

and comprehensive program of ecosystem protection through the SWRCB. SWRCB has proposed fish and wildlife objectives for the Bay-Delta Estuary based on the Principles in a draft water quality control plan (December 1994). Full implementation of these objectives will occur when components have been apportioned to the various water rights holders through the State's water rights process.

The Joint Proposal as modified by the Principles served as the primary source of information to NMFS regarding the proposed operation of the CVP and SWP under the Delta proposal. Biological justification for this plan of operation was provided in the following sources of information: (1) the November 3, 1994, document entitled Biological Explanation of the Joint Water Users Proposed Bay-Delta Standards; (2) the November 10, 1994, document entitled Report on Discussions with Federal and State Agencies and Interested Groups - Summary of Areas of Technical Disagreement on the Joint Ag/CUWA Draft Proposal for Bay-Delta Standards; (3) discussions with the Bureau of Reclamation (Bureau), California Department of Water Resources (DWR), Environmental Protection Agency (EPA), and California Department of Fish and Game (DFG) at several informal meetings; and (4) miscellaneous materials provided by Bureau, DWR, EPA, and DFG, including the results of water project operations simulation (DWRSIM) model runs.

The Delta proposal is designed to supersede previous fish and wildlife protective standards in Water Rights Decision 1485 (D-1485) and the QWEST criteria contained in the reasonable and prudent alternative of NMFS's CVP-OCAP biological opinion. Export limits and habitat protection achieved by the QWEST criteria in NMFS's CVP-OCAP biological opinion are provided by direct export/inflow ratio limits in the Delta proposal. Pending further analysis, my letter to you of December 30, 1994, temporarily modified the QWEST component of the CVP-OCAP biological opinion's reasonable and prudent alternative by replacing the requirements for maintaining QWEST conditions (RPA items 9 and 10, page 57) with the more direct limits on export contained in the Principles (paragraphs 1, 2, and 3 under Water Quality Standards and Operational Constraints pages 1 and 2). Those aspects of D-1485 that remained unchanged in the delta proposal, and all other components of NMFS's CVP-OCAP biological opinion remain in place.

Biological Justification for Water Quality Standards

Since 1978, CVP and SWP operations have been governed by the water quality standards and flow and operational constraints established by D-1485. The proposed action which NMFS analyzed in the CVP-OCAP biological opinion with changes analyzed in

subsequent amendments to this opinion, included CVP and SWP compliance with the requirements in D-1485. In general, the objectives outlined in the Principles are more protective of fish and wildlife than the standards contained in D-1485. The following assessment of impacts addresses each measure in the Delta proposal that is likely to affect the endangered Sacramento River winter-run chinook salmon.

Delta Outflow, River Flows, and Salinity Standard. The proposed standards for Delta outflow, Sacramento River flow at Rio Vista, San Joaquin River flow at Vernalis, and salinity in the western Delta during the period of November through June will generally result in minimum flows greater than flows which have historically occurred under D-1485. In the lower Sacramento River and northern Delta, increased flows are likely to improve conditions for both adult and juvenile winter-run chinook salmon over the conditions achieved by D-1485, particularly in critically dry periods. The quality of winter-run chinook habitat in the northern Delta will likely be increased with achievement of these water quality standards in dry and critical water years.

(a) **November to January period.** During the period of November through January the minimum flow requirements under the Delta proposal are likely to improve the guidance of downstream migrating juveniles in the Sacramento River mainstem towards suitable rearing habitat in the northern and western Delta, particularly in dry and critical water years. In combination with the periodic closure of the Cross Channel gates, greater minimum flow conditions are likely to reduce the number of juvenile winter-run chinook salmon pre-smolts diverted into the central Delta. Fisheries investigations since the 1980's have shown that hatchery salmon smolts which pass into the interior Delta have substantially lower survival rates than those fish which remain in the mainstem Sacramento River (USFWS 1987).

