CLOSING STATEMENT

to the

PROCEEDING TO DEVELOP
DELTA FLOW CRITERIA FOR THE DELTA ECOSYSTEM
NECESSARY TO PROTECT PUBLIC TRUST RESOURCES

State Water Resources Control Board
Sacramento, California

prepared by

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April 14, 2010

The State Water Board's Task and the Scientific Evidence

The California Water Impact Network (C-WIN) thanks the State Water Resources Control Board (State Water Board) for organizing and hosting this proceeding to develop Delta flow criteria for the Delta Ecosystem necessary to protect public trust resources.

As the State Water Board prepares to digest and assimilate the impressive array of scientific studies and recommendations for flow criteria, C-WIN wishes to remind all Board members that the Legislature charged you *only* with the responsibility to develop flow criteria from this proceeding, and that these flow criteria should be protective of public trust resources in the Bay-Delta estuary. The purpose of this proceeding *does not include*:

- Solving California's water supply problems;
- Designing flow regimes and capacity for a peripheral canal; nor
- Determining export rate schedules for the state and federal pumping plants in the south Delta.

Board members expressed concern in January about the complexity and gravity of this proceeding. While we appreciated that Board members were taking seriously the Legislature's assignment, C-WIN sought in our testimony to reassure the State Water Board that the schedule set for it by the Legislature can be met, and pointed to two previous examples of State Water Board work products that provide guidance on how to proceed, and what issues to address in

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meeting your obligation to the Legislature: the 1988 Draft Water Quality Control Plan and the 1992 Draft Water Rights Decision 1630.[1]

Consequently, C-WIN also thanks the State Water Board for accepting into the record of this proceeding the testimony of scientists working for state and federal resource agencies first submitted into evidence between 1987 and 1992 to the State Water Board. The virtue of this earlier scientific record lies with the 1987 and 1992 proceedings: flow criteria were developed out of scientific research presented under oath and subject to cross-examination in evidentiary proceedings. The science from all the participants in this 2010 proceeding cannot make this claim. This work continued and enlarged upon scientific insights from the 1970s that shaped the information and findings you have recently received in this proceeding. The scientific findings from this earlier period are remarkably consistent with recommendations for flow criteria submitted to the State Water Board in 2010. We believe the scientific record from this proceeding is richer for the Board's accommodations of this earlier information.

Because the record from 1987 through 1992 has undergone this evidentiary test, the State Water Board owes it to the people of California to take account of the scientific findings. ***C-WIN urges the State Water Board to incorporate an analysis of the science and flow recommendations presented by the California Department of Fish and Game and US Fish and Wildlife Service and others in these earlier evidentiary proceedings into your Delta flow criteria report this August***.

The State Water Board did accept these earlier flow recommendations in drafts of the 1988 plan and the 1992 water rights decision; unfortunately due to gubernatorial objections, the Board did not implement them. California's public trust heritage in the Delta and water supply reliability have suffered as a direct result: populations of native and important recreational fish species have collapsed under the approved flow regime of Water Right Decision D-1641 (with its roots in the 1994 Bay-Delta Accord), and Delta water exports (whether from service contract supplies or from cross-Delta transfers) to benefit lowest priority water contractors have been and will be contentious until some solution is found.

We understand the temptation is great to balance what fish need with what water contractors and water project operators demand as part of developing flow criteria from this proceeding. "Balancing" is the planning mantra of the November 2009 water legislation that passed into law. But this is not your assignment.

SB X7 1's Water Code Section 85086 is an exception to this planning mantra: ***With the Delta Flow Criteria Proceeding, the State Water Board should not balance competing beneficial uses to complete its work and comply with this section of the Water Code. The Board is to obtain and relay information about what flows fish in the Bay-Delta estuary need to experience a sustained recovery to greater abundances to the Legislature, the Bay Delta Conservation Plan process, and the Delta Stewardship Council.***

We recommend the Board simply tell the Legislature (and provide the information as planning data to the Bay Delta Conservation Plan and the Delta Stewardship Council) what the State Water Board learned about what water flows fish in the Bay-Delta estuary need to avoid extinction and recover to their once substantial levels of abundance. To the extent that fish rely on other creatures in the Delta estuary's ecosystem, the Board should address them as well. This planning information will help with balancing efforts later.

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[1] State Water Resources Control Board, *Draft Water Quality Control Plan*, October 1988, see especially Chapter 5; and State Water Resources Control Board, *Draft Water Rights Decision 1630*, December 1992.

Summary of C-WIN Delta Flow Criteria Recommendations

The California Department of Fish and Game (DFG) prepared flow recommendations in 1992 that took account of both estuarine fish and anadromous fish flow needs in the Delta.[2] DFG flow recommendations included operational changes in the state and federal water projects as well: a four-month closure of the Delta Cross Channel gates and Georgiana Slough and a zero-export period from April 1 through June 30 to enable migratory fish to use Old and Middle Rivers as migration corridors to the sea. In so doing, anadromous salmonids would thereby avoid the hypoxic Stockton Deep Water Ship Channel and the threat of entrainment at the export pumps during this crucial period in their life histories. C-WIN has incorporated this approach to protecting public trust resources into our flow criteria recommendations.

C-WIN's full specific recommendations appear in Table 4 of our February 16, 2010, testimony (C-WIN Exhibit 2), except where we clarify them in this closing statement, below. Table 1 to C-WIN's closing statement presents a water-year schedule of our flow recommendations.

C-WIN recommends that the State Water Board apply two general flow regimes to the Delta to protect and recover public trust resources: one regime would be based on the close linkages between riverine inflows to the Delta, the position of X2 (the estuarine standard), and Delta outflows (measured at Chipps Island) and the life histories of estuarine fish species ; and a second regime based on pulse flows that match and facilitate the early life stages of salmonid larvae, juvenile rearing, and smoltification. The inflow/X2/outflow "estuary" regime is constructed as a year-round flow regime, while the pulse flow regime focuses on late winter through spring flow periods along with a brief 10-day pulse flow in late October intended to attract adult spawning salmonids to the San Joaquin river basin.

Estuary Flow Criteria: C-WIN's recommended Delta outflows would have critical-to-wet year monthly average flow ranges of 9,100 cubic feet per second (cfs) to 91,800 cfs from February through March; 6,700 to 43,000 cfs from April through July; and 4,100 to 29,000 cfs from August through January. The numeric midpoint of these ranges are 50,500 cfs in February through March; 24,850 cfs in April through July, and 16,500 cfs from August through January. To support these outflows, C-WIN recommends minimum flows of 6,000 cfs in all years for all months from February through October.[3] Because these recommendations call for more sustained Delta outflows throughout the water year, C-WIN also recommends that the State Board include a narrative criterion stating that Valley outflows (understood as flows from all major tributaries of the Sacramento and San Joaquin Rivers as well as other tributaries[4]) shall reflect fair-share

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[2] C-WIN Exhibit 20, California Department of Fish and Game, 1992. *Summary and Recommendations for the Department of Fish and Games Testimony on the Sacramento-San Joaquin Estuary*, WRINT-DFG Exhibit No. 8. Because the Department endorsed its 1992 testimony in DFG's 2010 Exhibit 5 (point 4, p. 3) to this proceeding, we have included the flows identified in C-WIN Exhibit 20 in our summary comparison table of recommendations attached to this Closing Statement.

