmon on the San Joaquin or Sacramento River systems." In addition, the draft plan stated, "Available data indicate that river flows in April through June up to a certain limit (22,500 cfs on the Sacramento River at Rio Vista and 20,000 cfs on the San Joaquin River at Vernalis) provide benefits to salmon migration. These benefits are linearly related to increasoing Sacramento River flows. Limited data from the San joaquin indicate a similar relationship." (pp. 7-6 to 7-7). "While the option exists to take no action related to the further regulation of flows and exports, it is not reasonable to rely on "out of Estuary" measures to correct habitat concerns related to factors in the Estuary....Currently there are no requirements for minimum upstream flows on the San Joaquin River for upstream salmon migration. Low dissolved oxygen at Stockton may also cause a blockage to upstream salmon passage. A 1969 agreement between DWR, USBR and DFG provided for 1) installation of a temporary barrier across Old River when dissolved oxygen falls below 6 mg/L so that flows increase down the San Joaquin River, or 2) if that is not successful, increased flow releases [from upstream reservoirs]. This objective should be incorporated in this Plan." (p. 7-10)			
	1988	Because of the condition of salmonid fisheries on the San Joaquin River, the draft plan recommended a suite of objectives that included reducing April through July exports to levels that would "reflect the conditions that occurred during a time when both striped bass and salmon populations were in much healthier conditions, prior to the increased export of the SWP (1953-1967...). Reducing exports to the period before the SWP does not always provide the positive downstream flow in Old and Middle rivers sought by many fishery groups. Under this alternative, positive flows occur only about 20 percent of the time during April - July. It does reduce the magnitude of reverse flows compared to present conditions. A safe level of exports is not known. However, pre-SWP spring export rates appears to be a reasonable interim goal until a safe level of exports is found.			

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	1988	"The average impact on existing and planned spring exports is a decrease of about 0.67 MAF. Compared to the last 15 years of spring exports, they would be reduced by about 0.2 MAF. In order to make up for this decrease in spring exports the CVP and SWP could increase exports in fall and winter months above today's levels as planned in their 1990 operations study. This is possible with existing facilities as shown in DWR's 1990 operations study. These actions would in effect freeze existing total annual exports at about the 1985 levels. The 1985 level of exports is the highest to date and 16 percent higher than the average level of exports since implementation of the 1978 Delta Plan. However,...this level of Delta supply is sufficient to meet reasonable water demands south and west of the Delta through the year 2010." (p. 7-32)			
1991 Water Quality Control Plan	1991 (rejected by US EPA)	The State Water Board did not change the southern Delta EC objectives in the 1991 Plan from the objectives in the 1978 Plan. However, because of on-going negotiations among DWR, USBR, and SDWA, the State Water Board established a staged implementation plan for the objectives with two interim stages and a final stage. The final stage, to be implemented no later than 1996, required implementation of a 30-day running average EC at all four southern Delta locations (Vernalis, Brandt Bridge, Old River near Middle River, and Old River at Tracy Road) of 0.7 between April and August and 1.0 between September and March for all year-types. The 1991 Plan also stated that if a three-party contract has been implemented among DWR, USBR, and SDWA, that contract will be reviewed prior to implementation of the southern Delta EC objectives and, after also considering the needs of other beneficial uses, revisions will be made to the objectives and compliance/monitoring locations noted, as appropriate. (1995 Plan, Table 1-1, p. 4 and 8.) No responsibility for compliance was assigned by the WQCP at the time.			
Draft Decision 1630	1992 (not adopted)	This draft water right decision intended to implement the 1991 WQCP was not adopted due to intense objections to its pulse flow and other fish and wildlife protection requirements. It would have retained the 1991 WQCP version of the southern Delta salinity standards, including retention of the 30-day running average for EC objectives. It included spring and fall pulse flows in the San Joaquin River together with export limit at the SWP, and CVP pumps (including Contra Costa Canal) of no more than 1,500 cfs combined (and split equally between DWR and USBR). Attraction flows were also included for October.			
1995 Water Quality Control Plan	1995	The State Water Board did not change the southern Delta EC objectives in the 1995 Plan from the objectives in the 1991 Plan except that the effective date of the objectives at the Old River sites was extended from January 1, 1996 to December 31, 1997. The 1995 Plan includes the same condition as the 1991 Plan regarding review of the objectives upon execution of a three-party agreement. (1995 Plan, p. 17.)			