(b) **February to June period.** From February through May in dry and critical water years, the higher minimum flow conditions under the Delta proposal are likely to improve the seaward guidance of winter-run chinook salmon smolts. Survival rates of smolts are likely to increase with better transport flows and reduced delays in emigration. Flows will also provide a "homing cue" for returning adult winter-run chinook salmon. Upstream passage conditions for adults are likely to improve under low flow conditions by enhancing guidance through the Delta to the upper Sacramento River.

Delta Cross Channel Gate Closure. The closure of the Delta Cross Channel gates at Walnut Grove on the Sacramento River under the Delta proposal is consistent with the reasonable and prudent

alternative in NMFS's CVP-OCAP biological opinion. From November 1 through January 31, the Delta proposal provides for closure of the Delta Cross Channel gates for up to a total of 45 days in response to the presence of migratory juvenile salmon. Full closure of the gates will occur between February 1 and May 20 for migratory juvenile salmon.

(a) **November to January period.** During the fall and early winter months most juvenile winter-run chinook emigrate from the upper Sacramento River to the lower river and Delta as pre-smolts. Research on many river systems, including the Sacramento River, has shown that downstream movements of juvenile salmon tend to peak during storm and turbidity events (Glase 1994; USFWS 1994). The proposed closure of the Delta Cross Channel gates for a period of up to 45 days between November 1 and January 31, in coordination with juvenile chinook salmon migration pulses, will reduce the diversion of downstream migrating juvenile winter-run chinook salmon into the central Delta and direct them away from the SWP and CVP pumping plants towards more suitable rearing habitat on the north and west side of the Delta.

(b) **February to May period.** Juvenile winter-run chinook actively emigrate to the ocean as smolts between February and mid-May. Full closure of the Delta Cross Channel gates during this period will reduce the percentage of the population diverted off the mainstem Sacramento River into the central Delta. The overall survival of the winter-run chinook salmon outmigrant population will increase by reducing the number of fish exposed to adverse conditions in the central Delta. The Delta proposal will provide protection above that contained in NMFS's CVP-OCAP biological opinion by extending the closure period from April 30 to May 20.

Export Limits. Water export restrictions assist juvenile winter-run chinook to safely rear in, and emigrate through, the Delta. A review of the inflow and export data from 1970 to 1992 indicates that the percentage of water diverted from the Delta in recent years has increased substantially above diversion levels which occurred during earlier years when winter-run chinook salmon population levels were at higher levels (CUWA 1994). The export/inflow limits in the Delta proposal will reduce the percentage of inflow exported from the Delta in comparison with that which occurred historically under D-1485 during dry and critical water years. The export/inflow ratios in the Delta proposal replace the QWEST criteria contained in the CVP-OCAP biological opinion (reasonable and prudent alternative items 9 and 10, page 57).

(a) **November to January period.** From November through January, some juvenile winter-run chinook salmon travel to the

lower Sacramento River and northern Delta as pre-smolts to rear until smoltification in the early spring. Available information does not provide an accurate measure of the number of juvenile winter-run chinook salmon which rear in the Delta during this period, but it does suggest the number is typically low and highly variable depending on streamflow conditions during the fall months. A maximum export rate of 65 percent of inflow is allowed from November through January in the Delta proposal; however, the export rate may be adjusted by the CALFED operations group to ensure biological protection (see CALFED section below).

An analysis of DWRSIM model results indicates that export/inflow ratios will typically be considerably less than the maximum allowable level. For example, export/inflow ratios are expected to exceed 60 percent less than 10 percent of the time. In addition, model results suggest the delta proposal will generally result in conditions which support the QWEST criteria established in NMFS's CVP-OCAP biological opinion. During this period, adverse effects to juvenile winter-run chinook salmon pre-smolts are expected to be minimal under the delta proposal since export limits will be managed in combination with the periodic closure of the Delta Cross Channel gates, real-time monitoring will be conducted, and operational flexibility will be provided under the CALFED operations group process.