[3] Mention here of a "midpoint flow" is intended simply to represent only the flow value that is midway between the critically dry year and wet year flows identified in C-WIN's more detailed flow critieria in Table 4 of C-WIN Exhibit 2. "Midpoint flow" is not a target, only a central tendency in the identified range of Delta outflow criteria that C-WIN recommends.

[4] C-WIN's recommended tributaries for inclusion in this method are found in Table 4 of C-WIN Exhibit 2.

contributions to Valley outflows from all of these tributaries in order to meet our recommended Delta outflow criteria recommendations.[5]

The functional benefits of these flows to the Delta ecosystem would include expansion of the volume of suitable estuarine aquatic habitat associated with the low salinity zone in the Delta, generation of frequent flows that carry high sediment loads needed to facilitate Delta smelt larval feeding patterns in the western Delta in the wintertime, as well as to create a more sustained freshwater environment in the western Delta and Suisun Bay areas to help suppress invasive species such as *Corbula amurensis* (the overbite clam). Higher base flows than now occur in the Delta can also result in floodplain inundation at Yolo Bypass and in other seasonal wetlands in the lower Sacramento and lower San Joaquin River systems, expanding significantly rearing habitat for juvenile estuarine and anadromous fish species in the late winter and early spring. Higher base flows as contained in C-WIN's recommendations in the late summer and early fall can keep the low salinity zone of the Delta larger and deeper (with X2 in a more westerly position than in the 1986 to 2005 hydrology cited by Fleenor, et al[6])for longer and more consistent periods which will expand over time the low salinity and higher turbidity flow events needed by Delta smelt and other estuarine fish for cover from predation.

Pulse Flow Criteria: C-WIN's recommended pulse flow criteria are intended to improve the access of anadromous salmonid species to passable and survivable migration corridors, to cold water essential to fingerling and juvenile development in tributaries of the Central Valley watershed, to seasonal wetland and floodplain habitat where juvenile life stages (including Sacramento splittail upstream, and Delta smelt and striped bass migrating to Suisun Marsh in late winter and early spring using high flows) as well as salmonid smolts that complete the journey to the ocean, to prevent entrainment of juvenile salmonids and smolts (and other larval fish) at the state and federal export pumps, and to attract adult salmonids escaping the ocean in October to return to their natal streams to spawn and resume the life cycle of their race.

For the Sacramento Valley rivers, C-WIN recommends an average minimum outflow from Freeport to Chipps Island of 30,000 cfs between April 1 and June 30 in all years. C-WIN's base Delta outflows would require Sacramento tributary and mainstem flows that would provide cold water to maintain temperatures at no higher than 59 degrees Fahrenheit from December 1 through May 15 measured at the confluences of each tributary and the I Street Bridge in Sacramento (at least in wet and above normal years at I Street). These base flows would protect salmonid rearing habitat in the upstream tributaries so that they grow and develop early so that they are ready to migrate to the Delta as part of our recommended three-month flow of 30,000 cfs where they could finish juvenile growth and undergo smoltification before heading to the Pacific Ocean. We believe these flows would be more protective of public trust resources than now occurs under D-1641 regulations and their performance, some aspects of which are summarized in Table 2 to this closing statement.

C-WIN's San Joaquin Valley outflows are derived from the recommended tributary flows identified in C-WIN Exhibit 19. To the tributary flows (each measured at their confluences with the San Joaquin River mainstem), we add in a flow of the San Joaquin River below Millerton

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[5] C-WIN cites past examples of fair-share approaches to allocating source flow responsibilities for Delta outflow by the California Department of Fish and Game and the State Water Resources Control Board at C-WIN Exhibit 2, pp. 23-24.

[6] William E. Fleenor, William B. Bennett, Peter B. Moyle, and Jay R Lund, *On Developing Prescriptions for Freshwater Flows to Sustain Desirable Fishes in the Sacramento-San Joaquin Delta*, University of California, Davis: Center for Watershed Sciences, 15 February 2010, Figure 8,, p. 13. Expressed in terms of Figure 8, C-WIN's recommendations are intended to move X2 in the fall more towards point A and away from either of points B and C.

Lake reflecting that river's fair-share unimpaired flow, as well as accretions and other inflows. This flow is added to those of the tributaries shown in C-WIN Exhibit 2, Table 4, and are assumed to be flow criteria that should be measured at Vernalis, and are considered in our recommendations to reflect San Joaquin Valley outflow criteria, and are summarized in Tables 1 and 2 of this closing statement.

C-WIN recommends a more detailed schedule of pulse flow criteria for outflows from the San Joaquin Valley tributaries and mainstem because flows contributions from the San Joaquin River basin have lagged significantly relative to unimpaired flows for the Valley over time due to upstream reservoir retention and diversions to more senior agricultural and urban water right holders. Our recommendations above for tributary temperature control at no higher than 59 degrees F between December 1 and May 15 also apply to San Joaquin Valley tributary streams, measured at their confluences with the San Joaquin mainstem, and at Vernalis. These flows are intended to help get juveniles fat and sassy and ready to migrate when larger pulse flows occur. Table 1 shows brief pulse flows from February 15 to March 15 that average 13,400 cfs in the San Joaquin River at Vernalis for 2 days in critical and dry years to a maximum of 17 days of the 29 to 30-day period. Atop these pulse flows would be an additional pulse flow of 26,800 cfs in below and above normal and wet years (ranging from 2 day bursts in below normal years to 5 day bursts in wet years). These two-tier pulse flows are intended to provide ample cold-water for rearing juveniles in the basin's tributaries and expand rearing habitat in local wetlands and floodplain areas.

By March 16, flows in the San Joaquin Valley would be reduced to an average of 4,500 cfs in the rest of March in all water year types (except wet years where minimum flows would average 13,400 cfs through to May 15). Between April 1 and April 15, average flows would be required to increase to 6,700 cfs, followed by average flows of 8,900 cfs through the last half of April. In critical and dry years, average flows from the San Joaquin Valley streams would be reduced to 1,200 cfs from May 1 through June 16. In below and above normal water years, average flows would be 11,200 cfs from May 1 through May 15. In these years, average flows would reduce to 1,200 cfs from mid-May through mid-June, after which other rules would govern tributary and mainstem streamflows in the Valley. In wet years, flows between May 15 and June 16 would increase from an average of 13,400 cfs to 14,900 cfs.[7]

Sustaining flows from February through June each year will provide flows sufficient for anadromous salmonids to complete their life stages in the upstream tributaries, rear successfully as juveniles and make the transition to their adult life stages in the ocean.

To prevent entrainment and keep migration corridors open to maximize salmon juvenile and smolt survival, **C-WIN recommends closing Delta Cross Channel Gates and Georgiana Slough (by introducing an acoustical barrier) from February 1 through June 30[8] and mandating an export pumping rate of 0 cfs from March 15 through June 30.** C-WIN believes that an Old and Middle River migration corridor would be much safer for rearing salmon juveniles migrating smolts than the path through the Stockton Deep Water Ship Channel, and therefore more protective of these public trust resources. We also believe these flows would be more protective of public trust resources than now occurs under D-1641 regulations and their performance, some aspects of which are summarized in Table 2 to this closing statement.

