Coalition for a Sustainable Delta

July 27, 2018

VIA EMAIL

Jeanine Townsend, Clerk of the Board
State Water Resources Control Board
1001 "I" Street, 24th Floor
Sacramento, California 95814
LSJR-SD-Comments@waterboards.ca.gov

Re: Comment Letter – Revisions to Proposed Bay-Delta Plan Amendments

Dear Ms. Townsend:

The Coalition for a Sustainable Delta ("Coalition") appreciates the opportunity to review and comment on the revised proposed amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary ("Bay-Delta Plan" or "Plan") and supporting proposed final Substitute Environmental Document ("SED"). The Coalition recognizes that the State Water Resources Control Board ("State Board") has made significant changes to the Bay-Delta Plan, and that the July 2018 Framework for the Sacramento/Delta Update to the Bay-Delta Plan ("Framework") provides additional details about the proposed Plan amendments and preferred alternative that will be identified in a forthcoming draft Staff Report, including proposed new and modified Sacramento River/Delta inflow and cold water habitat, Delta outflow, and interior Delta flow requirements. In general, the Coalition is critical of the State Board's singular focus on unimpaired flows. Currently, the State Board's approach leaves no room for a customized management response to the highly constrained hydrodynamics of the Delta. Instead of focusing solely on unimpaired flows, the Coalition encourages the State Board to meaningfully consider non-flow management measures or, at a minimum, other aspects of flow, including pulse flows.

The Coalition is submitting separate comments regarding the Plan and SED; the comments set forth below relate solely to the Framework. Specifically, the Coalition is concerned that the proposed new and modified inflow, outflow, and flow requirements set forth in the Framework do not take into account the best available scientific information and that the basis for the proposed flow levels is flawed and incomplete and, as a consequence, the anticipated benefits associated with those flow levels are overstated.

The Coalition encourages the State Board to consider the information described herein, as it moves forward with finalizing the Bay-Delta Plan, SED, and forthcoming Staff Report.

A. The Proposed New and Modified Flow Requirements Do Not Take Into Account the Best Available Science on Salmonids.

The State Board's Delta outflow objective is based on the premise that increased outflow improves the population dynamics of Chinook salmon and steelhead. Yet, over the past decade, scientific information has emerged that refutes this contention. The Coalition therefore requests that the State Board consider this new information, which is summarized below, in assessing outflow and salmon survival.

1. Tidally averaged flows ("net" flows) are unlikely to have a substantial influence on the survival of juvenile salmonids in the tidal Delta.

In the past, the idea that "net" flows were important to juvenile salmonids had support among personnel in the regulatory agencies but was never rigorously evaluated. New scientific information indicates "net" flows are unlikely to strongly influence the survival of juvenile salmonids. Expert panels have found that "net" flows in the tidal Delta likely have little impact on juvenile salmonids, except at locations close to the export facilities.[1,2] The Salmon Scoping Team, which was convened as part of the Collaborative Science Adaptive Management Program, concluded that velocities and flow direction could affect juvenile salmonids, while "net" flows lacked a demonstrated linkage to salmonid behavior.[3] As such, "net" flows are not appropriate bases for setting outflow requirements or managing water project operations in order to provide protection to juvenile salmonids. Rather than flows, the regulation of proportional entrainment losses at the water export facilities provides a more biologically defensible basis for setting fish-protective export restrictions.

2. Export-induced hydrodynamic changes are unlikely to pull Sacramento River-origin salmon into the south Delta.

Analyses of hydrodynamic conditions likely to influence fish behavior demonstrate little or no effect of exports on total flow at the entrances to the interior Delta. New science from hydrodynamic data and fish behavioral studies indicates that export-induced hydrodynamic changes are unlikely to pull Sacramento River-origin salmon into the south Delta. Rather, some fraction of Sacramento River juvenile salmonids can be expected to reach the south Delta regardless of export rates. At higher export rates, there is a greater probability of south Delta

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[1] Monismith S, Fabrizio M, Healey M, Nestler j, Rose K, Van Sickle J. 2014. Workshop on the Interior Delta Flows and Related Stressors Panel Summary Report. Delta Stewardship Council. July 2014. Available at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Int-Flows-and-Related-Stressors-Report.pdf

[2] Anderson JJ, Gore AG, Kneib RT, Lorang MS, Nestler JM, Van Sickle J. 2012. Report of the 2012 Delta Science Program Independent Review Panel (IRP) on the long-term operations Biological Opinion (LOBO) Annual Review. Prepared for Delta Science Program.

