980 NINTH STREET, SUITE 1500
SACRAMENTO, CALIFORNIA 95814
WWW.DELTACOUNCIL.CA.GOV
(916) 445-5511

# Delta Independent Science Board

**Chair**
Richard Norgaard, Ph.D.

**Vice Chair**
Tracy Collier, Ph.D.

**Members**
Brian Atwater, Ph.D.
Elizabeth Canuel, Ph.D.
Edward Houde, Ph.D.
Judy Meyer, Ph.D.
Jeffrey Mount, Ph.D.
Vincent Resh, Ph.D.
John Wiens, Ph.D.

May 22, 2012

To: Les Grober, State Water Resources Control Board

From: The Delta Independent Science Board

Re: Flow Criteria that use Percent of Unimpaired Flow

## SUMMARY

The proposed use of percent of unimpaired flow is a step toward improving the outlook for fish and other wildlife utilizing the San Joaquin River and its tributaries. Fall-run Chinook salmon are likely to benefit from February-through-June flows that are more natural in timing and variability than current flows. Compared with the existing maze of flow standards for the San Joaquin River and its tributaries, unimpaired flow comes closer to approximating natural flow, and it does so more transparently. Caveats include: (1) flow is but one of many stressors affecting fish and wildlife; (2) the choice of flow criteria and metrics needs to serve the broader needs of ecosystems as well as individual species; (3) a chosen percentage of unimpaired flow may fall short of the minimum needed by fish and wildlife in some years; and (4) such critical years are likely to become more common as Sierra Nevada snowpacks diminish as a consequence of climate change. This qualified endorsement is based on our reading of the "Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives" (State Water Resources Control Board, February 2012).

## BACKGROUND

This memo constitutes our responses to the questions you posed to us during our March 8, 2012, meeting. After providing us with an update on revisions to the SWRCB Bay-Delta Water Quality Control Plan, you asked us to respond to five questions about Phase 1: Southern Delta Salinity and San Joaquin River Flow Objectives. We discussed these issues with you further during our meeting of May 4, 2012.

We interpret your questions -- and the February 2012 report to which they refer -- as being limited in scope to beneficial uses of water by fish and wildlife. In addition, we recognize that the SWRCB has not yet addressed stressors other than the amount and variability of flow.

## QUESTIONS AND RESPONSES

**1) Do you concur with the scientific report determination that changes in the flow regime of the San Joaquin River basin are impairing fish and wildlife beneficial uses?**

The report makes a persuasive case that fish and wildlife need more flow and more natural spatial and temporal patterns of flow. The report's external scientific reviewers, who endorsed these conclusions, are respected and experienced scientists with extensive expertise in salmonid biology, and they provided a thorough review of the report.

The report acknowledges that many stressors in addition to changes in river flow have contributed to the ecological problems of the San Joaquin River and its tributaries (p. 3-1). A Substitute Environmental Document, which we have not seen, will address these additional stressors, and we are likely to review it when it is available.

**2) Does the Scientific Report demonstrate:**
**a. the relationship between flows and SJR basin fall-run Chinook salmon survival and abundance?**

The report demonstrates that flows during the February through June period are of particular importance in determining salmon survival and abundance. While correlation does not necessarily equal causation, available information indicates that a more natural flow regime during these months would be expected to increase the abundance of fall-run Chinook.

**b. the importance of unaltered hydrographic conditions in supporting ecosystem processes for Chinook salmon, Central Valley steelhead, and other native species?**

The report provides a thorough review of the relevant scientific literature showing the importance of a more natural flow regime to support ecosystem processes for native species including Chinook salmon and Central Valley steelhead. Similar conclusions regarding natural flows and ecosystem processes have been reached for rivers elsewhere in the U.S. and Canada, as well as in Australia and South Africa.

A more natural flow regime has the potential to broadly benefit the ecosystem in addition to specific target species. While managing a river for one particular native species may not be sufficient for overall ecological integrity, it may still help protect some aspects of overall river health by supporting the prey base as well as high quality habitat and improved water quality. The proposed flow criteria will help align California's flow management practices with river management approaches being used elsewhere in the U.S. and internationally to provide overall ecosystem benefits.