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[7] Testimony of Carl Mesick, *Statement of Key Issues on the Volume, Quality, and Timing of Delta Outflows, Necessary for the Delta Ecosystem to Protect Public Trust Resources with Particular Reference to Fall-Run Chinook Salmon in the San Joaquin River Basin*, February 16, 2010, Table 1, p.3.

[8] The California Department of Fish and Game recommended the same closures in 1992 (see footnote 2 above).

In the central and south Delta, C-WIN recommends positive (downstream) flows of 2,000 cfs daily in Old and Middle rivers from the head of Old River to the downstream confluence of Old River with the San Joaquin River, and in Middle River. The functional ecosystem benefits of these flow criteria include maintaining salmonid outmigration corridors and entrainment prevention for young salmonids, all of which are strongly and positively correlated with increased salmon smolt survival and adult escapement 2.5 years later.[9] We believe these flows would be more protective of public trust resources than now occurs under D-1641 regulations and their performance, some aspects of which are summarized in Table 2 to this closing statement.

Comparing Delta Flow Criteria

C-WIN urges the State Water Board take into consideration Tables 1 through 4 of C-WIN Exhibit 2 (pages 27 through 34) together with our Table 2, the comparative table attached to C-WIN's closing statement (starting on page 12, attached) as part of the Board's deliberations over what flows fish need in the Delta estuary. In our closing statement Table 2, C-WIN has incorporated for comparison a column about D-1641, the current flow regime (regulatory framework and some performance indicators) for Delta flow criteria.

By comparing these tables C-WIN hopes that the State Water Board will see the broad agreement across the decades since 1987 and 1992 that Delta fish species need greatly increased Delta outflows during the spring months April through the end of June in order to improve the survival of salmon smolts. Regarding estuarine resident species, refer to Table 2 of C-WIN Exhibit 2 to see the State Water Board's own recommended "optimal levels of protection" for striped bass from 1988 which called for robust average daily Delta outflows at Chipps Island ranging from 33,900 cfs for April and May in all years, 32,400 cfs for the month of June in all years, and 29,100 cfs in the month of July in all years. C-WIN's own similar standards for Delta outflow flows across water year types reflect the variability of the Delta hydrograph throughout the year, and are all in the five-figure order-of-magnitude.

C-WIN's recommendations to close Georgiana Slough and the Delta Cross Channel, and stop export pumping in the south Delta closely parallel those offered by the California Department of Fish and Game to the State Water Board in 1992. We also echo Fish and Game's proposal that the State Water Board assign responsibility on a fair share basis for allocating tributary flows that would be sufficient to support Delta outflows needed to protect public trust resources in the Delta. Such inflows are necessary to sustain Delta outflows that would protect public trust resources. These are still excellent ideas that, once implemented, would go a long way to help Delta estuarine resident fish and anadromous fish populations recover. Had they been followed and sustained since 1992, it is probable that the 2010 Delta flow criteria proceedings would not have been needed because the Delta's ecosystems would function better than they now do.

Can Habitat Substitute for Flows?

Consistent with the answers the State Water Board received from biologists and hydrologists with UC Davis, the California Department of Fish and Game, the US Fish and Wildlife Service, the Bay Institute, and others, simple provision of a variety of suitable habitat locations will not substitute for flows in the Bay-Delta estuary system. The decline of both estuarine and migratory fish species in the Delta ecosystem coincides with the imposition of a flow regime on the Delta that starves the estuary for water. Exports and upstream diversions have deprived the Delta of large amounts of water cumulatively over the decades that they have

[9] See C-WIN Exhibits 21 and 22.

occurred.[10] The great risks of providing habitat without committing to increased Delta outflows is that migration corridors will remain compromised, entrainment of listed fish species would continue, and temporarily inundated floodplains and wetlands would dry out to quickly, stranding listed species without flows needed to prevent their dying. It is also that providing habitat without committing to providing needed flows would be a waste of taxpayer resources, the ecological equivalent of a stranded asset.

Can Stressor Loads Be Reduced Without Flows?

The effects that stressors (such as nutrient [e.g., nitrate], pesticide, and other toxic contaminant loads) in the Delta estuary cause fish species are magnified the longer these stressors reside in the Delta. The longer they reside, the more likely that organisms at all nodes of the Delta's benthic and pelagic food webs will ingest and bioaccumulate some of these stressors and experience their toxicity over time. The cumulative impact of lower flows in the Delta lengthens residence times of the waters that enter, increasing the exposure of fish to their toxicity. Stressor loads may be increased to some degree by increased flows, but on the other hand, residence times of impaired water volumes flowing into the Delta will decrease, and so the net effect of stressors is likely to decrease over time.

What Effects Would a North Delta Diversion Have?

Water Board members requested that Delta flow criteria proceeding participants address this question in their remarks. This question is beyond the scope of the proceeding as defined by the State Water Board in its Notice of December 16, 2009, and its Revised Notice of January 2010. The Board did not request participant research into this topic for preparation of testimony. Two remarks by scientific and professional panelists stand out in our minds as succinct and telling answers to this question: on one hand, a north Delta diversion for a peripheral conveyance system would redirect to the Sacramento River the impacts of reduced inflows and entrainment/ fish kills now experienced along the San Joaquin and Old Rivers entering the Delta. On the other hand, from a water quality standpoint, if flows in the San Joaquin River were not increased significantly to compensate hydraulically for loss of freshwater crossing the Delta as reverse flows in Old and Middle River to the pumps, then south Delta channels would become tidally influenced toxic sumps.

But the State Water Board has not sought scientific research from participants to the Delta Flow Criteria proceeding on these matters and we urge the State Water Board to refrain from making findings about the flow and entrainment effects of a peripheral conveyance diversion in the North Delta when it transmits its final planning recommendations.

What Actions Should Be Taken Quickly?

C-WIN suggests that the State Water Board could adopt draft Decision 1630 from December 1992 as an interim water right decision and then hold an evidentiary proceeding prior to adopting it as a final decision. This draft water right decision contained flow recommendations, operational restrictions, a method for fair share allocation of tributary flow responsibilities, and

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[10] Fleenor, et al (note 6 above) report that net Delta outflows decreased from 23.8 million acre-feet per year between 1969 and 1985 to 16.6 million acre-feet per year between 1986 and 2005, an average decline of 30 percent. San Joaquin River outflow, over these same periods, decreased from an average of 4.1 to 0.9 million-acre-feet per year, a 78 percent decline, while Sacramento River outflows to the Delta decreased by 18 percent. See Fleenor et al, Table 2, p. 9.Similar patterns were observed for earlier historical periods in the work of Michael Rozengurt, Michael J. Herz and Sergio Feld, *The Role of Water Diversions in the Decline of Fisheries of the Delta-San Francisco Bay and Other Estuaries*, Technical Report Number 87-8, Romberg Tiburon Center Exhibit #20 for the State Water Resources Control Board Bay-Delta Hearings, September 1987. Inflows to the Delta have been diverted within and upstream of the Delta at pumping plants and reservoirs on Delta tributary streams, resulting in a shift of larger seasonal inflows from winter and spring to summer and fall. See also C-WIN Exhibit 6, p. 7.

water conservation policies that would put California on a path to greater water supply reliability and would be much more protective of public trust resources in the Delta than the flow regime that is now in place.

