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Questions for the Panel Discussion

State Water Resources Control Board
Draft Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives (October 29, 2010)

The following questions are presented for potential discussion by the panels scheduled for January 2011 in regard to the SWRCB Draft Technical Report (October 29, 2010). The questions are grouped for convenience under headings corresponding to the comments submitted by the respective agencies and stakeholders.

U.S. Department of the Interior (USFWS-USBR) Comments

1-Should San Joaquin basin water management be conducted in a more coordinated fashion (among the tributaries) to achieve a combined flow regime that closely and consistently mimics the natural hydrograph? If so, how can such an integrated flow regime be accomplished—i.e., what steps should be taken to implement that strategy?

2-To match a potential San Joaquin basin-wide flow-management strategy, should San Joaquin basin fall-run Chinook salmon populations be managed as an integrated unit—i.e., as a metapopulation rather than as separate populations?

a) What evidence exists to show that San Joaquin basin salmon populations are biologically distinct from one another?

b) Given the high straying rates and levels of genetic relatedness between Sacramento basin and San Joaquin basin fall-run salmon populations, is it unrealistic to expect that populations in the individual San Joaquin basin tributaries will ever become biologically differentiated in the future?

3-Are current fisheries management objectives and actions contributing to **greater mal-adaptation** of salmon and *O. mykiss* populations **to expected future environmental conditions** in the Central Valley region?

4-Water management has increased fall flows and decreased spring flows relative to the natural hydrograph. This has arguably favored earlier fall adult migration.

a) Wouldn't strict adherence to a natural hydrograph mean that fall flows should be curtailed, and wouldn't this harm the current fall run?

b) Should high flows in the late-spring and early-summer be curtailed in order to avoid favoring late migration-timing in the San Joaquin basin?

c) Are extended late-spring managed flows eventually counterproductive because they select for (i.e., favor) late life-history timing which would be maladaptive as the climate regime changes to earlier seasonal peak flows and less snowfall?

5-How should salmonid populations be managed during sustained (5+ years) droughts during which entire cohorts of local populations (each spanning an average of 3-4 years) are highly likely to be extirpated due to inadequate flows?

6-Salmonid species diversity reflects a wide array of evolutionary adaptations to diverse environments as reflected, for example, by the life-histories of four runs of Central Valley Chinook salmon. In general, in what ways should San Joaquin fall-run salmon be managed to favor greater adaptation to increasingly severe and restrictive environmental changes—e.g., a warmer, drier climate and a shift from snowmelt-driven to rainfall-driven hydrographs.

7-Is the goal to double the long-term average of salmon population levels the most appropriate or best biological goal? Would an alternative goal—e.g., to minimize population fluctuations to within some specified range—be a better goal or a more practicable one for the San Joaquin basin populations?

8-The recommended specific objectives stated by DOI under "Goals and Objective…" "include: a) self-sustaining populations that will persist indefinitely: b) large enough populations for limited harvest.."

In view of current hatchery operations in the Central Valley, aren't the above objectives (a) and (b) counteractive? Hatchery production is largely inimical to objective (a) and, therefore, hatchery production should be minimized. However, hatchery production is currently crucial for achieving objective (b). Is DOI suggesting that large-scale hatchery production should be drastically reduced or eventually terminated? How would such a reduction be implemented? If hatchery production is not curtailed, how would it be determined that populations are truly self-sustaining—i.e., with little or no hatchery contributions over multiple generations of natural spawners?

9-In view of the highly cyclic patterns of San Joaquin basin fall-run salmon populations and the stated "high risk of extinction" of Tuolumne and Merced River populations (Mesick 2009, 2010), together with repeated multi-year drought-deficits (DOI Comments 2010), how likely is it that the population in the Tuolumne (or Merced and Stanislaus) River have already been periodically extirpated over the past century? Is there evidence that is consistent with the past extirpation of those populations, or does the evidence point more strongly to the continuous existence of the separate tributary populations?