(b) February to June period. During the period of February through May, juvenile winter-run chinook salmon undergo smoltification and actively emigrate to the ocean. It is during this period that juvenile winter-run chinook salmon are especially vulnerable to entrainment at the Delta pumping plants. The Delta proposal will afford protection to winter-run chinook salmon smolts from entrainment loss and other indirect impacts in the central Delta by reduced export levels from February through June (35 percent export/inflow ratio) in concert with the closure of the Delta Cross Channel gates.

Under critical water conditions the Delta proposal allows for export rates in February to be increased to 45 percent. This may occur when Central Valley water conditions are critically dry during the month of January (Eight River Index is less than 1.0 MAF). Low streamflow conditions during the early winter typically delay the downstream migration of juvenile winter-run chinook salmon by several weeks. Thus, this increase in the allowable level of export will occur infrequently and during periods when winter-run chinook salmon emigration is not expected to occur.

DWRSIM model results predict that CVP and SWP operations under the Delta proposal will increase monthly computed QWEST flows approximately 70 percent of time during months of February

through April when compared to operations under NMFS's CVP-OCAP biological opinion and D-1485. During the remaining 30 percent of the time, the model predicts the QWEST criteria in the CVP-OCAP biological opinion will not be achieved. However, the water quality objectives for Delta outflow, minimum river flows, and salinity generally assist the February through June export constraints to improve Delta environmental conditions. Thus, DWRSIM model results suggest winter-run chinook emigrants will benefit from the increase in computed QWEST flows and reduced export levels in most years.

NMFS review of the two methods for limiting export levels suggests export/inflow ratios operate in a manner comparable to the QWEST criteria because both methods are mathematically similar in their use of export/inflow relationships. The calculated value of QWEST incorporates Delta inflow, CVP/SWP export rates, Contra Costa Water District export rates, cross Delta flow (via Delta Cross Channel), net Delta consumptive use, and in-Delta precipitation. Export/inflow ratios incorporates two of these parameters: Delta inflow and CVP/SWP export rates. A comparison of computed QWEST flows from the DWRSIM operations simulation model indicates that this maximum export/inflow level generally supports the QWEST criteria in NMFS's CVP-OCAP biological opinion. Therefore, NMFS has determined that the water export constraints achieved through the export/inflow ratio limits in combination with the improved minimum flow conditions of the delta proposal provide a level of protection equivalent to that achieved with the QWEST criteria in NMFS's CVP-OCAP biological opinion (reasonable and prudent alternative numbers 9 and 10, page 57).

CALFED operations coordination group. The Delta proposal recognizes the establishment of the CALFED (California Water Policy Council and Federal Ecosystem Directorate) operations group which will monitor biological and hydrological conditions throughout the year. Export rates established in the Delta proposal may be adjusted downward to a more protective level if deemed necessary by the CALFED operations group. February export rates will be set between 35 percent and 45 percent by the CALFED operations coordination group if the January Eight River Index is between 1.0 and 1.5 MAF. NMFS will play an active role in this group to ensure that actions can be implemented if available information suggests that export levels are not achieving the desired level of protection for winter-run chinook salmon.

Incidental Take Monitoring. The incidental take statement attached to NMFS's February 12, 1993, CVP-OCAP biological opinion identified the incidental take of winter-run chinook salmon from the proposed long-term operation of the CVP and SWP. NMFS's biological evaluation of project operations under the reasonable

and prudent alternative concluded that in the Delta both direct entrainment losses and indirect losses of juvenile winter-run chinook salmon are likely to result from Delta water exports. Direct entrainment losses at the Delta pumping plants are currently estimated by the direct loss calculation methodology adopted by the Bureau, DWR, and DFG in 1976. Juvenile winter-run chinook salmon are distinguished from the other three Central Valley chinook races by the size criteria developed by DFG. However, indirect fish losses associated with Delta water exports are very difficult to quantify, particularly on a real-time basis. Given this uncertainty, NMFS had determined that the annual 1 percent incidental take of juvenile winter-run chinook salmon based on the direct loss at the water export facilities was a conservative and reasonable index of the indirect losses that are expected to occur within central and southern Delta waterways.