[3] Salmon Scoping Team. 2017. Effects of water project operations on juvenile salmonid migration and survival in the south Delta. Report to the California Department of Water Resources, Sacramento, CA. Available: http://www.water.ca.gov/environmentalservices/csamp_salmonid.cfm

fish being entrained, but this does not appear to represent a Delta-wide attraction due to altered hydrodynamics. A mechanistic basis thus is lacking for the supposition that substantially more migrating salmon are diverted into the interior Delta with elevated water exports.

3. Increased river flows are unlikely to increase salmon survival in the extensive areas of the Delta where flow is tidal.

The National Marine Fisheries Service ("NMFS") 2009 Biological Opinion hypothesized that higher (or more positive) "net" flows through the tidal Delta are an essential habitat characteristic for juvenile salmonids. Prior conceptualization of the Delta did not adequately consider the relationship of channel geomorphology and other spatial considerations to flow and salmonid survival; flow was assumed to have the same effects on salmon survival in all areas of the Delta. Acoustic studies completed in the past decade indicate that greater inflow can influence survival in riverine areas and in the transitions between river and tidal areas, but increased river flows are unlikely to increase salmon survival in the extensive areas of the Delta where flow is bi-directional, (that is, tidal). Steelhead acoustic study results for 2011-2012 further indicate that survival from Mossdale to Turner Cut did not improve with increased San Joaquin River inflows.[4]

If increased Delta flows improved habitat conditions for juvenile salmonids, there would be evidence of such an improvement in acoustic tagging studies. But recent studies of juvenile salmonids suggest that survival is insensitive to flows in tidal reaches. For example, one study found that survival of San Joaquin River-origin salmon was consistently low between Turner Cut/export facilities and Chipps Island, even in the high outflow year of 2011.[5] Similarly, another study found that survival of Chinook salmon was insensitive to flow in reaches where flow is always bi-directional (tidal).[6]

4. Higher flows may cause juvenile salmonids to emigrate more quickly which may increase their survival rates.

The NMFS 2009 Biological Opinion hypothesized that higher flows increased migration rates and thereby also improved survival of juvenile salmonids. A study of Chinook salmon survival from the upper Sacramento River to the Golden Gate Bridge revealed that in a year with high flows, survival and migration rates were higher than in four low flow years;[7] however,

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[4] *Id.*, at Section E.8-5.
[5] Buchanan RA, Brandes PL, Skalski JR. 2018. Survival of juvenile fall-run Chinook salmon through the San Joaquin River Delta, California. North American Journal of Fisheries Management.
[6] Perry RW, Pope AC, Romine JG, Brandes PL, Burau JR, Blake AR, Ammann AJ, Michel CJ. 2018. Flow-mediated effects on travel time, routing, and survival of juvenile Chinook salmon in a spatially complex, tidally forced river delta. Canadian Journal of Fisheries and Aquatic Sciences.
[7] Michel CJ, Ammann AJ, Lindley ST, Sandstrom PT, Chapman ED, Thomas MJ, Singer GP, Klimley AP, MacFarlane RB. 2015. Chinook salmon outmigration survival in wet and dry years in California's Sacramento River. Canadian Journal of Fisheries and Aquatic Sciences 72:1749-1759.

relationships between migration rates and survival were not quantitatively examined. In the Delta, one study found only three of eight reaches have significant flow-survival relationships, indicating that flow influences survival by mechanisms other than increasing migration rates.[8]

Though additional information from field studies is needed, scientific information currently available suggests that as juvenile salmon migration rates increase, predator encounter rates decrease, and survival probability increases, though not in tidal areas of the Delta.[9] Migration and rearing behavior studies indicate some flow events may facilitate rearing behaviors that may delay migration.

Managing outflow and water diversions to improve migration rates and survival may have advantages in some reaches of the Delta. Upstream reservoir releases to enhance flows may result in some fish migrating more slowly if rearing habitat availability or accessibility improves with increased flows.

B. The Proposed Fall Delta Outflow Objective Does Not Take Into Account the Best Available Science on Delta Smelt.

At the time that the Fish and Wildlife Service developed the Fall X2 Action, it acknowledged its experimental nature, stating to "address uncertainties about the efficiency of the Action, it will be adaptively managed under the supervision of the Service" (FWS 2008). Since then, scientific information has emerged that refutes the basis for the action. The State Board has not taken adequate account of this information in establishing a Fall Delta Outflow Objective. Below we summarize the most noteworthy information that should inform the State Board's assessment of fall outflow and delta smelt.

1. No relationship between fall X2 and subsequent abundance of delta smelt has been demonstrated, so estuarine outflow levels should not be based on fall X2 locations.

The Fish and Wildlife Service cited Feyrer et al. (2007) to assert in its 2008 Biological Opinion that implementing the Fall X2 Action would increase survivorship and performance of delta smelt and, accordingly, its subsequent abundance in proportional response to increased available habitat.[10] However, studies that asserted a relationship between fall X2 and subsequent abundance of delta smelt were flawed by assumptions and design shortcomings, and no such relationship has been demonstrated. Of primary concern was that Feyrer et al.