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Water Right Order 95-06	1995	The State Water Board temporarily amended DWR's and USBR's water rights for the SWP and the CVP to be consistent with the 1995 Plan. This order allowed DWR and USBR to operate the SWP and CVP in accordance with the 1995 Plan while the State Water Board prepared a long-term water right decision to implement the plan. Among other requirements, the order required USBR to release conserved water from New Melones Reservoir to comply with the 1995 Plan Vernalis EC objectives. The order was to expire on December 31, 1998 or upon adoption by the State Water Board of a long-term water right decision implementing the 1995 Plan. (Order 95-6, p. 51-52.)			
Water Right Order 98-9	1998	The State Water Board continued the temporary terms and conditions set forth in Order 95-6. The order was to expire on December 31, 1999 or upon adoption by the State Water Board of a long-term water right decision implementing the 1995 Plan. (Order 98-9, p. 23-24.)			
D-1641	2000	For the first time, the State Water Board assigned sole responsibility to USBR for meeting the Vernalis EC objectives and DWR and USBR for meeting the EC objectives at Brandt Bridge, Old River near Middle River, and Old River at Tracy Road. Decision 1641 immediately implemented the Vernalis objectives and implemented a year round objective of 1.0 EC at the interior southern Delta stations until April of 2005. After April of 2005, Decision 1641 requires implementation of 0.7 EC during April through August unless permanent barriers or equivalent measures are completed and a plan to protect agriculture is approved, in which case the required objective is 1.0 EC. (Decision 1641, p. 159-160 and Table 2, p. 182.) Decision 1641 also approved use by DWR and USBR of each other's points of diversion (JPOD) subject to completion by DWR and USBR and approval by the Division Chief of mitigation requirements including a WQRP. (Decision 1641, p. 150-153; 155-158.)			
2006 Water Quality Control Plan	2006	The State Water Board assigned sole responsibility to USBR for meeting the Vernalis EC objectives and DWR and USBR for meeting the EC objectives at Brandt Bridge, Old River near Middle River, and Old River at Tracy Road. Decision 1641 immediately implemented the Vernalis objectives and implemented a year round objective of 1.0 EC at the interior southern Delta stations until April of 2005. After April of 2005, Decision 1641 requires implementation of 0.7 EC during April through August unless permanent barriers or equivalent measures are completed and a plan to protect agriculture is approved, in which case the required objective is 1.0 EC. (Decision 1641, p. 159-160 and Table 2, p. 182.) Decision 1641 also approved use by DWR and USBR of each other's points of diversion (JPOD) subject to completion by DWR and USBR and approval by the Division Chief of mitigation requirements including a WQRP. (Decision 1641, p. 150-153; 155-158.)			

Sources: State Water Resources Control Board, Order WR 2006-0006, Figure 2, pp. 8-9; various State Water Resources Control Board water quality control plans and water right decisions cited herein and available online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/; W. Turrentine Jackson and Alan M. Paterson, *The Sacramento-San Joaquin Delta: Evolution and Implementation of Water Policy*, California Water Resources Center, Contribution No. 163, June 1977; California Water Impact Network.