Since the issuance of NMFS's February 12, 1993, biological opinion and incidental take statement, an interagency work group and the winter-run monitoring and loss committee has attempted to improve the loss estimation methodology at the Delta pumping plants. The entire direct loss estimation procedure from the juvenile winter-run chinook production estimates to the size criteria for chinook race identification has been reviewed. Close scrutiny of the various components has allowed refinement of several factors in the calculation, but some parameters continue to have wide or undefined confidence boundaries. Available data, and physical and logistical constraints limit our ability to significantly improve the accuracy of several components of the direct loss estimation process. For example, the fish count sampling period at the salvage facilities must be reduced from 30 minutes per hour to a few minutes per hour when pumping rates are high.

In addition, the use of the size criteria for identification of Sacramento River chinook races has been seriously questioned. Data from the fisheries monitoring program and entrainment studies along the Sacramento River indicate that the size criteria performs well in the Sacramento River. Unfortunately, it does not perform as well in the Delta, particularly at the salvage facilities. NMFS has identified several problems with the use of the size criteria at the Delta fish facilities that are not encountered at other locations which lead to a higher degree of uncertainty. These problems include: juvenile chinook growth rates in the Delta differ from riverine habitat; size selective predation in forebay; size selective screening efficiency at the louvers; size overlap with unmarked Mokelumne River and Merced River fish hatchery releases of yearling fall-run chinook; and the facility is primarily sampling fish

undergoing smoltification which do not represent a random sample of the population.

Alternative methods for chinook salmon race identification are being pursued. DWR is currently funding a program to develop genetic discriminators for Central Valley chinook stocks. Despite these efforts, the size criteria remains the best methodology available for distinguishing chinook races. However, NMFS has concluded that the direct loss estimation methodology used at the Delta fish salvage facilities does not provide a high level of accuracy in its current form, and there is a need to incorporate additional flexibility when employing this method for evaluating "take". In addition, there is a need to develop supplemental or alternative methods for evaluating the level of incidental take associated with Delta water export operations.

Conclusion

The reasonable and prudent alternative described in the February 12, 1993, CVP-OCAP biological opinion, as modified by actions described in subsequent amendments to that biological opinion (August 2, 1993, October 6, 1993 and December 30, 1994), as well as the actions described herein, will avoid jeopardy to the Sacramento River winter-run chinook salmon and adverse modifications to its critical habitat as a result of the proposed long-term operation of the Central Valley Project and the State Water Project.

Amendments to NMFS's CVP-OCAP Opinion

Therefore, the CVP-OCAP biological opinion is further amended by NMFS as follows:

1. Item #7 on page 55 is deleted.
2. Item #8 on page 56 is deleted.
3. Item #9 on page 57 is deleted.
4. Item #10 on page 57 is deleted.
5. On page 69, term and condition #9 is revised as follows:

"9. The DWR and the Bureau are authorized to take up to 2 percent of the estimated number of juvenile winter-run chinook salmon incidental to the operation of the Delta pumping facilities at Byron and Tracy as calculated by the direct loss estimation outlined in item #13 of the reasonable and prudent alternative.

During the period of October 1 through May 31 of each year, calculated estimates of winter-run chinook salmon loss must be performed by the Bureau and DWR on a real-time basis. In consideration of several sources of inaccuracy in the loss estimation methodology, the total level of incidental take at the Delta pumping facilities for this period must not exceed 2 percent of the estimated number of winter-run chinook salmon entering the Delta. NMFS estimates that approximately 74,491 fish will enter the Delta during the 1994-95 season. Therefore, the total combined incidental take level for the Delta pumping facilities covered in this biological opinion must not exceed an estimated loss of 1,490 juvenile winter-run chinook salmon. NMFS will review the chinook salmon data from the Delta fish collection facilities through the CALFED operations coordination process and make real-time adjustments to the loss estimates in accordance with the best available information to improve the accuracy of the estimated incidental take level of juvenile winter-run chinook salmon."