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[8] Perry RW, Pope AC, Romine JG, Brandes PL, Burau JR, Blake AR, Ammann AJ, Michel CJ. 2018. Flow-mediated effects on travel time, routing, and survival of juvenile Chinook salmon in a spatially complex, tidally forced river delta. Canadian Journal of Fisheries and Aquatic Sciences.

[9] Anderson JJ, Gurarie E, Zabel RW. 2005. Mean free-path length theory of predator-prey interactions: application to juvenile salmon migration. Ecological Modelling 186:196-211.

[10] Feyrer F, Nobriga ML, and Sommer TR. 2007. Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco estuary. Canadian Journal of Fisheries and Aquatic Sciences 64: 723-734.

(2007) limited the search for environmental correlates of delta smelt occupancy in the estuary to just three physical variables -- salinity, turbidity, and temperature. It ignored other physical variables that appear in conceptual ecological models linking delta smelt population responses to environmental attributes, and it disregarded biotic variables altogether. The three variables combined could only explain a quarter of the variance in subsequent delta smelt abundance.

Another study found that geography was as good as or better than salinity in explaining the pattern of landscape occupancy by delta smelt.[11] Further, a number of multivariate studies used diverse approaches to explore how both physical and biotic factors effect the delta smelt abundance. Multivariate autoregressive models indicated substantial support for a relationship between abundance of delta smelt and one of 19 covariates, summer water temperature (Mac Nally et al. 2010).[12] A Bayesian change-point analysis found that two of 19 covariates, water clarity and the volume of water exported from the Delta in winter, were associated with the FMWT-derived autumn abundance of delta smelt (Thomson et al. 2010).[13] A state-space life-cycle model indicated that delta smelt abundance is affected by density dependence, temperature from April through June and specifically in July, prey density from April through June and July through August, abundance of predators from April through June and September through December, turbidity in January and February, and adult entrainment (Maunder and Deriso 2011).[14] Five covariates -- stock, entrainment, water temperature, prey densities, and predation from April through June appeared to affect delta smelt abundance in an investigation by Miller et al. (2012).[15] None of those studies indicated that a Fall X2 Action would contribute to increasing the subsequent abundance of delta smelt.

2. Delta smelt are frequently and consistently found outside of X2 boundaries in the estuary, so X2 is not a valid surrogate for delta smelt habitat for purposes of conservation planning.

A key premise supporting the Fall X2 Action is that the position of X2 in the estuary is a direct measure of the location and extent of the portion of the low-salinity zone that is occupied by delta smelt and, therefore, "a surrogate indicator of habitat suitability and availability for Delta

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[11] Manly B.FJ, Fullerton D, Hendrix AN, Burnham KP. 2015. Comments on Feyrer et al. "modeling the effects of future outflow on the abiotic habitat of an imperiled estuarine fish." Estuaries and Coasts 38: 1815–1820.
[12] MacNally R, Thomson JR, Kimmerer WJ, Feyrer F, Newman KB, Sih A, Bennett WA, Brown L, Fleishman E, Culberson SD, Castillo G (2010) Analysis of pelagic species decline in the upper San Francisco Estuary using multivariate autoregressive modeling (MAR). Ecological Applications 20:1417–1430.
[13] Thomson JR, Kimmerer WJ, Brown LR, Newman KB, Mac Nally R, Bennett WA, Feyrer F, Fleishman E (2010) Bayesian change point analysis of abundance trends for pelagic fishes in the upper San Francisco Estuary. Ecological Applications 20:1431–1448.
[14] Maunder MN, Deriso RB. 2011. A state-space multi-stage lifecycle model to evaluate population impacts in the presence of density dependence: illustrated with application to delta smelt. In press. Canadian Journal of Fisheries.
[15] Miller WJ, Manly BFJ, Murphy DD, Fullerton D, Ramey RR. 2012. An investigation of factors affecting the decline of delta smelt (*Hypomesus transpacificus*) in the Sacramento-San Joaquin Estuary. Reviews in Fisheries Science 20: 1-19.

Smelt in all years" (Service 2008). The reference to a "surrogate indicator" combines two concepts -- surrogates and ecological indicators -- which individually have valuable application in conservation planning. But a growing body of literature warns against the use of surrogates or ecological indicators without validation of the relationship between the target and the surrogate/indicator (Murphy and Weiland 2014, Wenger 2008) and post-Biological Opinion data and analyses of delta smelt provide strong evidence that the premise is false.[16]

An *ecological indicator* must fulfill three criteria to establish its validity to indicate or represent the habitat for delta smelt in conservation planning:[17]

1) The location of X2 (the indicator) must spatially and temporally occur over much of the range of the target species and the distribution of its habitat,

2) There must be an ecological mechanism by which X2 (the indicator) controls or affects the distribution or abundance of delta smelt, or the extent or condition of its habitat, and

3) The location of X2 (the indicator) must be anticipatory of changes in the status of delta smelt or its habitat; that is, a measurable change in the position of X2 will predict changes in the size of the delta smelt population or the extent and/or condition of its habitat, which can be averted by a management action.

