

Technical Issues/Questions for Tech Team Evaluation by Category:

1. Fish and Flow

- 1.1. Winter export of small flow pulses in dry years (e.g., February 1991) – potential effect of moving X2 upstream and making delta smelt adults more vulnerable to export related impacts.
- 1.2. Importance of San Joaquin attraction flows – puts demands on SJ storage and is expensive.
- 1.3. Importance of pulse flows for fish migration and habitat.
- 1.4. Are there any potential impacts of altering Sacramento River flow in August and September?
- 1.5. Would changes in Delta inflows and export rates affect upstream habitat conditions?
- 1.6. X2 standard is a seasonal standard – how do short term changes in flow and X2 potentially affect fish and fish habitat?
- 1.7. AFRP action sets July exports as a function of June exports – if we adjust June exports, how will we deal with July exports to provide the same or more protection to the striped bass for which the AFRP action is directed?
- 1.8. Can fish be safely protected by managing X2, QWEST, and other Delta hydrodynamic parameters on a seasonal or monthly basis, or does it require daily management? Is recent hydrodynamic history important? Are other factors (e.g. local velocity fields, water residence time and local habitat conditions) important factors?

2. Fish Population Effects and Factors that Affect Them

- 2.1. Effect of export losses on fish populations: At what salvage level is the potential risk to populations significant enough to warrant cutback in exports? *"The team differs on the potential degree of population effects of entrainment and salvage related losses. The team does not agree on the importance of export related effects (direct or in-direct) in reducing these losses on populations."*
- 2.2. Effect on Sacramento salmon populations. *"The DEFT salmon team differs on the potential degree of recovery that may be achieved from the actions in the Common Program and the AFRP. The team agreed on a list of habitat actions for Stage 1 and on the priorities for the actions. The team agreed that Common Program and Upstream AFRP actions would probably lead to recovery of Sacramento salmon and steelhead populations."*
- 2.3. Which populations are in greatest need of protection from project operations?
- 2.4. Is the percent reduction in salvage using the salvage model a real parameter for assessing impacts and benefits of simulations on the populations?
- 2.5. Do impacts have to be observed or predicted (manifested) at the population level to be significant?
- 2.6. Habitat: *"Salmon stocks can be greatly enhanced over existing conditions by improving habitat, food web, and predator/prey relationships within the interior*

*Delta. We should do every thing possible to reduce movement of juvenile salmon into the interior Delta via the DCC, Georgiana Slough, and HOR."*

- 2.7. Ocean Conditions: *Recovery of salmon and other species may be dependent on ocean conditions. For example: the El Nino appears to affect ocean productivity and the distribution of predators and prey of salmon in coastal and open ocean feeding areas of salmon. The team differs on the potential role ocean conditions may be playing in the decline and recoveries of these fish species.*
- 2.8. Harvest/Hatcheries: *Recovery potential for salmon, steelhead, and striped bass may depend on activities outside the control of water projects such as harvest in the ocean or hatchery practices. The team differs in the potential role hatcheries and harvest play in the decline and recoveries of these species. "The salmon team did not want to address hatchery issues when the topic was raised with the work group. CalFed really needs to take a separate look at the hatchery issues."*
- 2.9. Exotics: *"The Bay/Delta is dominated by non-native species. Some introduced species have substantially altered the functioning of ecosystems they have invaded and the team has limited understanding of the new ecological relationships among species. New species will likely continue to arrive and disrupt the biological communities of the estuary in the future. All data and analyses, therefore, that rely on historical relationships may not accurately predict the future. The almost certain arrival of new species in the future may alter the ability of the estuary to support the three species described above. The team has not evaluated the potential role of exotic species in the potential for recovery of important fish populations. However, for many of the team members this is an important issue." "We probably have a consensus that eliminating Potamocorbula from the estuary would be a good thing, but it can not be done."*
- 2.10. Other Delta Diversions: *"The team has not evaluated or considered the relative role of other Delta diversions (primarily agricultural and steam electric generating stations) in the decline or recovery of important fish populations."*
- 2.11. Predation: *"Striped Bass Predation on Salmon Smolts and Yearlings – This is not on the salmon teams list of issues but it should be. EBMUD Fisheries Biologists recently conducted an electrofishing survey in the lower Mokelumne River from Camanche downstream to the confluence with the Cosumnes River. The river was full of striped bass (live well of the electrofishing boat filled up in fifteen minutes) and they were preying on yearling fall-run chinook salmon FAR downstream of Woodbridge Dam. Jim Buell's scenario mentions predator removal in Clifton Court Forebay. The DEFT work group largely ignored Jim's proposal which may have a tremendous benefit in improving the survival of salmon smolts and yearlings."*

