

TO: DEFT and NoName Group
FROM: Bruce Herbold
RE: Hybrid Scenarios for CalFed ESA Assurances
DATE: November 17, 1998

PROBLEMS

Recent discussions have focused on delta export operational impacts on species not covered by the Accord or for species that have suffered large entrainment effects since the Accord. Uncertainty surrounds the role of entrainment effects on subsequent adult population levels and the appropriate hydrological variable to link with export operations to reduce entrainment. Since 1994 all years have been wet, so the flow/X2 elements of the Accord have not been in effect. Only the elements that were directed toward entrainment reduction (specifically the E/I ratios) have resulted in actual operational changes. Areas of concern have been described in several meetings of the DEFT:

- 1. Delta smelt adults (entrainment in Jan-Feb)
- 2. Delta smelt young (take exceeded in late May/early June of recent years.)
- 3. San Joaquin salmon fry (high takes following high flows in January/February)
- 4. San Joaquin salmon smolts (portion of outmigrants not covered by VAMP)
- 5. Spring-run yearlings (outmigrating in November-January)
- 6. Steelhead outmigrants (period variable from Feb-May, but passage swift)
- 7. Striped bass young of year (especially May-July).

Several of these areas of concern were addressed in the delta actions of CVPIA B(2). Many of these delta actions cannot be unilaterally performed by BOR. Implementation of upstream B(2) actions have resulted in a windfall of federally-stored water to state delta export operations. Implementation of delta B(2) actions could similarly constitute foregone exports by federal facilities that are 'picked up' by SWP pumps.

ASSUMPTIONS

Implementation of the ERPP/DEFT/Strategic Plan habitat improvement actions should provide substantial benefits to all species of concern except steelhead. CALFED programs to improve environmental water quality and the reduction of entrainment by agricultural diversions in the delta should improve survival of all species. Construction of efficient fish screens at the entrance into Clifton Court should greatly reduce impacts of entrainment on salmon, steelhead, sturgeon and striped bass. The importance of entrainment effects on determining population size of delta smelt is unknown, but requires reduction under any plan that could provide ESA assurances for the next 7-10 years. Entrainment effects on salmon and steelhead are likely cumulative with other sources of mortality so that reductions in mortality at any life stage will tend to result in improved adult production. At least some of the effects of entrainment are unlikely to be operative in all years (e.g. San Joaquin salmon fry are abundant in the delta only following high flows), some effects are likely to reflect conditions that reduce the likelihood of other effects (e.g. the flow conditions that bring San Joaquin fry into the delta reduce concern about entrainment of adult delta smelt), and some protective measures for one species are apt to reduce entrainment effects of other species (e.g. reduced exports to protect delta smelt young in late May are likely to protect striped bass

and salmon).

TOOLS

All DEFT members seem to agree that entrainment is less of a concern when flows are high, or that there are times and conditions when entrainment is less of a concern.

Several of these variables have been proposed as an index to link with entrainment:

1. San Joaquin flow. The 1995 water quality control plan, the current delta smelt biological opinion and the Vernalis Adaptive Management Plan (VAMP) all set exports in relation to San Joaquin flow at Vernalis. This is believed by most to be the best link to protect San Joaquin salmon smolts and (by a smaller group) to protect young delta smelt. In contrast to all other fish of concern, San Joaquin salmon fry are only at risk following a high San Joaquin flow event.
2. QWEST. This calculated value estimates net flows in the western delta, influenced primarily by San Joaquin flows and total export rates. The amount by which Sacramento River flows influence this calculation is greatly affected by closure of the cross-delta channel. This variable was the basis of the SWRCB draft plan in 1992 and the original NMFS biological opinion for winter-run salmon. QWEST shows the best correlations with Sacramento salmon salvage rates, but the ecological and hydrodynamic implications are gravely questioned by some parties.
3. X2. The tidally averaged location of the upstream edge of salt water intrusion (in km from the Golden Gate) is an area where several species occur in greatest abundance and which shows correlations with many populations. This variable was one of the primary bases of the 1995 WQCP and is used to define the critical habitat for delta smelt. For those species which live in low salinities, the further their habitat is from the pumps the less concern there is about entrainment effects. There is some historical pattern that entrainment of adult delta smelt is a greater problem in winters following years when X2 has remained upstream of Chipps Island through the preceding spring. There is also a pattern that high springtime entrainment of young delta smelt is followed by lower adult abundance. One B(2) action restricts export rates if X2 is far upstream, another improves the overall extent of X2 protections.
4. Habitat. Aside from the open water salinity habitat associated with X2, the abundance and location of other habitats used by fish are widely believed to provide improved growth, survival and reproductive success for the species of concern. Improvements in estuarine habitats can therefore be expected to improve the abundance of these species and may reduce the effects of entrainment on these species in several ways. These expectations are the foundation of the CalFed Ecosystem Restoration Plan. Construction of habitat is slow and expensive and there is great uncertainty attached to the degree to which habitat restoration will occur to buffer species from the impacts of entrainment in the first seven years of the program.
5. Timing. All species vary seasonally in their sensitivity to entrainment effects. Some, like delta smelt and striped bass, live in the estuary year-round and therefore may be at some risk in all months and greater risk in some months.