10-If the individual San Joaquin salmon populations each have periodically been extirpated and re-established by immigrants from neighboring populations, what are the implications for San Joaquin basin-wide salmon management? Should they be managed differently from the way they have been managed up to now?

Adaptive Management

11-What is the logical process (e.g., decision tree) by which the initial flow criteria would be evaluated and deemed to be either success or failure?

a) For example, what is the time-frame (number of years) over which a given flow regime would be considered to have succeeded (or failed) to achieve a biological objective? As a point of comparison, the 1995 Settlement Agreement between stakeholders and agencies for the lower Tuolumne River (and the subsequent 1996 FERC Order) was deemed by certain agencies to have failed in recovering the salmon population after ten years of implementation.

b) Would adaptive management be used to investigate whether flows can be adjusted downward from the initial flow criteria? If so, what would be the process by which the initial flows would be adaptively adjusted downward?

c) How high would flows be increased to evaluate their feasibility in achieving the biological criteria while still accommodating other water-user obligations? In other words, is there a cutoff point for experimental flows at which it is deemed too expensive or impracticable to further implement?

12-How would hypothesis-driven studies and adaptive management be conducted given that multiple factors are operating simultaneously to depress salmonid populations?

a) How do we avoid conflating multiple cause-and-effect relationships? How would remedial actions be evaluated to determine success/failure such that the individual effects of multiple actions are not conflated?

b) Is it possible to conduct scientifically robust population recovery in ways that provide clear evidence that certain actions were responsible for a given population response?

California Sportfishing Protection Alliance- C.Mesick Comments

13-Given the fact that salmon and steelhead juveniles require a period of lower water temperatures—i.e., with an upper threshold of 59˚F--in order to successfully undergo smoltification, what is the appropriate and practicable length of time that water temperatures should be maintained at, for example, less than 59˚F?

Dr. C. Mesick's comments (3 December 2010 on the Draft Technical Report) mentions March 20 to June 15 for the lower Merced River as a desirable period of lower water temperatures. Can this period be shortened but still provide sufficient thermal protection for smolting salmonids that would ensure a high proportion of the smolts will survive? What are some alternative endpoints of that period that still would be adequately protective of the smolts---June 7, May 30, May 21?

California Department of Fish and Game Comments

14-The CDFG's Comments (page 16) stated in reference to the "Escapement Trend Analysis" that:

> "The results of this analysis indicates [*sic*] that a strong relationship exists between spring flow magnitude and total number of fish produced (both ocean harvest and inland escapement). To the contrary, spring South Delta combined exports showed little correlation with brood year cohort population abundance."

Would the apparent lack of effects of South Delta exports on cohort production be due to the current lack of functional floodplain rearing habitats in the South Delta and lower San Joaquin River? If floodplain habitats for juvenile salmon rearing were to be restored in the South Delta and lower San Joaquin River and were actually enhancing juvenile salmon production, would it then be more likely that South Delta water exports would have a detectable effect on the salmon populations?

15-The comparisons of historical unimpaired flows for the major San Joaquin basin tributaries—as measured by percent of unimpaired flows—and the relative amounts of spring-flow reductions are highly informative in illustrating both the "natural" flow regimes and the degrees of alteration of those flows. However, are the total unimpaired flows for each tributary and their proportionate reductions the most appropriate or most useful benchmarks for gauging the ecological impairment or functionality of the altered flow regimes?

a) To credibly address this question it seems that the sizes of the watersheds must be considered because the largest watershed (Tuolumne River) will carry the largest volume of water that would have accordingly more destructive power during high floods than would smaller rivers. For example, the larger river at 70% of unimpaired flow still could have more downstream destructive potential than a smaller river that was running at, say, 80-90% of unimpaired flow. Hence, wouldn't it make sense to have a proportionately greater reduction—within "reason"—of total unimpaired flows in the larger river(s)? Would larger rivers have proportionately more "excess" flow capacity in respect to satisfying ecological functions?

b) The issue is whether it is valid to presume that all rivers regardless of size should have equal proportionate degrees of "flow impairment." Another way to view this is the question: "At what fractions of the total unimpaired flows are the most important ecological functions still accommodated in each of the tributaries which differ in watershed size?"

c) What would be some alternative benchmarks to use —instead of fully unimpaired flow— for gauging how much the tributaries have been impaired relative to their full ecological functionality?