Other than that action, C-WIN believes that the State Water Board is not positioned well to act quickly at this time. The Board has currently no evidentiary proceedings under way that could take up and address these flow criteria recommendations promptly, though it could have recently. We respectfully remind the Board that the Board rejected a public trust and waste and unreasonable water use and diversion complaint concerning Delta public trust resources that was lodged in March 2008 by C-WIN. This complaint challenged the State Water Board to exercise its duty to adjudicate petitions raising violations of the public trust (given the Board's authority over both water rights and the public trust), and to reexamine past water allocations due to the deteriorating ecological conditions in the Delta (that is, the pelagic organism decline, the collapse of Central Valley salmonid populations, and the estuary's deteriorating water quality).[11]

C-WIN's complaint was rejected by the State Water Board several months later. C-WIN now offers the State Board a set of action steps to implement C-WIN's Delta flow criteria recommendations that would acknowledge the clear and present danger to Delta estuarine and migratory fish from maintaining the status quo flow regime under D-1641:

- Issue an emergency water rights order that closes the Delta Cross Channel gates and Georgiana Slough between February 1 and June 30 in all years.
- Issue an emergency water rights order to shut down export pumping at Banks and Jones pumping plants between March 15 and June 30 of each water year.
- Initiate an evidentiary proceeding with the goal of imposing tight source control regulations on drainage discharges from lands in the western San Joaquin Valley to the San Joaquin River and associated tributaries to significantly reduce loading of toxic stressors to that river system (which become inflows to the Delta) such as selenium, boron, molybdenum, arsenic, mercury, and salts. Related to this we would urge the State Water Board to limit the Grasslands Bypass Project basin plan amendment this summer when it arrives from the Central Valley Regional Water Quality Control Board to a two-year extension so that this region of the San Joaquin Valley can prepare for land retirement.
- Initiate a separate but related evidentiary proceeding with the purposes of implementing Delta public trust resource protective outflows, and determining a method for devising and sustaining fair-share tributary contributions to Delta inflows needed to sustain protective Delta outflow, X2, and pulse flow criteria.

C-WIN respectfully reminds the State Water Board that it has ample authority to undertake these actions on its own initiative, quite apart from the mandate for this informational flow criteria proceeding set forth in the California Water Code Section 85086. These authorities include:

- Consideration of the public trust when allocating water.
- Re-examination of past allocations whenever circumstances change or the passage of time warrants review.

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[11] California Water Impact Network and California Sportfishing Protection Alliance vs. US Bureau of Reclamation, California Department of Water Resources, *Complaint before the State Water Resources Control Board regarding Central Valley rivers, tributary to the Sacramento and San Joaquin River thence Bay Delta Estuary thence Pacific Ocean*, March 18, 2008. Available online at http://www.c-win.org/our-2008-delta-public-trust-complaint.html. See also C-WIN's comments on the State Water Resources Control Board's *Draft Strategic WorkPlan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 8 July 2008.

- Balancing public trust needs against other traditional water rights requirements under Article 10, Section2 of the California Constitution.
- Entertaining and adjudicating petitions raising violation of the public trust.[12]

C-WIN thanks you for the opportunity to participate in this informational proceeding.

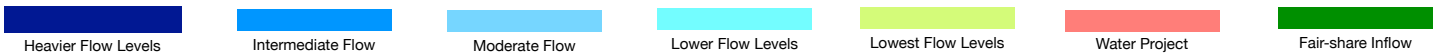
[12] Atwater and Markle, *Overview of California Water Rights and Water Quality Law*, Pacific Law Journal 19(1988): 957, 958.

Table 1: Summary of Water Year Schedule of Delta Flow Criteria Recommendations

Location for Flow Criterion	Criterion for Ecosystem Function	October	November	December	January	February	March	April	May	June	July	August	September
Delta Outflow at Chipps Island	Estuarine Habitat Expansion and Invasive Species Suppression	29,000 (wet) to 4,100 (critical) cfs; midpoint flows ~16,500 cfs				91,800 (wet) to 9,100 (critical) cfs; midpoint flows ~50,500 cfs		43,000 (wet) to 6,700 (critical) cfs; midpoint flows ~24,850 cfs				29,000 (wet) to 4,100 (critical) cfs; midpoint flows ~16,500 cfs	
X2 and/or San Joaquin River at Jersey Point	Estuarine Salinity Regulation and Habitat Expansion and Variability	50 km (wet) to 90 km (critical) east of Golden Gate; midpoint X2 (flow-derived) ~ between 75 and 70 km most years				51 km (wet) to 79 km (critical) east of Golden Gate; midpoint X2 (flow-derived) < 60 km most years		54 km (wet) to 83 km (critical); midpoint X2 (flow-derived) < 70 km most years				50 km (wet) to 90 km (critical) east of Golden Gate; midpoint X2 (flow-derived) ~ < 75 km most years	
Sacramento Valley Outflows	Base Flows					Minimum 6,000 cfs in all years, measured at Rio Vista							
	Pulse Flows for juvenile salmon and smolt migration							30,000 cfs in all years from Freeport to Chipps Island					
Old River from Head of Old River to to Downstream Confluence with San Joaquin River	Maintain Salmonid Outmigration Corridor						2,000 cfs daily flow from March 15 through May 15 in all years						
Old and Middle River	Flow Direction, Entrainment Prevention and Provision of Migration Corridors						2,000 cfs daily flow from March 15 through May 15 in all years						
San Joaquin Valley Outflows	Pulse Flows in All Years to Attract Adult Spawning Salmonids, Oct 20 to 29		<-- 5,400 cfs on the San Joaquin River at Vernalis										
San Joaquin Valley Outflows	Pulse Flows for Temperature Control, Habitat Inundation, and Migration					San Joaquin Valley pulse flows above are intended to maintain tributary temperatures at no higher than 59 degrees F, and provide migration cues for juvenile salmon and to get juveniles to the Delta to rear before Delta water temperatures get too warm.							
	Wet years					13,400 cfs for 17 days and 26,800 cfs for 5 days	13,400 cfs average monthly flows, contributed on fair share basis from major tributaries		14,900 cfs average monthly flows				
	Above Normal Years					13,400 cfs for 13 days and 26,800 cfs for 5 days	4,500 cfs avg flows	6,700 cfs avg flows	8,900 cfs avg flows	11,200 cfs avg flows	1,200 cfs average flows, May 16-June 15		
	Below Normal Years					13,400 cfs for 16 days and 26,800 cfs for 2 days	4,500 cfs avg flows	6,700 cfs avg flows	8,900 cfs avg flows	11,200 cfs avg flows	1,200 cfs average flows, May 16-June 15		
	Dry Years					13,400 cfs for 2 days	4,500 cfs avg flows	6,700 cfs avg flows	8,900 cfs avg flows	1,200 cfs average flows, May 1-June 15			
	Critically Dry Years					13,400 cfs for 2 days	4,500 cfs avg flows	6,700 cfs avg flows	8,900 cfs avg flows	1,200 cfs average flows, May 1-June 15			
Delta Cross Channel and Georgiana Slough	Salmonid Juvenile and Smolt Survival via Entrainment Protection					Delta Cross Channel gates and Georgiana Slough (via an acoustical barrier) would be closed.							
Banks, Jones and Contra Costa Pumping Plants	Export Pumping Rate						Combined export rate would be 0 cfs in all years, March 16 through June 30						
Mainstem Tributary Streams of the Central Valley Watershed	Inflow Contributions to Delta Outflow	Determine for all water years equitable shares of flow contributions allocated among all Central Valley watershed tributary streams to determine inflows to the Delta sufficient to meet Delta outflow needs.											
Mainstem Tributary Streams of the Central Valley Watershed	Temperature Protection for Juvenile Salmon and Salmon Smolts					Sacramento Valley and San Joaquin Valley pulse flows (above) are intended to maintain tributary temperatures at no higher than 59 degrees F, and provide migration cues for juvenile salmon and to get juveniles to the Delta to rear before Delta water temperatures get too warm.							
Sacramento and San Joaquin River Floodplains and Seasonal Wetlands	Floodplain Inundation for Habitat Expansion and Variability					See San Joaquin Valley Outflows above for Feb 15 thru March 15.							