Other species, particularly all salmon and steelhead runs, have periods when they are not passing through the delta. Species also vary in how predictable they are in their timing. The arrival of spring-run salmon from Deer and Mill creeks into the delta is much more predictable than steelhead; striped bass spawning is much more predictable than delta smelt spawning. Considerable effort is already being spent on monitoring the exact movements of these species and serious efforts are underway to develop comprehensive monitoring throughout their ranges.

DEFT SCENARIOS

The Diversion Effects on Fish Team (DEFT) has developed three broad categories of scenarios to reduce the effects of entrainment. One category uses stricter standards to improve general estuarine conditions and thereby reduce the impacts of entrainment. Another category uses close attention to monitoring data to reduce exports when species of concern are in immediate danger of entrainment. The third approach identifies a volume of water dedicated for environmental uses but relies on the deliberation of a resource manager to determine within each year what actions will be taken to protect fish. These alternative scenarios are all believed by DEFT to be able to provide similar levels of fish protection, but for the same level of protection they vary in their water costs, in the degree to which they can incorporate changing priorities and adaptive management, and in their suitability for the various species of concern.

A HYBRID PROPOSAL

This 'Ecomanagers' scenario attempts to combine the certainty of stricter standards with the flexibility of an environmental water account. Stricter standards are most appropriate for species with predictable times of vulnerability and for which we have a good understanding of their sensitivities. Active management, wherein decisions are made based on real-time data, is most suited for those species whose needs are likely to shift greatly from year to year. Adaptive management is most suited for those species whose sensitivity to entrainment is poorly understood, and an experimental approach can be used to improve understanding. Both active and adaptive management benefit from the flexibility of an environmental water account.

Stricter standards

The Vernalis Adaptive Management Plan is designed to determine the relative roles, and overall importance, of flows and export rates on the migratory success of San Joaquin salmon smolts. VAMP is intended to satisfy the protective goals of the 1995 WQCP by substituting an experimental design for a purely regulatory approach, but it is still the most stringent control on exports and flows. CVPIA delta action 5 added a ramping period for two weeks after the end of the 31 day experimental period to improve protection to the portion of the population that migrates late. Delta smelt tend to be particularly sensitive to entrainment in late May and early June. Winter-run outmigration tends to peak just before the 31 day VAMP period.

Proposal: Convert the B2 ramping period into a full extension of VAMP conditions,

thereby increasing the number of survival tests that can be performed each year and extending equal protection to a high percentage of the San Joaquin smolts. Add 15 discretionary days wherein exports can be reduced to VAMP levels at the determination of the resource manager anytime within the March 15-June 30 period, in response to monitoring or salvage data.

Active and adaptive management

From October through March hydrological and biological conditions vary enormously from year to year. Most Sacramento salmon, longfin smelt, delta smelt adults, and steelhead are entering the estuary in these six months. At this season also, flows are high and use of the NoName Group tools are expected to permit filling of San Luis Reservoir in most years, without greatly reducing carryover storage in Shasta reservoir. Standards adequate to protect all species that might be at risk in all years are certain to have major adverse effects on water project operations, including biologically significant aspects. In addition, the mechanisms behind indirect mortality, the role of export operations on migratory success and indirect mortality, and the importance of these effects on the adult population levels of longfin and delta smelt, are all poorly understood. Adaptive management is the preferred CalFed method for addressing such uncertainty. Adult populations of smelt vary by orders of magnitude from year to year and population sizes of most salmon vary strongly in response to hydrological conditions three years earlier. These annual fluctuations in adult population sizes tend to heighten concerns about entrainment effects in years when populations are small. Active management decision-making can reduce these concerns by emphasizing protection of species in years when their populations are at greatest risk.

An environmental water account can provide the flexible but firm basis for active and adaptive management, but it has several problems to be overcome: how can protection be afforded to species early in the water year when the account may be empty? How can environmental water be stored for later use in a system limited by storage? How can protection be ensured when protective needs exceed the water available?