**3) Does the approach used to develop San Joaquin River flow objectives and the associated program of implementation provide for the reasonable protection of fish and wildlife beneficial uses?**

Whether the flows implemented will be adequate for protection of fish and wildlife beneficial uses depends on what percentage of unimpaired flow is selected for implementation (see response to question 4), how flows are allocated among tributaries, the potential for habitat improvement through flow management, and how well adaptive management can be applied in

the face of changing climate and increasing human demands for water.

**4) Does use of a percent of unimpaired flow provide an appropriate method for implementing the narrative San Joaquin River flow objectives in a way that reasonably protects fish and wildlife beneficial uses, given the other factors that the State Water Board must consider when determining a reasonable level of protection for beneficial uses?**

Depending on the percentage used, percent of unimpaired flow could allow flows to vary seasonally, and on shorter time scale, to the benefit of fish and wildlife. The approach will likely require modification as adaptive management is implemented.

The decision on what percentage to use will determine if there is a reasonable level of protection for fish and wildlife beneficial use. In defense of the range of percentages considered (20-60%), the Water Board staff posits that even the lower percentage will increase flows during the February-through-June period and thus be of benefit in dry years. However, this argument is not fully convincing, because a very small increase in flow may improve conditions in the ecosystem, but still not be sufficient to result in measurable improvement in salmonid abundance and survival.

We therefore advise comparing the flows recommended in the report's Tables 3.15 through 3.23 with the unimpaired flow volumes during years with different water availability and the resultant flow volumes under different percent unimpaired flow over past decades. The comparisons should include the Water Board's own determination that 60% of unimpaired flows would be protective of fish and wildlife beneficial uses. What percentages of unimpaired flow result in flows below the ranges derived by the several methods in Tables 3.15 through 3.23? Such an analysis of the extent of loss of protection of fish and wildlife beneficial use would provide needed information to be factored into balancing different beneficial uses.

Worldwide, research is indicating that the percent of impaired flow should be used together with other criteria. Variability in flow, tributary-specific minimal critical flows (i.e., thresholds) and flow targets need further consideration. In particular, the combined importance of higher and more variable flows in the spring, and variables such as the timing of flows and the rate of change in flow, which have been demonstrated to provide important cues to fish and other wildlife, should be further evaluated.

Spatial patterns of flow also need further consideration. The proposed plan does not identify areas in the San Joaquin system where investment (e.g. restoring the hydrograph) would have the greatest benefits to fish and ecosystem processes. Adherence to flow regime alone, assumes equal benefit everywhere, but this is not likely to be the case. Accordingly, we recommend that the approach consider strategic investments in flow and flow controls at locations and times where the return will be greatest.

**5) Given scientific uncertainty, does the program of implementation allow for the development of a successful science-based adaptive management program?**

The implementation program states that a core operations group will develop an adaptive management plan, and it provides some elements the plan will need. However, without an example of such a plan, it is not possible to determine if the adaptive management program will be either successful or science-based. The material provided does not indicate what will be monitored and what performance measures will be used as the basis for adaptive management decisions, nor the time frame in which these decisions will be made (weekly? monthly? annually?). A science-based adaptive management program is essential.

The report could say more about the finances, organization, and oversight needed to ensure that adaptive management is implemented over a projected 30-year lifespan. While some sites that received environmental flow allocations have had effective monitoring and reporting, at most sites the collection of pre- and post-implementation data has been very limited, especially regarding ecological responses to flow alteration.

Because the plan covers a 30-year time period that will likely see dramatic changes in hydrology and runoff from the Sierra Nevada, an adaptive management program is fundamental to addressing ecosystem needs under changing conditions. Data and modeling simulations indicate that climate change will likely influence the timing and variability of runoff. This could have negative effects on salmonid populations and the ecosystem, particularly if less water is available during critical times. It is essential that a well-defined adaptive management plan be part of the framework for implementing the proposed approach.

Climate change is also expected to increase competition for water among users. Maintaining the flows necessary to sustain the protected species in the San Joaquin River, and in fact the whole Delta, will likely require establishment of adjusted minimum flows, but more importantly will require further refinement and control rules to regulate the timing, frequency, duration, and magnitude of flows and the rates at which those flow parameters change.