Attachment 2

Comparison of State Water Resources Control Board and Department of Fish and Game Delta Flow Criteria, Correlated with Ecological Function and Location/River System in the Bay-Delta Estuary				
Location/ River	**Ecological Function**	**SWRCB Delta Flow Criteria**	**DFG Delta Flow Criteria**	**Comments**
Delta Outflows	Promote abundance for Longfin Smelt and other estuarine species	1) 75% of 14-day running average of unimpaired flows from January through June in all water years	11,400 to 29,000 cfs January through June in all water years.	SWRCB Delta flow criteria report comments (p. 102) that its criterion would average about 51,000 cfs between January and March, and 35,000 cfs between March and May in nearly 50% of all years, and that DFG argues that spring outflow criteria should continue through June to fully protect a number of estuarine species (DFG 1, pp. 2-5).
	Fall X2 position to benefit Delta smelt	2) X2 < 74 km from Golden Gate in wet years; X2 < 81 km from Golden Gate in above normal years.	Same as SWRCB.	SWRCB (p. 107) relied on DFG testimony for this criterion (DFG 2, p. 6); would benefit longfin smelt, starry flounder, bay shrimp, zooplankton, and American shad. "For each of these species, the DFG (closing comments, p. 7) recommends that sufficient outflow be provided to position X2 between 75 and 64 km. Flows for this are equivalent to 11,400 to 29,200 cfs .
		3) Net Delta outflows from the 2006 Bay-Delta Plan in Critical, Dry and Below Normal water years from July through November.	No criterion identified	DFG should clarify whether it agrees with SWRCB flow criteria from the 2006 Bay-Delta Plan.

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Location/ River	**Ecological Function**	**SWRCB Delta Flow Criteria**	**DFG Delta Flow Criteria**	**Comments**
Sacramento River	Juvenile fall-run Chinook salmon outmigration	1) Rio Vista: 75% of 14-day running average of unimpaired flows, April through June in all water years.	Rio Vista: 20,000 to 30,000 cfs from April through June (in all water years?)	DFG needs to clarify whether their flow criteria recommendations are for all water years or not.
	Other salmon runs	2) Rio Vista: 75% of 14-day average of unimpaired flows, November through March	No criterion identified	DFG needs to clarify whether they intend to offer flow criteria recommendations for other salmon runs.
	Increase juvenile salmon outmigration survival by reducing diversion into Georgiana Slough and the central Delta.	3) Wilkins Slough: 7-day pulse flows at 20,000 cfs unitl smolts move downstream all years, November through January.	Wilkins Slough: same as SWRCB.	
	Increase juvenile salmon outmigration survival	4) Freeport: Approximately 13,000 to 17,000 cfs positive flows downstream of confluence with Georgiana Slough while juvenile salmon are present, November through June in all water years	Freeport: same as SWRCB.	
	Fall adult Chinook salmon attraction flows	5) Rio Vista: 2006 Bay-Delta Plan flow objectives in September through October, all years	No criterion identified	DFG should clarify whether it agrees with SWRCB flow criteria from the 2006 Bay-Delta Plan.

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Location/ River	**Ecological Function**	**SWRCB Delta Flow Criteria**	**DFG Delta Flow Criteria**	**Comments**
San Joaquin River	Juvenile salmon survival for abundance doubling	1) Vernalis: 60% of 14-day running average of unimpaired flows from February through June in all water years.	Vernalis: Combination of base flows (1,500 cfs in Critical years to 6,315 cfs in Wet years), from January through June	DFG apparently is invested in its San Joaquin River salmon model and did not offer an analysis of how its criterion differs in actual flow from 60% of unimpaired flows. By contrast, SWRCB (p. 120) compared its criterion to AFRP and DFG modeling, opting for February through June; they were looking to mimic the natural hydrograph.
	Adult salmon attraction, decrease straying, improve DO, improve olfactory homing	2) Vernalis: 3,600 cfs pulse flow in late October	Vernalis: 1,000 cfs pulse flow - footnote states “up to 28 TAF additional flows for October average of 2,000 cfs.”	DFG flow criterion lower than SWRCB’s; also not well specfied - e.g., what is duration of the 1,000 cfs pulse flow?
		3) SWRCB Bay-Delta Plan October flows in all water years.	No criterion identified	DFG should clarify whether it agrees with SWRCB flow criteria from the 2006 Bay-Delta Plan.