"Commencing in September 1995, NMFS will develop an estimate of the number of winter-run chinook salmon juveniles that will enter the Delta during the fall, winter, and spring months each year. This estimate will be used to determine the incidental take limit for that year."

"The Bureau and DWR will monitor the loss of juvenile winter-run chinook salmon at the Delta facilities as described in the reasonable and prudent alternative and will use that information to determine whether the estimated level of loss is likely to exceed the identified level. If either agency or NMFS determines the rate of loss has exceeded 1 percent of the estimated number of winter-run chinook juveniles that enter the Delta, the CALFED operations coordination group will immediately convene to explore additional measures that could be implemented to reduce the rate of take and ensure the identified 2 percent level of take is not exceeded. If either agency or NMFS determines the rate of loss is sufficiently high that the estimated loss will likely exceed the 2 percent identified level, consultation should be reinitiated immediately to develop measures which will ensure the authorized level of take is not exceeded."

6. On page 63, Conservation Recommendations are appended as follows:

"During 1995, the CALFED operations group continues to work with NMFS to develop supplemental and, perhaps, alternative measures to the fish counts at the Delta salvage facilities

for evaluation of winter-run chinook salmon "take" associated with Delta water export operations. Both direct and indirect loss components should be addressed. Evaluation methods including those outlined below should be pursued by the CALFED operations group for use commencing in the 1995-96 season:

(1) OBJECTIVE: Determine time of arrival, abundance, and distribution of winter-run chinook juveniles in the Delta to assist real-time operations and management decisions.

- (a) Intensive sampling near the city of Sacramento by kodiak trawl, fyke net, rotary screw trap, and beach seine. 4 days/week in October and 7 days/week from November through May.
- (b) Intensive sampling at Chipps Island by kodiak trawl or mid-water trawl. 4 days/week from October through December and 7 days/week from January through May.
- (c) Intensive sampling at the Delta fish collection facilities. Sampling frequency as allowed by pumping rates.
- (d) Rotary screw trap operation in the Delta cross channel (when it is open). 4 days/week in October and 7/days week from November through January.

(2) OBJECTIVE: Determine the level of take (impact to the year-class) occurring real-time to support real-time operations and management decisions.

- (a) Estimate the number of juvenile winter-run expected to arrive in the Delta; use the existing loss estimation procedure at the Delta fish salvage facilities; classify winter-run juveniles by the DFG size criteria; estimate the percent of the year-class lost to date. (FROM: February 12, 1993 biological opinion).
- (b) Coded wire tag (CWT) recoveries of Coleman National Fish Hatchery (CNFH) production at the Delta fish salvage facilities:

winter-run juveniles - direct loss estimation by existing method; estimate the percent of the CWT production lost to date.

late-fall run chinook salmon - use the November and December releases from CNFH in the upper Sacramento River to evaluate direct loss of salmon smolts during

the period of December and January. Loss rates may not be directly applied to the February through April period for winter-run, but will provide a measure of level of impact to salmon smolts under the environmental and hydrological conditions which occurred in December and January.

- (c) Smolt survival index - develop a predictive model which will generate a smolt survival index based on water export levels and other hydrological/environmental factors; set a target survival index value (or range of values) for winter-run chinook based on the operational criteria establish in the new Water Quality Control Plan and the desired level of protection; compute the index periodically with actual export levels and environmental/hydrological conditions to see if target index levels are being achieved. (FROM: EPA's proposed use of the smolt survival index).

(3) OBJECTIVE: Determine the level of impact to winter-run associated with Delta water exports during the past water year to measure the effectiveness of the new standards and in-season operational decisions.