3. Fish and Exports

- 3.1. Importance of dry year exports on fish populations. Gaming did little to reduce exports in dry years.
- 3.2. Are large gaming reductions in exports in wet years necessary to protect fish? Is the use of EWA assets in wet years to reduce exports the most effective use of resources? Does this maximize population benefits?

- 3.3. Do exports significantly affect habitat, habitat quality, food availability, migration, and distribution of important fish species?
- 3.4. **Migratory cues:** *"On this issue the controversy does not revolve around the fish using one cue versus the other; the issue for salmon is that during their migration they need to shift from a flow cue which is reliable in upstream areas, to a salinity cue that is reliable in tidally influenced areas. How long does this transition take, and how do the fish behave during the transition are important areas of uncertainty and disagreement. The team differs on the factors that guide or cue migrating fish on their movements through the Delta. Some believe net freshwater flow cues are important for downstream migrating juvenile fish such as smolt salmon. Others believe that tides and salinity gradients are potentially more important."* *"Out migrants key to flow or salt once in tidal zone and move with mean or tidal flows."*
- 3.5. Do exports pull fish from the San Joaquin into the South Delta that would otherwise continue down San Joaquin to Central and Western Delta? Do they pull fish from the Sacramento River into the Central and South Delta that would otherwise move to the Bay?
- 3.6. What are risks to fish from expanded Banks high export rates?
- 3.7. Are export losses of salmon confined to hatchery produced salmon?
- 3.8. Are export losses more serious when populations are low?
- 3.9. Are effects greater at intake locations in dead-end channels?
- 3.10. Could increased export rate cause an increase in fish density at the export pumps?
- 3.11. What is the risk to Sacramento salmon from exports?
- 3.12. With new screens and VAMP plus HOR barrier, is there adequate protection for SJ salmon?
- 3.13. Are export losses of steelhead confined primarily to hatchery fish? (Check this year's and last year's salvage for marked fish; and check timing relative to stocking records and locations.)
- 3.14. Fish/WQ conflict – Water quality would benefit more from July exports, whereas fish would be better off if we wait to transfer water south until August.
- 3.15. Are there risks to yearling smelt, salmon, and steelhead at Delta Wetland intakes in winter?
- 3.16. If we manage exports on a daily basis, is there a potential risk of a QWEST roller coaster effect?
- 3.17. Experiments in one season may not apply to other seasons.

#### 4. Fish Habitat as Mitigation for Exports

- 4.1. Can fish habitat improvements mitigate for or reduce impacts of exports? *"A through-Delta alternative should require improved habitat in the central Delta to slow fish egg/larval dispersal toward pumping plants to allow these life stages to mature, to increase food web interactions, to stimulate fish growth and survival, and to facilitate fish/habitat relationships that might otherwise be adversely affected by changes in tidal hydrodynamics attributable to south Delta exports."*

- 4.2. Will habitat improvements benefit fish populations regardless of changes in exports? *"The team differs in the importance of habitat relative to salvage losses in the declines of Bay-Delta fish, and the relative potential benefits of habitat improvement and salvage reductions in the recovery of these fish species. The team agrees on habitat actions and the priority for implementing them in Stage 1."* *"The salmon team agreed on a list of habitat actions for stage 1 from the ERPP, not the AFRP. The salmon team never received a list of the AFRP priority actions so the priorities were based largely upon the ERPP. The salmon team consequently based their assessments on upstream ERPP actions, not on upstream AFRP actions."* *"Some team members believe that improving habitat is far more important than reducing salvage losses, while other members believe improvements in both are essential."*