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Location/ River	**Ecological Function**	**SWRCB Delta Flow Criteria**	**DFG Delta Flow Criteria**	**Comments**
South, Central, and Western Delta (hydro-dynamics)	Reduce straying, improve San Joaquin River fish home fidelity for adult salmon	1) Inflow/Export ratio > 0.33 during fall pulse flow for 10 days in October of all water years, which complements San Joaquin River criterion 2 above.	No criterion identified	DFG should clarify whether it intends to offer central and southern Delta criteria that address straying problems
	Reduce entrainment losses of Delta smelt, longfin smelt and benefitting other estuarine dependent species	2) Net OMR flows > -1,500 cfs in critical and dry years for March and June.	No criterion identified	DFG should clarify whether it intends to offer central and southern Delta criteria that address entrainment problems, which would also benefit other estuarine (including pelagic species).
		3) Net OMR flows > 0 cfs (Critical years) when FMWT < 500; or > -1,500 cfs when FMWT > 500 for longfin smelt in April and May	Net OMR flows > 0 cfs (Critical years) when FMWT < 500; or > -1,500 cfs when FMWT > 500 for longfin smelt from March through June	DFG essentially combined SWRCB's criteria 2 and 3 into one.
	Reduce adult Delta smelt, longfin smelt, others entrainment at the pumps	4) Net OMR flows > -5,000 cfs in all year types, December through February.	Net OMR flows > -5,000 cfs in all year types, December through June	DFG increases the duration of these net OMR flows over criterion offered by SWRCB.
	Reduce risk of juvenile salmon entrainment and central Delta straying	5) Net OMR flows > -2,500 cfs when salmon smolts present in Delta from November through June	Same as SWRCB.	

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Location/ River	**Ecological Function**	**SWRCB Delta Flow Criteria**	**DFG Delta Flow Criteria**	**Comments**
Delta Hydrodynamics	Improve San Joaquin River juvenile salmon survival, and improve escapement	6) San Joaquin River Inflow/Export ratio > 4.0	No criterion identified	DFG should clarify whether it intends to offer central and southern Delta criteria that address entrainment problems, which would also benefit other estuarine (including pelagic species).
Jersey Point	Increase survival of outmigrating smolts	7) Positive flows when salmon present in the Delta	Same as SWRCB.	
	Protection of estuarine dependent species	8) Export/Inflow ratio from 2006 Bay-Delta Plan exports to inflow restrictions	No criterion identified	DFG should clarify whether it intends to offer central and southern Delta criteria that address entrainment problems, which would also benefit other estuarine (including pelagic species).
Eastside Streams	Mokelumne River flows for juvenile salmon outmigration	SWRCB (p. 126) states “flows should generally be provided from tributaries in proportion to their contribution to unimpaired flow.”	1,500 cfs in March and April in all water years	DFG testimony in 1992 also called for proportional contributions to inflows from tributary streams.
	Eastside stream minimum flows	SWRCB (p. 126) states “flows should generally be provided from tributaries in proportion to their contribution to unimpaired flow.”	1,060 cfs year-round in all water years	DFG testimony in 1992 also called for proportional contributions to inflows from tributary streams.

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Location/ River	**Ecological Function**	**SWRCB Delta Flow Criteria**	**DFG Delta Flow Criteria**	**Comments**
Floodplain inundation (e.g., Yolo Bypass and other potential sites, including along the San Joaquin River)	Floodplain activation and inundation for rearing habitat for Sacramento splittail, Chinook salmon	SWRCB recommends that the Bay Delta Conservation Plan process, Delta Stewardship Council, and others continue to explore the various issues concerning flood protection, weir modifications, and property rights related to floodplain inundation, including: 1) Development of slough networks with natural channel geometry and less diked and rip-rapped channel habitat; 2) increased tidal marsh habitat, including shallow (one to two meters) subtidal areas in both fresh and brackish zones of the estuary (in Suisun Marsh, for example); and 3) create large expanses of low salinity open water habitat in the Delta.	56,000 cfs with current Fremont Weir or 23,100 cfs flow with notched Weir for 30-days or more to inundate the floodplain from January through May in Wet and Above Normal water years. Benefits generally increase with increasing duration, with even relatively short periods of two-weeks providing potential feeding benefits to salmon. Benefits to salmon may also increase with increasing inter-annual frequency of flooding. Repeated pulse flows and associated increased residence times may be associate with increased productivity which would benefit salmon growth rates and potentially reduce stranding. (p. 57)`	DFG focuses on salmon smolts benefiting from increase food in floodplain habitats. Written and oral testimony to the SWRCB in February and March 2010 also noted the benefits to Sacramento splittail upstream of the Delta.

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