

## Questions for the Technical Teams

For development of an adequate EWA it is important to assemble all the current knowledge about problems an EWA might be expected to deal with. Relevant data files should be readily accessible and descriptive statistics written up to address the following questions. The following questions are grouped by factors that an EWA is expected to address. Within each factor we are asking the technical team's help in identifying how important the factor is for each species, how that importance is modified by environmental conditions such as season, flow, etc. and, finally we are requesting technical support for possible management options that an EWA might use.

These questions address only actions that relate to delta conditions. Upstream actions of an EWA will be pursued through other channels.

1. Direct Mortality Impacts. Direct mortality at the export pumps is a clearly documented source of mortality for most species at least at some times. The importance of such mortality to the various fish populations is not well understood.

A. What relationships exist between spawning adult population size, subsequent juvenile abundance in the delta, juvenile entrainment at the export facilities, and subsequent adult population size? Species of concern are: delta smelt, salmon, splittail, steelhead and sturgeon.

B. Environmental modifiers. Do the relationships between entrainment rates and various life stages of species of concern appear to vary with flow conditions, tidal conditions, gate operations, temperature, dissolved oxygen and possible density dependent factors?

C. Management options. The size and duration of export curtailments are generally believed to alter the impacts of entrainment on each species. What size and duration of curtailment appear necessary to achieve a net reduction in entrainment for each species?

2. Indirect Mortality. Mortality in the Delta is high at times for some species such as San Joaquin fall-run juvenile salmon and Delta smelt. The causes and mechanisms of this mortality are not well understood.

A. What measures are available for indirect mortality for each species of concern? How similar is indirect mortality likely to be for different runs or for different species? What measures of water toxicity, predator density, habitat quality or other sources of mortality correlate with the observed indirect mortality? Does direct mortality at the export facilities correlate with indirect mortality in the Delta?

B. What are the causes of the relatively high Delta mortality of some fishes? What improvements in water quality, habitat quality, predator abundance or other sources of mortality are likely to improve in-delta survival?

C. Environmental modifiers. Do indirect mortality rates vary with flow conditions, tidal conditions, gate operations, temperature, dissolved oxygen or other environmental factors?

D. Management options. What evidence exists that export curtailments of a given size and duration can reduce the effects of indirect mortality for each species?

3. Modifying flows. The timing and degree of freshwater flow as it enters the delta or as it leaves the delta are believed to influence the distribution and susceptibility of various life stages of some fish to direct and indirect mortality in the delta.

A. What evidence suggests that moving the low salinity zone farther from the influence of the export pumps (as measured by X2) reduce entrainment of delta smelt or striped bass? What evidence suggests that increasing QWEST, and particularly minimizing negative QWEST values, reduce entrainment? What evidence suggests that increasing Vernalis flows reduce entrainment of San Joaquin salmon, delta smelt, and striped bass?

B. Environmental modifiers. Do the effects of modifying flows vary with baseline flows, tidal conditions, gate operations, temperature, dissolved oxygen or other environmental factors?

C. Management options. What size and duration of flow modifications can be expected to reduce mortality for each species?

4. Barrier impacts. A substantial amount of information is accumulating to support the fishery advantages of closing the Delta Cross Channel. Newman and Rice (1998) is the most recent model to support such action for Sacramento salmon. How closure of the DCC relates to the entrainment in the central Delta of other species is much less clear. The Head of Old River Barrier prevents, about 60% of the flow of the San Joaquin, and presumably 60% of the outmigrating San Joaquin smolts, from going directly to the export facilities. The impacts on species, particularly delta smelt, that reside within the delta are the subject of much speculation.

A. What evidence suggests that closing the DCC and HORB reduce direct and indirect mortality of salmon as they pass through the delta? How do barrier operations affect the distribution and mortality rates of fish such as striped bass and Delta smelt in the central Delta?

B. Environmental modifiers. What flow, export, or other factors are believed to change the general relationship between barrier operations and each species?

C. Management options. Where barrier operations might have a negative effect on one species and a positive effect on another, what guidance can the technical team offer?

5. Delta standards relaxations. One tool that could allow water to enter an EWA without interfering with any other water diverter is through the relaxation of various standards. The 1995 WQCP explicitly allows such variances in the E/I ratio and several participants have argued for the generation of water into an EWA through the relaxation of X2 or b(2) requirements.

A. What are the likely impacts of relaxing requirements to achieve benefits described in response to the questions above? For which standards is the benefit expected from a standard more likely to be obtained through an EWA? What are likely impacts on benefits not included in the above benefits expected of an EWA? What are the regulatory and technical barriers to treating other requirements in the manner described for modifying the E/I ratio in the 1995 WQCP?

B. Environmental modifications. What baseline flows, tidal conditions, gate operations, temperature, dissolved oxygen or other environmental factors would be likely to minimize the negative impacts of relaxing each requirement?

C. Management options. What size and duration of requirement modifications can be pursued by the EWA without risking impacts greater than those identified above for each species?