Sources: Flow parameters provided here are summaries of our actual recommendations contained in C-WIN Exhibit 2, Table 4: Testimony of Carl Mesick, *Statement of Key Issues on the Volume, Quality, and Timing of Delta Outflows, Necessary for the Delta Ecosystem to Protect Public Trust Resources with Particular Reference to Fall-Run Chinook Salmon in the San Joaquin River Basin,* February 16, 2010, Table 1, p.3

Legend



April 14, 2010

Location for Flow Criterion	Ecosystem Function	Current Delta Flow Performance and/or Criteria	Table 2: Comparison of Selected Delta Flow Criteria Recommendations, 2010				
		State Water Resources Control Board D-1641 (Table 3, pages 184, 186, 187; unless otherwise noted)	UC Davis Experts (All flows from Table 3, page 19)	California Department of Fish and Game (DFG Exhibits 1, 2, 3, and 4; unless otherwise noted)	US Department of the Interior (US DOI, unless otherwise noted)	Bay Institute (Exhibits 2, 3, and 4)	California Water Impact Network (Exhibit 2, Table 4, pp. 30-34)
		DISCLAIMER: These Delta flow criteria recommendations are compared here for illustrative purposes only. For full descriptions, see original narrative information submitted as testimony to the State Water Resources Control Board.					
Delta Outflows at Chipps Island	Estuarine Habitat Expansion, Invasive Species Suppression	From February through June, Net Delta Outflow is governed by X2 position modulated by number of days at a given position between Chipps Island and Port Chicago. X2 was equally likely to be under or over 80 km from the Golden Gate (near Collinsville, east of Chipps Island). X2 was likely to be east of 71 km location (west of Chipps Island) 80 percent of the time. (UC Davis Experts, Figure 8, p. 13) In July net Delta outflow could range from 4,000 to 8,000 cfs by water year type; in August 3,000 to 4,000 cfs; in September 3,000 cfs in all years; in October 4,000 cfs in all years, except 3,000 in critical years; and in November through January, 4,500 cfs in all years except critical years in November and December.	Net Delta outflows should be 48,000 cfs from April through June in 5 of every 10 years; *Egeria* suppression flows of 8,000 cfs from August through September for 3 driest of every 10 years; and *Corbula* clam suppression flows of 120,000 cfs from February through April in 3 of every 10 years.	In three 1992 alternative scenarios, DFG presented April through July mean Delta outflows ranging from 4,500 cfs to 6,700 cfs in critical years, to 29,000 cfs to 43,000 cfs in wet years. DFG presented August through December outflows ranging from 3,700 cfs in critical years to 14,300 cfs in wet years. They also presented February Delta outflows ranging from 8,000 cfs in critical years to 93,500 cfs in wet years; and for March Delta outflows ranging from 7,200 cfs in critical years to 74,300 cfs in wet years. (WRINT-DFG Exhibit 8, 1992)	Historical flows between 1969 to 1985 should be more relevant for establishing fish flows since this was a time when fish abundance cohabited with some export activity. (USDOI, p. 48)	Outflows in January through June period should exceed 6.3 MAF in at least 8 of 10 years; exceed 13.5 MAF in half of years; and exceed 20 MAF in at least one-third of years. Outflows of less than 3.2 MAF should occur in no more than 1 of every 20 years (TBI, Exhibit 2, p. 25); fall Delta outflows (September through November) should be no less than 5,750 cfs in all years; no less than 7,500 cfs in dry years; no less than 9,700 cfs in below normal years; no less than 12,400 cfs in above normal years; and no less than 16,100 cfs in wet years to protect abundance and spatial extent of public trust resources. (TBI, Exhibit 2, p. 35)	Delta outflows from February 1 through March 31 would range from averages of 9,100 cfs (critical) to 91,800 cfs (wet); April 1 through July 31 would range from averages of 6,700 cfs (critical) to 43,000 cfs (wet); and from August 1 through January 31 would range from averages of 4,100 cfs (critical) to 29,000 cfs (wet).
X2 and/or San Joaquin River at Jersey Point	Estuarine Salinity Regulation and Habitat Expansion and Variability	X2 was equally likely to be under or over 80 km from the Golden Gate (near Collinsville, east of Chipps Island). X2 was likely to be east of 71 km location (west of Chipps Island) 80 percent of the time. (UC Davis Experts, Figure 8, p. 13)	None offered; however, historically under unimpaired flows, X2 was "equally likely to be upstream or downstream of the 71 km location [west of Chipps Island in Suisun Bay]" (Figure 8, p. 13).	DFG recommended in its Exhibit 2 a composite estuarine indicator that incorporates X2, unimpaired runoff, sediment, mysid shrimp density which indicates a downward trend since the mid-1960s after which State Water Project exports began. (DFG Exhibit 2, pages 1-4 (including Table 1) 6, 13).	Move X2 westward in fall to increase quality and quantity of suitable Delta smelt habitat, reduce risk of pump entrainment. (USDOI, p. 46)	Average monthly X2 values for September through November should be less than 83 km from Golden Gate in all years; < 80 km in dry years; < 77 km in below normal years; < 74 km in above normal years; and < 71 km in wet years. (TBI, Exhibit 2, Table 1, p. 35)	Average 14-day running average position of X2 measured 1 meter from channel bottom, expressed in kilometers from the Golden Gate: Feb 1 through March 31: 51 km (wet) to 79 (critical); April 1 through July 31: 54 km (wet) to 83 (critical); August 1 through January 31: 50 km (wet) to 90 km (critical). (C-WIN, Exhibit 2, Table 4, p. 33)

