

October 27, 1997

**CALFED OPERATIONS GROUP
SACRAMENTO RIVER SPRING-RUN CHINOOK SALMON
PROTECTION PLAN**

BACKGROUND

Recent Fish and Game Commission Actions

On June 13, 1997, the California Fish and Game Commission designated the Sacramento River spring-run chinook salmon as a candidate species under the California Endangered Species Act. The Commission also adopted a Special Order Relating to the Incidental Take of Sacramento River Spring-Run Chinook Salmon During Candidacy Period. The Special Order describes a number of existing management actions and makes findings that, based on current knowledge, the level of habitat loss and take of Sacramento River spring-run chinook salmon individuals which is likely to occur during the candidacy period (one year) will not jeopardize the continued existence of the species. Based on those findings, the Commission authorized the take of Sacramento River spring-run chinook salmon during the candidacy period, subject to terms and conditions described in the Special Order. The candidacy period ends in June 1998, at which time the Department of Fish and Game must make a recommendation to the Commission regarding the listing of spring-run chinook salmon and the Commission will decide whether the listing is warranted.

With respect to the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary, the Special Order authorizes the take of spring-run chinook salmon incidental to operation of the State Water Project (SWP) facilities and the Central Valley Project (CVP) facilities in accordance with the SWRCB 1995 Water Quality Control Plan and the Central Valley Project Improvement Act and as may be modified by the CALFED Operations Group through its processes.

Because the flow and export conditions for water year 1997-1998 are unknown, the Special Order instructs the Department of Fish and Game to assess the range of possible flow and export conditions within the Delta that yearling and smolt spring-run chinook salmon may encounter and, if operational changes are deemed necessary, to develop and recommend to the Operations Group, by October 1997, target levels of protection and measures to achieve that protection.

At its June 13, 1997 meeting, the Commission received comments on the Special Order. The Commission requested a presentation at its August 28-29, 1997 meeting by representatives of the Operations Group describing the approach to spring-run salmon protection during candidacy.

1997-1998 Salmon Protection Plan

To comply with the Commission's Special Order related to the spring-run chinook salmon incidental take authorization for the SWP and CVP facilities operations in the Delta, this Salmon Protection Plan has been prepared and will be implemented by the Operations Group during the candidacy period for the Sacramento River spring-run chinook salmon. The Plan includes monitoring of environmental conditions and salmon movement, data assessment procedures, specific indicators that spring-run salmon are entering the Delta from upstream or being entrained at the SWP or CVP export facilities, and operational responses to minimize the effect of SWP and CVP facilities on the spring-run salmon. Some spring-run salmon migrate from freshwater to the ocean as yearlings during the fall. Thus, the Plan emphasizes monitoring, indicators and operational responses, described below, that will apply from October 1997 through January 1998.

Other spring-run salmon, which are younger and smaller than the yearlings that emigrate during the fall, migrate from freshwater to the ocean during the winter and spring of their first year. The conditions they encounter in the Delta are determined by several factors. Pursuant to the Delta Accord and the 1995 Bay-Delta Water Quality Control Plan, on February 1 the allowable percentage of Delta inflow that can be diverted from the Delta by the SWP and CVP (export-to-inflow ratio) drops from 65 percent to 35 percent through June. (If January is very dry, the ratio is set by the Operations Group at between 35 and 45 percent during February only; the ratio is 35 percent thereafter). SWP/CVP exports are further limited for 31 days in April and May by the Biological Opinion for delta smelt. The Delta Cross Channel gates are closed from February 1 through May 20 to protect winter-run salmon and for 14 additional days between May 20 and June 15, as determined by the Operations Group. These operational requirements are in part intended to minimize the impact of SWP/CVP facilities on Sacramento River basin salmon and should satisfy requirements of the Special Order for the late-winter and spring period. Salmon monitoring will continue in the rivers and Delta through June and the status of Sacramento River spring-run chinook salmon will continue to be a factor in Operations Group decision making throughout this period.

The National Marine Fisheries Service Biological Opinion for winter-run chinook salmon, which relates to the operations of the SWP and CVP, protects out-migrating juveniles by specifying closure of the Delta Cross Channel gates for up to 45 days during November, December, and January. DCC closures are triggered by turbidity, flow, and fish movement events and are described in Attachment A, "Delta Cross Channel Closure Guidelines for Protection of Sacramento River Juvenile Chinook Salmon during the period between November 1 and January 31".

Operations Group Decisions Prior to Candidacy Designation

In April, May and June 1997, the Operations Group implemented actions consistent with the U.S. Fish and Wildlife Service's OCAP Biological Opinion for delta smelt. Other species also benefitted from those actions which resulted in about 162,000 acre-feet of reduced CVP/SWP exports from the Delta compared to the quantity that otherwise could have been exported. An operation plan for the balance of the year was developed to recover those foregone exports through a combination of operations adjustments. Table 1 summarizes the water recovery plan that is to be implemented this fall. The assumed hydrology for this fall is lower quartile (i.e., precipitation and runoff in the fall will be toward the dry end of the range of possible conditions). The water recovery plan includes a combination of modified reservoir operations and export pumping adjustments to recover the water supply losses incurred during the Spring 1997 fishery actions. If this fall is dry, the proposed operations plan anticipates a relaxation of the November and December Delta outflow objective contained in the Biological Opinions for winter-run chinook salmon and delta smelt and the export-to-inflow standard contained in SWRCB Order 95-6. If the fall hydrology is wetter than predicted, the water supply may be recovered without these relaxations.