#### 5. Fish and Facilities

- 5.1. **Closure of Delta Cross Channel:** Does closure of the DCC really benefit Sacramento salmon?
- 5.2. **New Screens:** Would construction of screens at south Delta pumping plants reduce losses of fish?
- 5.3. **Head of Old River Barrier:** *"A barrier at the head of Old River is a concern as it may aggravate the potential of Sacramento or central and southern Delta fish being drawn to the south Delta pumping plants. The team concluded that such a barrier would be essential for restoring San Joaquin salmon, steelhead, and splittail populations, and that a capacity to variably operate the barrier would limit concerns for delta smelt and other Delta and Sacramento River fish."*

#### 5.4.

#### 6. Delta Habitat Conditions and Exports

- 6.1. Does interior Delta have poorer water quality and habitat, and as a consequence have lower probability of survival?
- 6.2. Is this due to exports or physical configuration?

#### 7. Fish Distribution and Abundance

- 7.1. Are salvage data a reasonable surrogate for real-time monitoring of fish distribution and abundance?
- 7.2. Would delta smelt distribution likely change with changes in exports and inflows?

#### 8. Winter Run Chinook Salmon

- 8.1. Is there a risk to winter run salmon from exports?
- 8.2. To what extent is that risk reduced by new screen facilities and greater frequency of closure of DCC?
- 8.3. Do proposed ERP habitat improvements decrease risk to winter run?
- 8.4. What are the indirect risks of exports on winter run?

- 8.5. Are Stage 1 risks acceptable? Can risks be adequately minimized through adaptive management?
- 8.6. What upstream EWA flow actions would benefit winter run?
- 8.7. What can we expect from ERP for winter run in Stage 1?
- 8.8. Can we differentiate winter run smolts from other smolts in salvage data?
- 8.9. Would a shift to higher October to March exports from expanded Banks even if confined to wet years increase risks to winter run?

**9. Spring-Run Chinook Salmon**

- 9.1. Could late summer and early fall transfers from Yuba storage cause spawning in gravel beds that would later become dewatered?
- 9.2. How much do spring chinook yearlings depend on the first flow pulse of the water year? How can we protect them from export impacts?

**10. Fall Run Chinook Salmon**

- 10.1. What are the indirect and direct effects on fall run fry from winter Delta exports?
- 10.2. Are proposed new screening systems adequate to protect fall run fry?

**11. Steelhead**

- 11.1. Are salvaged steelhead primarily hatchery fish released in February? Are wild fish vulnerable to export facilities?
- 11.2. Are new screen systems adequate to protect wild steelhead?

**12. San Joaquin Fall Run Chinook Salmon**

- 12.1. Does survival of downstream migrating subyearlings in spring improve with closure of HOR barrier? If so how much is the improvement? Does it reduce the need for screens at the south Delta pumping plants?

**13. Delta smelt**

- 13.1. Do changing exports and flows change the distribution of delta smelt adult spawners, prespawners, and young?
- 13.2. Would delta smelt benefit from releasing water to outflow from Bacon Island storage?
- 13.3. How should potential actions vary from year to year based on population abundance index?
- 13.4. What are the potential effects relating to larval smelt? Are larval smelt far less important because they are less valuable in terms of adult equivalents?

**14. Splittail**

- 14.1. Would splittail benefit from HOR barrier?
- 14.2. Would splittail benefit from SJ flow pulses?
- 14.3. Would splittail benefit from new screens and JPOD?
- 14.4. Would these new features adequately protect SJ splittail?

**15. Striped Bass**

- 15.1. Would new screens and habitat enhance striped bass survival sufficiently to allow proposed changes in system operations under EWA without further jeopardizing population or existing fishery?
- 15.2. Should striped bass be a factor in operation decisions?