Location for Flow Criterion	Ecosystem Function	Current Delta Flow Performance and/or Criteria	Table 2: Comparison of Selected Delta Flow Criteria Recommendations, 2010				
		State Water Resources Control Board D-1641 (Table 3, pages 184, 186, 187; unless otherwise noted)	UC Davis Experts (All flows from Table 3, page 19)	California Department of Fish and Game (DFG Exhibits 1, 2, 3, and 4; unless otherwise noted)	US Department of the Interior (US DOI, unless otherwise noted)	Bay Institute (Exhibits 2, 3, and 4)	California Water Impact Network (Exhibit 2, Table 4, pp. 30-34)
			DISCLAIMER: These Delta flow criteria recommendations are compared here for illustrative purposes only. For full descriptions, see original narrative information submitted as testimony to the State Water Resources Control Board.				
Sacramento Valley Outflows	Base Flows	Base flows at Rio Vista established only for Sept through Dec all years, ranging from 3,000 cfs in critical years to 4,500 cfs in non-critical years.	10,000 cfs in all months in all years				6,000 cfs February 1 through October 30 in all years measured at Rio Vista.
	Pulse Flows for adult salmon		10,000 cfs from October through June, 6 of 10 years				
	Pulse flows for juvenile salmon and smolt migration		25,000 cfs from March through June, 6 of 10 years	Maximum survival of salmon smolts was observed at or above 20,000 to 30,000 cfs. Flows are important for Chinook salmon smolts from November through June, with the greatest need for flows occuring in May.	Provide flows that mimic natural hydrograph. Smolt survival is maximized between 20,000 and 30,000 cfs flow at Rio Vista in spring months. (USDOI, p. 57)		30,000 cfs April 1 through June 30 in all years, from Freeport to Chipps Island.
	Pulse flows for adult sturgeon migration		70,000 cfs from January through May, 1 year in 10	Increased early spring Delta and river flows would likely increase attraction and successful migration of adult green sturgeon and white sturgeon, both of which are presumed to spawn in the mainstem Sacramento River.			
	Suppression Flows for *Corbula amurensis*		120,000 cfs from February through April, 3 years of 10				

Location for Flow Criterion	Ecosystem Function		Current Delta Flow Performance and/or Criteria	Table 2: Comparison of Selected Delta Flow Criteria Recommendations, 2010				
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				DISCLAIMER: These Delta flow criteria recommendations are compared here for illustrative purposes only. For full descriptions, see original narrative information submitted as testimony to the State Water Resources Control Board.				
Old River from Head of Old River to Downstream Confluence with San Joaquin River	Maintain salmonid outmigration corridor							2,000 cfs from March 15 through May 15.
Old and Middle River	Flow Direction, Entrainment Prevention and Provision of Migration Corridors		Historically, under unimpaired flows, net OMR flows > 0 cfs occurred only about 8 percent of the time. (UC Davis Experts, Figure 9, p. 15, point B)	None offered; however, historically under unimpaired flows, net OMR flows > 0 about 84 percent of the time.	DFG reports that "increased flow into the south Delta increases survival by reducing the effects of these various mortality factors"; that is, of Port of Stockton ship traffic (DWSC) and entrainment at the export pumps. DFG Exhibit 3, p. 14.	Inverse relation between OMR flows and Delta smelt and other fish salvage at pumps. State Water Board should develop criteria for OMR positive net flows (flows > 0 cfs) in January through June to protect public trust resources. (USDOI, p. 53)	Base net OMR flows of > -2,000 cfs from October through June; adjusted as follows: in December through February in all year types, net OMR flows should be > -1,500 cfs, and > -1,500 cfs in critical years in March as well; positive net OMR flows > 0 cfs from March through May in all years except for March in critical years; and > -1,500 cfs in June of all years. (TBI, Exhibit 4, Table 1, p. 30)	Base positive net OMR flow of 2,000 cfs March 15, through May 15 in all years. Pulse flows derived from San Joaquin Valley outflows (see below).
San Joaquin Valley Outflows	All Years	Pulse Flows to Attract Adult Spawning Salmonids		2,000 cfs in all months of all years.		1,000 cfs pulse flow for 10 days in mid-October needed to maintain high levels of gamete viability in migrating salmon and to minimize straying to the Sacramento River watershed during periods of high exports (i.e., exports no more than 300% of Vernalis flow). USFWS, 2005, p. 12.	July through February in all years, 2,000 cfs (TBI, Exhibit 3, p. 28)	5,400 cfs on the San Joaquin River at Vernalis, with each major tributary contributing 1,200 cfs at their confluences with the San Joaquin River from October 20 to October 29.

Table 2: Comparison of Selected Delta Flow Criteria Recommendations, 2010

DISCLAIMER: These Delta flow criteria recommendations are compared here for illustrative purposes only. For full descriptions, see original narrative information submitted as testimony to the State Water Resources Control Board.

Location for Flow Criterion	Ecosystem Function		Current Delta Flow Performance and/or Criteria: State Water Resources Control Board D-1641 (Table 3, pages 184, 186, 187; unless otherwise noted)		UC Davis Experts (All flows from Table 3, page 19)	California Department of Fish and Game (DFG Exhibits 1, 2, 3, and 4; unless otherwise noted)	US Department of the Interior (US DOI, unless otherwise noted)	Bay Institute (Exhibits 2, 3, and 4)	California Water Impact Network (Exhibit 2, Table 4, pp. 30-34)
San Joaquin Valley Outflows	Wet Years	Pulse Flows for Temp Control, Habitat Inundation and Migration	**Non-VAMP Flow Dates -** Feb 1 - April 14; May 16 - June 30 (Higher flow to move X2 west of Chipps Island) **2,130 or 3,420 cfs**	**VAMP Flow Dates** - April 15 through May 15 (Higher flow to move X2 west of Chipps Island) **7,330 or 8,620 cfs**	20,000 cfs from April through June, 2 years of every 10	15,000 cfs for 70 days in VAMP-like spring period. Pulse flows based on DFG's San Joaquin River modeling program. DFG's model projects a 191 percent increase in Chipps Island smolt abundance, and a 104 percent increase in projected escapement later.	Flows to implement anadromous fish doubling goals, combined late winter and spring average monthly flows for San Joaquin River tributaries, plus other accretions and inflows, measured in cfs at Vernalis.* Month / Flow (cfs) February 6,600 March 13,200 April 15,600 May 25,900 USFWS, 2005, p. 10.	Late March, 5,000 cfs; April through mid-May, 20,000 cfs; Late May through mid-June, 7,000 cfs; late June 2,000 cfs. Flow regime recommended for 20 percent of all years (TBI, Exhibit 3, p. 28)	Combined flow releases for Stanislaus, Tuolumne, Merced and San Joaquin Rivers, plus other accretions and inflows, measured in cfs at Vernalis.** **Feb 15 to March 15 flows for rearing habitat in floodplains would call for 13,400 cfs for 17 days and 26,800 cfs for 5 days.** March 15 - 31: 13,400 April 1-15: 13,400 April 16-20: 13,400 April 21-30: 13,400 May 1-15: 13,400 May 16-June 15: 14,900
San Joaquin Valley Outflows	Above Norm Years	Pulse Flows for Temp Control, Habitat Inundation and Migration	Non-VAMP Flow Dates 2,130 or 3,420 cfs	VAMP Flow Dates 5,730 or 7,020 cfs	15,000 cfs from April through mid-June, 4 years of every 10	10,000 cfs for 60 days in VAMP-like spring period. Pulse flows based on DFG's San Joaquin River modeling program. DFG's model projects a 102 percent increase in Chipps Island smolt abundance, and a 58 percent increase in projected escapement later.	Average monthly fish doubling flows for combined San Joaquin Valley rivers, other inflows and accretions.* Month / Flow (cfs) February 3,800 March 7,700 April 12,200 May 20,500 USFWS, 2005, p. 10.	Late March, 5,000 cfs; April, 20,000 cfs; May, 7,000 cfs; June, 2,000 cfs. Flow regime recommended for 40 percent of all years (TBI, Exhibit 3, p. 28)	Date / Combined San Joaquin Valley Flows February 15 - March 15: 13,400 for 13 days; 26,800 for 5 days March 15 - 31: 4,500 April 1-15: 6,700 April 16-20: 8,900 April 21-30: 8,900 May 1-15: 11,200 May 16-June 15: 1,200