Proposal:

Establish an environmental water account and ecosystem manager to coordinate its use. Export reductions totaling about 80 days are required to reduce entrainment of each sensitive species to 50% in the historic salvage records. Credit the environmental water account with 150 TAF in San Luis Reservoir on October 1 of each year (except as below). If San Luis fills in that wateryear the credit is automatically paid off. The environmental manager (with approval of all ESA and CESA agencies) can relax the E/I ratios and/or the Corps criteria to put more water into the account, which may be banked wherever storage can be found if San Luis fills or in San Luis if it does not fill. After San Luis fills, export restrictions can be imposed as necessary using either water banked elsewhere, long-term options or purchases, or drawn against the next October 1 credit. If San Luis does not fill, then the volume of export restrictions taken from the credited account is deducted from the next year's credit and must be replaced through relaxed springtime requirements, banked water, purchases, options, or other tools. Removal of

groundwater is a slow process but the current NoName groundwater banking plans permit withdrawal of 12-42 TAF/month, so if San Luis is forecasted in February to not fill than at least 96 TAF could be withdrawn from groundwater banks by October.

In all, 150 TAF for the October-to-filling period and another 150 TAF for the post-filling period (either from real-time relaxations of the default requirements or borrowed against the subsequent year's October credit) would permit strict export curtailments for 20 to 30 days in each period. Combined with the 45 days of the extended VAMP this approximates the 80 days of export reduction that would be needed to reduce salvage of each sensitive species by 50%.

Any water in the environmental water account is available for sale or trade at the discretion of the ecosystem manager (with concurrence of the responsible regulatory agencies). Sale of EWA water could both fund habitat enhancement and provide supplies for exporters. Trade of water could provide flows on streams that are otherwise not managed by CalFed agencies.

IMPLEMENTATION, MODELING AND WATER SUPPLY

This scenario is intended to make environmental protection more effective without a significant increase in impacts to export interests above those of the 1995 WQCP. Much of the work of several programs within CalFed has been aimed at reducing the conflict between water export and environmental protection by reducing demand and finding alternative supplies, particularly in dry years when aquatic resources are most at risk. This scenario assumes that alternative ways of meeting dry year demands will provide the flexibility needed to make an environmental water account successful in dry years. Water purchases and drought option contracts are tools that would obviously make it easier to ensure that protection could be achieved in successive dry years.

1. Use expanded pumping capacity with the JPOD to recover upstream AFRP CVP releases. This eliminates most impacts of b(2) delta actions. These actions include improving X2 to 1962 LOD for March-June and adding a ramp of flows &/or exports from May 15 to June 1. Modeling accompanying the Nov 20, 1997 DOI announcement suggests that this would reduce total water costs of delta actions to about 30 TAF relative to Accord.
2. Beyond step #1, allow full use of JPOD, but impact of additional pumping on aquatic resources is offset by a credit of 150 TAF in environmental water account each October 1. Net gain to CVP water supplies of at least 50 TAF, if net impact of JPOD is 200 TAF and maximum reduction is 150 TAF.
3. Use expanded pumping capacity with the JPOD and eliminate E/I ratios to bank water in San Luis for environmental purposes later in year. Ecomanagers determine timing of export expansion and restriction. Default conditions are 1995 WQCP and Corps Criteria. Water into environmental account includes half of any water that can be retained in upstream project reservoirs as a result of additional pumping of 'surplus' flows. No net water supply impacts; some capacity for improved storage for projects. Requires South of Delta groundwater (or other) storage to provide protection across years and in droughts. Water

quality at times of relaxation of standards is apt to be substantially better than that stored in San Luis Reservoir and should be shunted past O'Neill Forebay for delivery as drinking water supplies. No net water supply impacts.

4. Expand VAMP export rates and flows from May 15 to June 1 in all years. Additional 15 days of export restriction on call during the Mar 15 to June 15 period. Install operable Head of Old River Barrier, operated solely at discretion of council of ESA agencies. Some water supply impacts addressed under #1. Water supply impacts beyond those covered by #3 are addressed through CalFed water use efficiency program and water transfers program. Flow augmentation might be contingent on finding suitable sources, either from currently unused environmental supplies, purchases when VAMP volumes are lower than usual, or from releases from San Luis Reservoir when such releases are determined suitable by ecomanager.

5. All water stored in the environmental account is transferable to fund any environmental actions that are otherwise unavailable, such as flow enhancements on non-project streams, or non-flow actions deemed necessary by the Ecomanagers. Could provide substantial future export supplies after habitat and other protective measures are in place and have proven successful.