16-The CDFG validly noted that enormous expenditures on non-flow restoration measures have been made on the San Joaquin basin tributaries but have had limited success in bolstering salmon stocks to consistent, self-sustainable population levels. The major question, then, is, "Will enormous expenditures of water supplies and associated costs be required to sustain San Joaquin salmon (and steelhead) stocks?" Some constituent questions include:

a-What is (or are) the most practicable and scientifically informative way(s) to implement increased flows—at least initially for the putatively functionally "dominant" spring-flow period?

b-Various improvements in the flow schedules for San Joaquin basin have been made—e.g., the Tuolumne River 1995 Settlement Agreement and 1996 FERC Order—that simultaneously changed the flows for different seasons. How should future changes in the flow schedules be implemented without conflating cause-and-effect relationships? For example, perhaps increased spring flows will significantly increase smolt production but increased winter flows (independent of springs flows) would not; how would we determine which of the two seasonal flow increases actually "worked"?

c-At what point, in respect to the water volumes that may be required, do we decide that the costs of substantially increased flows are prohibitive? In other words—given the premise that more flows equal more salmon—at what point in the cost-benefit relationship do the total costs outweigh the total salmon benefit?

d-In the worst-case scenarios—such as during extended (4+ years) droughts—what would be the **minimum** target population levels above which we would want to maintain the San Joaquin basin populations?

17-The CDFG's graphical analysis of the amounts of river surface area versus flows for the San Joaquin basin tributaries indicated the possible absence of accessible floodplain habitat on the Stanislaus River, based on the linear appearance of the plot in the CDFG's Figure 8 (CDFG Comments on the Draft Technical Report). Previous analysis by the USFWS (Mesick 2009) has inferred that floodplain habitats exist on the Stanislaus River (and Tuolumne River) and have a pivotal role in enhancing juvenile salmon production and survival.

a-What direct evidence exists that shows the current presence of ecologically functional and beneficial (to juvenile salmon) floodplains on the Stanislaus and Tuolumne rivers?

b-Perhaps the existence of inundated floodplains that serve as rearing habitats on the Stanislaus and Tuolumne rivers is not the main reason why juvenile salmon production and survival are evidently enhanced (or at least associated with) high winter and spring flows. If inundation of floodplains is not the key mechanism, then what other mechanisms might explain why the higher winter and spring flows benefit juvenile salmon?

The Bay Institute Comments

18-While all components of natural ecosystems are important from an ecological (i.e., scientific) perspective, the importance of many species is not clear in the minds of the general public. Which fish species would be most likely to be considered as "worth saving" in the general public's opinion, in terms of trade-offs with water supplies? How can we avoid having the various stakeholders and general public turn against conserving natural aquatic resources during periods of pronounced water scarcity?

References Cited

Mesick, C. Comments on The Draft Technical Report on The Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives. December 3, 2010. Submitted on behalf of the California Sportfishing Protection Alliance.

Mesick, C. 2009. The High Risk of Extinction for the Natural Fall-Run Chinook Salmon Population in the Lower Tuolumne River due to Insufficient Instream Flow Releases. Report prepared for the U.S. Fish and Wildlife Service, Sacramento, CA.

Mesick, C. 2010. The High Risk of Extinction for the Natural Fall-Run Chinook Salmon Population in the Lower Merced River due to Insufficient Instream Flow Releases. November 30, 2010. Report prepared for the California Sportfishing Protection Alliance.