Location for Flow Criterion	Ecosystem Function		Current Delta Flow Performance and/or Criteria		Table 2: Comparison of Selected Delta Flow Criteria Recommendations, 2010					
			State Water Resources Control Board D-1641 (Table 3, pages 184, 186, 187; unless otherwise noted)		UC Davis Experts (All flows from Table 3, page 19)	California Department of Fish and Game (DFG Exhibits 1, 2, 3, and 4; unless otherwise noted)	US Department of the Interior (US DOI, unless otherwise noted)	Bay Institute (Exhibits 2, 3, and 4)	California Water Impact Network (Exhibit 2, Table 4, pp. 30-34)	
			DISCLAIMER: These Delta flow criteria recommendations are compared here for illustrative purposes only. For full descriptions, see original narrative information submitted as testimony to the State Water Resources Control Board.							
San Joaquin Valley Outflows	Below Norm Years	Pulse Flows for Temp Control, Habitat Inundation and Migration	Non-VAMP Flow Dates	VAMP Flow Dates	10,000 cfs from April through May in 6 years of every 10	8,500 cfs for 50 days in VAMP-like spring period. Pulse flows based on DFG's San Joaquin River modeling program. DFG's model projects a 106 percent increase in Chipps Island smolt abundance, and a 60 percent increase in projected escapement later.	Average monthly fish doubling flows for combined San Joaquin Valley rivers, other inflows and accretions. (USFWS, 2005, p. 10.)	March, 2,000 cfs; early April 20,000 cfs; late April, 10,000 cfs; early May 7,000 cfs; late May 5,000 cfs; June 2,000 cfs. Flow regime recommended for 60 percent of all years (TBI, Exhibit 3, p. 28)	Date	Combined San Joaquin Valley Flows
			1,420 or 2,280 cfs	4,620 or 5,480 cfs			Month / Flow (cfs)		February 15 - March 15	13,400 for 16 days; 26,800 for 2 days
							February 2,700		March 15 - 31	4,500
							March 5,200		April 1-15	6,700
							April 10,000		April 16-20	8,900
							May 14,800		April 21-30	8,900
							USFWS, 2005, p. 10.		May 1-15	11,200
									May 16-June 15	1,200
San Joaquin Valley Outflows	Dry Years	Pulse Flows for Temp Control, Habitat Inundation and Migration	Non-VAMP Flow Dates	VAMP Flow Dates	7,000 cfs from April through mid-May in 8 years of every 10	7,000 cfs for 40 days in VAMP-like spring period. Pulse flows based on DFG's San Joaquin River modeling program. DFG's model projects a 60 percent increase in Chipps Island smolt abundance, and a 36 percent increase in projected escapement later.	Average monthly fish doubling flows for combined San Joaquin Valley rivers, other inflows and accretions. (USFWS, 2005, p. 10.)	March 2,000 cfs; early April 5,000 cfs; late April 10,000 cfs; early May 7,000 cfs; late May 5,000 cfs; June 2,000 cfs. Flow regime recommended for 80 percent of all years (TBI, Exhibit 3, p. 28)	Date	Combined San Joaquin Valley Flows
			1,420 or 2,280 cfs	4,020 or 4,880 cfs					February 15 - March 15	13,400 for 2 days
									March 15 - 31	4,500
							Month / Flow (cfs)		April 1-15	6,700
							February 2,700			
							March 4,700		April 16-20	8,900
							April 8,800		April 21-30	1,200
							May 11,600		May 1-6/15	1,200

<table>
<tr><th rowspan="3">Location for Flow Criterion</th><th colspan="2" rowspan="3">Ecosystem Function</th><th colspan="2">Current Delta Flow Performance and/or Criteria</th><th colspan="6">Table 2: Comparison of Selected Delta Flow Criteria Recommendations, 2010</th></tr>
<tr><th colspan="2" rowspan="2">State Water Resources Control Board D-1641 (Table 3, pages 184, 186, 187; unless otherwise noted)</th><th>UC Davis Experts (All flows from Table 3, page 19)</th><th>California Department of Fish and Game (DFG Exhibits 1, 2, 3, and 4; unless otherwise noted)</th><th colspan="2">US Department of the Interior (US DOI, unless otherwise noted)</th><th>Bay Institute (Exhibits 2, 3, and 4)</th><th colspan="2">California Water Impact Network (Exhibit 2, Table 4, pp. 30-34)</th></tr>
<tr><th colspan="8">DISCLAIMER: These Delta flow criteria recommendations are compared here for illustrative purposes only. For full descriptions, see original narrative information submitted as testimony to the State Water Resources Control Board.</th></tr>
<tr><td rowspan="8">San Joaquin Valley Outflows</td><td rowspan="8">Critic Dry Years</td><td rowspan="8">Pulse Flows for Temp Control, Habitat Inundation and Migration</td><td>Non-VAMP Flow Dates</td><td>VAMP Flow Dates</td><td rowspan="8">5,000 cfs in the month of April, every critically dry year.</td><td rowspan="8">7,000 cfs for 31 days in VAMP-like spring period. Pulse flows based on DFG's San Joaquin River modeling program. DFG's model projects a 59 percent increase in Chipps Island smolt abundance, and a 36 percent increase in projected escapement later.</td><td colspan="2">Average monthly fish doubling flows for combined San Joaquin Valley rivers, other inflows and accretions. (USFWS, 2005, p. 10.)</td><td rowspan="8">March 2,000 cfs; April through May, 5,000 cfs; June 2,000 cfs. Minimum flow regime recommended for all years (TBI, Exhibit 3, p. 28)</td><td>Date</td><td>Combined San Joaquin Valley Flows</td></tr>
<tr><td>710 or 1,140 cfs</td><td>3,110 or 3,540 cfs</td><td colspan="2"></td><td>February 15 - March 15</td><td>13,400 for 2 days</td></tr>
<tr><td colspan="2" rowspan="6"></td><td>March 15 - 31</td><td>4,500</td></tr>
<tr><td>Month</td><td>Flow (cfs)</td><td rowspan="5">April 1-15</td><td rowspan="5">6,700</td></tr>
<tr><td>February</td><td>2,600</td></tr>
<tr><td>March</td><td>4,200</td></tr>
<tr><td>April</td><td>7,300</td></tr>
<tr><td>May</td><td>8,400</td></tr>
<tr><td>San Joaquin Valley Outflows</td><td colspan="2">Base Flows through Stockton Deep Water Ship Channel - including flows for improving Dissolved Oxygen</td><td colspan="2">October only - 1,000 cfs give or take 20% on a daily basis. No dissolved oxygen criterion provided.</td><td>2,000 cfs from July through October in all years.</td><td></td><td colspan="2"></td><td>July through February in all years, 2,000 cfs (TBI, Exhibit 3, p. 28)</td><td colspan="2"></td></tr>
<tr><td>Delta Cross-Channel and Georgiana Slough</td><td colspan="2">Salmonid Juvenile and Smolt Survival via Entrainment Prevention</td><td colspan="2">November through January close DCC gates for up to 45 days in consultation with FWS, NMFS, and DFG. Between May 21 and June 15, close DCC gates for total of 14 days, with similar consultation procedures.</td><td></td><td>In 1992, DFG recommended closing DCC Gates and Georgiana Slough from Feb 1 through June 30 in all water years. (WRINT-DFG Exhibit 8, p. 10; C-WIN Exhibit 20, p. 10)</td><td colspan="2"></td><td></td><td colspan="2">DCC gates would close between February 1 through June 30 in all water years; Georgiana Slough would be closed by an acoustical barrier during the same period.</td></tr>
</table>