The location of X2 in the Delta fails to fulfill each of these criteria for delta smelt and its habitat. Delta smelt are frequently and consistently found outside of X2 boundaries in the estuary, and large portions of the available lens of X2 in the estuary are unoccupied by delta smelt in the autumn; therefore, the location and extent of the low-salinity zone fails to represent delta smelt habitat for purposes of conservation planning.

No data exist that link delta smelt performance to the position of X2. No surrogate species that could represent delta smelt for purposes of conservation planning or as monitoring proxy for it has been identified, and no individual environmental variable has been identified that can serve as an ecological indicator of delta smelt habitat.

[16] Murphy DD, Weiland PS. 2014. The use of surrogates in implementation of the federal Endangered Species Act – proposed fixes to a proposed rule. J. Environ. Stud. Sci. 4: 156-162; Wenger, S.J. 2008. Use of surrogates to predict the stressor response of imperiled species. Conservation Biology 22:1564-1571.
[17] Dale VH, Beyeler SL. 2001. Challenges in the development and use of ecological indicators. Ecological Indicators 1:3-10; Hunsaker C, Carpenter D, Messer J. 1990. Ecological indicators for regional monitoring. Bulletin of the Ecological Society of America 71:165-172; Niemi GJ, McDonald ME. 2004. Application of ecological indicators. Annual Reviews in Ecology, Evolution, and Systematics 35:89-111.

3. Increased seasonal flows across floodplains may improve food production and thus contribute to elevated delta smelt survival and reproduction.

Hamilton and Murphy (2018) considered all of the environmental factors from the previous multivariate studies in an attempt to identify the environmental factor or factors that limit(s) the distribution, abundance, and reproduction of delta smelt.[18] The effects of four factors appeared to limit delta smelt performance. Entrainment at two power plants in Contra Costa County was identified as a significant contributor to delta smelt declines in the 1990s and earlier.[19] More recently, predation and competition by Mississippi silversides had demonstrable effects on delta smelt numbers.[20] But it is the availability of food that appears most frequently to impact delta smelt survival.[21] A shortage of zooplankton in summer appeared to affect delta smelt numbers in more than 40 percent of the years that were evaluated, and, not surprisingly, the availability of food earlier in the year may influence survival of the delta smelt's early life stages. When food availability in the spring was included in models that best-explain delta smelt abundances, the frequency of food limitation in summer decreased and food limitation in the spring showed elevated effects.[22]

The Hamilton and Murphy investigation observed that allocating resources for management actions that do not address limiting factors, such as attempts to position and expand the low-salinity zone in the estuary in the autumn, are unlikely to contribute to the recovery of delta smelt. Instead, actions that improve food production, such as restoration of tidal marshlands, enhanced management of freshwater wetlands, and increased seasonal flows across floodplains might be expected to contribute to elevated delta smelt survival and reproduction, and should be prioritized in action plans targeting the species. Strategies for controlling non-native fishes preying on and competing with delta smelt also need to be developed.

In conclusion, the Coalition urges the State Board to duly consider the foregoing comments, as well as the comments the Coalition has previously submitted, as it proceeds with the Bay-Delta Plan amendment process.

Sincerely,

William D. Phillimore

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[18] Hamilton SA, Murphy DD. 2018. Analysis of Limiting Factors Across the Life Cycle of Delta Smelt (Hypomesus transpacificus). Environmental Management (on line 18pp.).
[19] *Id*.
[20] *Id*.
[21] *Id*.
[22] *Id*.

From: Remillard, Ashley J. <aremillard@nossaman.com>
Sent: Friday, July 27, 2018 11:39 AM
To: LSJR-SD-Comments@waterboards.ca.gov; WQCP1Comments
Cc: Taylor, Amy R.; Remillard, Ashley J.; Weiland, Paul S.
Subject: Comment Letter – Revisions to Proposed Bay-Delta Plan Amendments
Attachments: 2018-07-27 Comment Letter - Revisions to Proposed Bay-Delta Plan Amendme....pdf; 2018-07-27 Comment Letter re July 2018 Framework.pdf

Dear Ms. Townsend,

On behalf of the Coalition for a Sustainable Delta, please find attached two comment letters on the revisions to the proposed Bay-Delta Plan amendments. Please let us know if you have any questions.

Best regards,

Ashley Remillard

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