REVISED DRAFT

HYPOTHESES FOR TECHNICAL GROUPS

July 15, 1999

The technical groups should test the following specific hypotheses and report on whether the available evidence supports the hypotheses. These reports should state the circumstances under which the relevant data support or refute each hypothesis, and the reasons for these conclusions. Where the data are insufficient the report should recommend experiments that will allow testing of the hypotheses. . These hypotheses are important because they are the basis for EWA actions.

The technical groups should perform new analyses if necessary and feasible for their mission. They should also invite presentations by non-group members who have special expertise or who have developed analyses relevant to the hypothesis under review.

The Technical Groups should conduct their review in an iterative fashion. That is, they should attempt to produce early, preliminary conclusions using available information and analyses that could subsequently be refined, as more data and analyses are available.

The phrase "important to the population" as used below should be addressed by quantifying the population effect whenever possible.

The intent of this process is to produce analyses and conclusions, along with backup material, that would withstand independent scientific review consistent with that normally applied to professional journals.

NEXT STEPS

1. Agree on a list of hypotheses

2. Expand this list by including specific questions to be answered for each specific hypothesis

3. Annotate the expanded list by identifying analyses and information that would be relevant to answering each question (that is, give the teams a head start).

4. Decide how the analyses and information will be prepared (responsibility, schedule, budget).

5. Identify the members of the Technical Teams (could vary for each hypothesis or species).

6. Describe the process by which the teams conduct their evaluations.

HYPOTHESES

Six general hypotheses (A-F) are listed below. Each is followed by specific hypotheses. Each specific hypothesis will be further expanded by a series of questions to ensure that the meaning of the hypothesis is clear. The last general hypothesis is followed by a description of work to be done by technical teams to put the effects of water project actions in the Delta in perspective.

A. DIRECT EXPORT MORTALITY:

Direct export mortality is mortality occurring within export facilities. It can be categorized as follows:

- Pre-screen predation (in Clifton Court Forebay at the Banks Pumping Plant, at and near the trash booms at the Tracy Pumping Plant)
- Screening mortality (fish dying at or passing through the screens)
- Salvage and handling mortality
- Post release predation (abnormally high predation rates at sites where salvaged fish are released).

General Hypothesis:

Direct export mortality is affected by export rates and has important population effects.

Specific Hypothesis

A1. Changes in exports to reduce salvage have an important net effect on populations of Chinook salmon, delta smelt, striped bass, and splittail ("net" refers to the possibility that exports might be reduced at one time of the year and increased at another).

A2. Mortality based on adult equivalents of numbers salvaged is a better measure of export effects on population than mortality computed salvage. However, adult equivalent direct mortality for delta smelt cannot now be estimated with enough accuracy to be useful.

A3. Flexible real time modification of exports is superior to fixed E/I ratios in minimizing effects on fish populations.

B. INTERIOR DELTA MORTALITY:

Interior Delta mortality is mortality occurring in the Delta, primarily the central and southern Delta (as defined in CALFED ERP maps), and not within the export facilities. Causes of interior Delta mortality include predation, food limitation, toxicity, water temperature, and, indirectly, the quality and abundance of available habitat area.

General Hypothesis:

Exposure to interior Delta mortality affects levels of interior Delta mortality. This exposure is associated with export pumping rates; the higher the export rate, the greater the interior Delta mortality. Interior Delta mortality has important population effects, as do the changes in interior Delta mortality attributed to export pumping.

Specific Hypotheses:

B1. Interior Delta mortality is important to population levels of various fish.

B2. Increased exports have potential indirect effects on interior Delta mortality and these indirect effects affect populations of several species of fish.

C. FLOWS:

Evidence exists that certain flows benefit fish populations either directly or through the control of western Delta salinity.

General Hypothesis:

Maintenance of flows at certain times and location in the estuary increase the abundance of specific fish species.

Specific Hypotheses:

C1. There is an inverse relationship between X2 and abundance of several estuarine species; that is, the lower the value of X2, the higher the abundance. Managing water project operations would cause changes in the location of X2 that would be important to fish populations.

C2. Lower values of X2 result in delta smelt being farther downstream, which results in lower mortality at the export pumps, and this lower mortality has an important positive effect on population.

C3. Increasing flows in the San Joaquin River during times of outmigration of San Joaquin River salmon smolts results in an increase in survival of smolts, and this increase has an important effect on population.

C4. Higher levels of flow in the Sacramento River results in higher levels of survival of outmigrating salmon and early life stages of striped bass, and these higher levels of survival have an important effect on population.

C5. Mortality of resident and migrating fish at the export pumps (direct export mortality) varies inversely with net calculated flow (QWEST) in the lower San Joaquin River is, and this variation has important effects on population.

C6. Survival of outmigrating salmon is higher the higher QWEST is, and this higher survival has an important effect on population.

D. BARRIERS:

The Delta Cross channel gates are one barrier. Other barriers have been proposed or built in the southern Delta. These barriers influence the movement of water and fish.

General Hypothesis:

Closing or installing barriers has positive effects on population levels of some fish (primarily salmon) and negative effects on other fish (primarily delta smelt).

Specific Hypotheses

D1. Closing the barrier at the Head of Old River during times of outmigration of San Joaquin River salmon smolts results in an increase in survival of outmigrating smolts, and this increase has an important effect on population.

D2. Barrier operations in the South Delta result in an increase in direct mortality of delta smelt at the export pumps and indirect mortality of delta smelt in the central and southern Delta, and these increases in mortality would have important effects on the delta smelt population.

D3. Closing the Delta Cross Channel gates whenever significant numbers of young Chinook salmon are migrating past the Cross Channel will have important positive effects on the population of Chinook salmon.

D4. Closing the Delta Cross Channel gates sometimes has important negative effects on the population of Delta Smelt

E. OTHER WATER PROJECT-RELATED REQUIREMENTS:

Several other prescriptive requirements control water project operations in the Delta.

General Hypothesis:

These prescriptive requirements have good relationships with population level effects, and are superior in this regard to flexible, real time requirements.

Specific Hypotheses

E1. Flexible, real time modification of exports is superior to prescriptive standards (direct export curtailments, VAMP, X2) in minimizing the effects on fish populations for any given amount of water.

F. OTHER ACTIONS AND FACTORS:

Actions other than water project-related actions in the Delta affect population levels of fish. Uncontrollable factors also have important effects.

General Hypothesis:

Water project-related actions in the Delta have effects that are important to population levels of fish and important relative to other actions and factors affecting population levels.

Specific Hypotheses

F1. Introduced species have altered the relationships between water project operations and survival, mortality, or population, but the relationships as defined in A through E above are still sound enough for management of water project operations.

PUTTING WATER PROJECT ACTIONS IN THE DELTA IN PERSPECTIVE

The above hypotheses concern water project actions in the Delta and the effect of these actions on fish. Other actions can be taken to improve the fishery. These include water project-related actions upstream of the Delta (increasing stream flows, removing dams, controlling water temperature, etc.) They also include non-water project-related actions throughout the habitat range of species of interest (e.g., hatchery and harvest management, habitat improvements, and predator control). In addition, factors not subject to control (e.g., climate-related changes) have important effects on Bay-Delta fish.