Location for Flow Criterion	Ecosystem Function	Current Delta Flow Performance and/or Criteria	Table 2: Comparison of Selected Delta Flow Criteria Recommendations, 2010				
		State Water Resources Control Board D-1641 (Table 3, pages 184, 186, 187; unless otherwise noted)	UC Davis Experts (All flows from Table 3, page 19)	California Department of Fish and Game (DFG Exhibits 1, 2, 3, and 4; unless otherwise noted)	US Department of the Interior (US DOI, unless otherwise noted)	Bay Institute (Exhibits 2, 3, and 4)	California Water Impact Network (Exhibit 2, Table 4, pp. 30-34)
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Banks, Jones and Contra Costa Pumping Plants	Export Pumping Rate	For Jones and Banks pumping plants only: From April 15 through May 15, no more than 1,500 cfs or 100% of 3-day running average San Joaquin River flow at Vernalis (whichever is greater); Between February through June, the export rate is to be no more than 35 percent of Delta inflow; from July through January, export rate can be no more than 65 percent of Delta inflow.	Recognized as potential parameter, but no recommendations provided.	In 1992, DFG recommended 0 cfs exports at Banks and Jones Pumping Plants from April 1 through June 30 in all water years (WRINT-DFG Exhibit 8, p. 11; C-WIN Exhibit 20, p. 11)		TBI also recommends use of two ratios to regulate export rates in the Delta: the ratio of Vernalis flow to exports (VF:E) in March through May; and the ratio of exports to total inflows (E:I) from December through June in all but wet year. VF:E would be > 4.0 in wet and above normal years, > 3.0 in below normal years, > 2.0 in dry years, and > 1.0 in critical years; E:I would be less than 10 percent in all months in all but wet years. (TBI, Exhibit 4, Table 1, p. 30)	Combined export rate would be 0 cfs in all years, March 16 through June 30.
Mainstem Tributary Streams of the Central Valley Watershed	Inflow Contributions to Delta Outflow			In its 1992 recommendations, DFG stated that SWRCB should consider requiring flow contributions from the tributaries to provide a fair share portion of Delta outflow. DFG suggested allocating responsibility to tributaries based on the period of record from 1906 to present, unimpaired flow share, 50 year averages. (WRINT-DFG Exhibit No. 29, 1992; C-WIN 18, pp. 3-4)			Determine equitable shares of inflows to Delta, expanding responsible parties to include DWR and USBR but other major reservoir owners and water right holders in the Central Valley watershed of the Delta estuary.

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Mainstem Tributary Streams of the Central Valley Watershed	Temperature Protection for Juvenile Salmon and Salmon Smolts			Juvenile early rearing, < 61 degrees F; smoltification < 59 degrees F; for steelhead smolts < 57 degrees F. See DFG Exhibit 4, Table 1.	Adopt biological goals of the Anadromous Fish Restoration Program (AFRP) based on 2005 streamflow schedules for AFRP doubling goals. (USDOI, p. 57)	To provide adequate temperatures in the lower San Joaquin River/ southern Delta that avoid lethal effects and increase outmigration success of juvenile Chinook salmon and steelhead, provide flows sufficient to provide average daily water temperatures of 65 degrees F or lower from April 1 through May 31 in all years. (TBI, Exhibit 3, p. 21)	San Joaquin Valley pulse flows above intend to maintain tributary temperatures at no higher than 59 degrees F, and provide migration cues for juvenile salmon, and to get juveniles to the Delta to rear before Delta water temperatures get too warm.**
Sacramento and San Joaquin River Floodplains and Seasonal Wetlands	Floodplain Inundation for Habitat Expansion and Variability		2,500 cfs in base flows between Feb-April in 8 of 10 years to Yolo Bypass. 4,000 cfs pulse flows in March-April, 6 of 10 years to Yolo Bypass		Flood flows on the Sacramento River should exceed 70,000 cfs in at least 6 of 10 years, to enable spillage into Yolo Bypass. (USDOI, p. 54)	By notching Fremont Weir at north end of Yolo Bypass, frequency of floodplain inundation should be maximized (i.e., yearly): 27,500 cfs in early March for 15 days in critical years; 27,500 cfs in March in dry years for 30 days; 30,000 cfs from late February to mid-April in below normal years; 32,500 cfs from February through April for 90 days; and 35,000 cfs from late January through mid-May for 120 days. (TBI, Exhibit 3, Table 3, p. 36)	**Water Year** / **San Joaquin Valley Base/ Pulse Outflows** Critical and Dry: 13,400 cfs for 2 days Below Norm: 13,400 cfs 16 days/ 26,800 cfs for 2 days Above Norm: 13,400 cfs 13 days/ 26,800 cfs for 5 days Wet: 13,400 cfs for 17 days; 26,800 cfs for 5 days Between February 15 and March 15 for assuming equitable portioning of flows from each major tributary stream (p. 30).
		* Combined Valley outflows assumes tributaries are 67.06% of total San Joaquin River flow at Vernalis. Rationale for late winter floodplain inundation flows are obtained from US Fish & Wildlife Service, 2005, *Recommended Streamflow Schedules to Meet the AFRP Doubling Goal in the San Joaquin River Basin*, Table 2, p. 10 (CSPA Exhibit 20, and cited in US DOI testimony for this proceeding); shares of unimpaired runoff obtained from Bulletin 120-2008 (May issue) for unimpaired runoff; Carl Mesick, *Statement of Key Issues on the Volume, Quality, and Timing of Delta Outflows, Necessary for the Delta Ecosystem to Protect Public Trust Resources with Particular Reference to Fall-Run Chinook Salmon in the San Joaquin River Basin,* February 16, 2010, Table 1, p.3 (C-WIN Exhibit 19; CSPA Exhibit 7). Flows for Stanislaus, Tuolumne, and Merced tributaries are about 67 percent of San Joaquin Valley unimpaired flows at Vernalis.					

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		** Combined Valley outflows assumes tributaries are 67.06% of total San Joaquin River flow at Vernalis. Rationale for late winter floodplain inundation flows are obtained from Carl Mesick's submitted testimony, C-WIN Exhibit 19, p. 1; CSPA Exhibit 7, p. 1: "Providing winter flows of at least 3,000 cfs [per tributary] to inundate floodplains for at least 2 days in the upper tributary reaches, augments the food supply for juvenile salmon, improves their survival as they migrate through the lower tributaries, and causes about 40 percent of the smolts to begin migrating in late March and early April, compared to 8 percent migrating under base flows [of 275 cfs per tributary]. Early smolt migration is important because it is possible to use flow management to maintain optimum water temperatures throughout the tributaries to the confluence with the San Joaquin River prior to May 15, which helps produce healthy smolts that have a relatively good chance of survival as they migrate through the Delta. Prolonged winter flow releases of 8,000 cfs [from all three tributaries on the San Joaquin River] provide maximum floodplain inundation that provides an even greater increase in food resources, refuge from predators, as well as optimum water temperatures."				