- (a) Use the data from 1(a), 1(b), and 1(c) to develop indices for each location; evaluate the relative differences between the three indices to estimate the level of impact.
- (b) Experimental releases of CWT late-fall chinook at Ryde/Isleton and Georgiana Slough to evaluate the relative survival of fish migrating through the central delta (Georgiana Slough group) versus those migrating down the Sacramento River (Ryde/Isleton group). Survival rates may not be directly applied to the February through April period for winter-run, but will provide a measure of level of impact under the environmental/hydrological conditions which occurred during the experimental release. (as conducted in December 1993, December 1994, and January 1995)."

7. On page 74 term and condition #13 is appended as follows:

"11a) 3-day average and 14-day average export/inflow ratio as defined in the SWRCB December 1994 draft water quality control plan (page 22)."

NMFS recognizes that the Bureau will need to re-evaluate the operation of all CVP facilities to conform with the new water

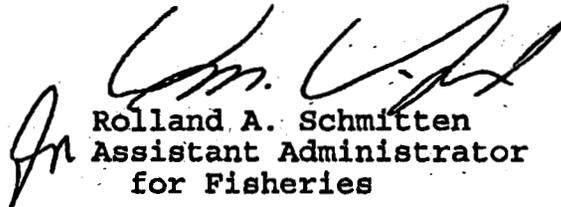
12

quality control plan. The continued coordination of NMFS, Bureau, and DWR will be required to ensure that CVP and SWP operational changes which result from compliance with the new water quality standards are compatible with the Bureau's need to comply with all other elements (Trinity, Shasta, and Sacramento River Divisions) of the CVP-OCAP biological opinion's reasonable and prudent alternative and incidental take statement.

Consultation must be reinitiated if: (1) the amount or extent of taking specified in any incidental take statement is exceeded; (2) new information reveals the long-term operations of the Central Valley Project may affect winter-run chinook salmon or its critical habitat in a manner or to an extent not previously considered; (3) project operations are subsequently modified in a manner that causes an effect to the listed species that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the Bureau's action.

I look forward to your continued cooperation in this process and future consultations.

Sincerely,


Rolland A. Schmitt
Assistant Administrator
for Fisheries

cc: FWS - Michael Spear
DFG - Boyd Gibbons
DWR - David Kennedy
SWRCB - Walter Pettit

REFERENCES:

California Urban Water Users. 1994. San Francisco Bay-Sacramento and San Joaquin River Delta Estuary - Regulatory recommendations to the State Water Resources Control Board for a coordinated estuarine protection program. October 19, 1994.

California Urban Water Agencies. 1994. Biological explanation of the joint water users proposed Bay-Delta standards. November 3, 1994.

Contra Costa Water District. 1994. Report on discussions with Federal and State Agencies and interested groups - Summary of areas of technical disagreement on the Joint Ag/CUWA draft proposal for Bay-Delta standards. November 10, 1994.

Glase, J. 1994. Monitoring Juvenile Salmon and Steelhead outmigrants produced in the upper Trinity River, Northern California, 1991-1993 - Progress Report. U.S. Fish and Wildlife Service, Trinity River Restoration Program. October 1994.

Principles for agreement on Bay-Delta standards between the State of California and the Federal Government. December 15, 1994.

State Water Resources Control Board. 1994. Draft water quality control plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. December 1994.

U.S. Fish and Wildlife Service. 1987. The needs of chinook salmon, Oncorhynchus tshawytscha, in the Sacramento-San Joaquin estuary. (USFWS Exhibit 31: SWRCB Bay-Delta Hearing). U.S. Fish and Wildlife Service. Sacramento, CA. Prepared for California State Water Resources Control Board 1987 Water Quality/Water Rights Proceeding on the Sacramento-San Joaquin Delta, Sacramento, CA.

U.S. Fish and Wildlife Service. 1994. Abundance and survival of juvenile chinook salmon in the Sacramento-San Joaquin Estuary - 1993 Annual Progress Report. Sacramento-San Joaquin Estuary Fishery Resource Office, Stockton, California. December 1994.