Operations Experience in 1996

Similar to 1997, the Operations Group voluntarily implemented fishery protection actions in April and May of 1996 by modifying CVP and SWP operations. In the fall of 1996, an operations plan was implemented to recover export water supply that was foregone during these fishery-related modifications to CVP and SWP operations. During the "make-up" period in the fall the Operations Group relied on monitoring of environmental conditions and fish sampling to indicate delta smelt vulnerability and salmon migration through the Delta. When the monitoring indicated juvenile salmon were entering the Delta in mid-November, the Delta Cross Channel gates were closed to reduce the likelihood that salmon migrating downstream in the Sacramento River would enter the central Delta. The "make-up" pumping phase of the operations was completed in early December 1996.

MONITORING OF ENVIRONMENTAL CONDITIONS AND SALMON MOVEMENT

The Salmon Protection Plan depends on identifying the time when young spring-run salmon are likely entering the Delta and taking actions to avoid or minimize the effects of SWP and CVP facilities operations on their survival through the Delta. The Department of Fish and Game and the U.S. Fish and Wildlife Service conduct fisheries sampling at numerous locations on the Sacramento River, on the primary spring-run salmon tributaries, and in the Delta (Figure 1). Table 2 describes the sampling gear,

season and effort as well as the origin of salmon that could be collected at each location. Stream flow and either water transparency or turbidity also will be measured at the sampling sites or nearby.

The fish sampling at these locations will provide data to evaluate the distribution and movement of spring-run salmon through the rivers and estuary during the candidacy period. Spring-run salmon probably will not be collected at mainstem Sacramento River sampling sites upstream of spring-run salmon tributaries. However, these upstream sites will provide data on the occurrence and movement of salmon of other races that are in the river system at the same time as the spring-run. Furthermore, it may not be possible to distinguish spring-run from other races at sampling sites located along the Sacramento River downstream of spring-run salmon tributaries. Interpretation of salmon catch data from sampling locations closer to and in the Delta will include comparison with the size distribution of salmon collected at various locations upstream.

INDICATORS OF SENSITIVE PERIODS FOR SALMON IN THE DELTA: Fall 1997 - Spring 1998

The following environmental conditions and fish sample data are used to indicate the movement of spring-run salmon downstream into the Delta where survival may be affected by SWP and CVP pumping. When these indicators are observed, they trigger a data evaluation/decision making process and actions to minimize or avoid the effects of SWP and CVP operations on the spring-run. These indicators are based on collecting fish at sampling locations in the spring-run tributaries and at other locations farther downstream or on measuring changes in river flow or water clarity which are often associated with the beginning of downstream movement of salmon, including yearling spring-run in the fall and early winter.

Environmental cues known to stimulate young salmon migration are used as indicators of fish movement, in addition to the collection of salmon at the various sampling sites, because of the low abundance of spring-run salmon juveniles and the possibility that no fish would be captured when they move past a sampling site. In the fall of 1996 when this system was used, increased flow and turbidity coincided with the capture of the first yearling spring-run salmon in tributary streams and salmon were collected in the mainstem Sacramento River at Knight's Landing within several days.

Any of the following conditions (1-7) indicate that spring-run are likely to arrive in the Delta:

1. Collection of chinook salmon at sampling locations in the valley reach of Mill, Deer or Big Chico creeks and collection of similar size salmon in sampling gear on the Sacramento River at either Knight's Landing or Sacramento or at beach seine sites near Sacramento or in the Delta.
2. Collection of chinook salmon in Butte Creek at the Parrott/Phelan diversion site or the Sutter Bypass sampling site and collection of similar size salmon in sampling gear on the Sacramento River at Sacramento or at beach seine sites near Sacramento or in the Delta.
3. Collection of yearling size chinook salmon at the Parrott-Phelan diversion site on Butte Creek and in the Sutter Bypass.
4. A 50 percent increase in daily flow from the previous days flow measured at stream flow gaging stations in the lower reaches of Mill, Deer, or Big Chico creeks and a concurrent 25 percent increase in daily flow in the Sacramento River at Wilkins Slough. Flow increases of these magnitudes, respectively, are presumed to be sufficient to initiate the downstream movement of spring-run yearlings from the tributaries and facilitate continued downstream migrations in the mainstem Sacramento River to the Delta.
5. A 50 percent increase in turbidity measured at fish sampling locations or stream flow gaging stations on Mill, Deer or Big Chico creeks and a concurrent 25 percent increase in daily flow in the Sacramento River at Wilkins Slough or 25 percent increase in turbidity in the Sacramento River at Knights Landing.

NOTE: In January 1997, record or nearly record high flows occurred in many Central Valley streams. In Mill and Deer creeks, high flows caused movement of the gravels in the stream bed before egg incubation was completed and while spring-run yolk-sac fry were still in the gravel substrate. The high flows may have had a devastating effect on spring-run production (incubating eggs and early fry stages) in Mill and Deer creeks, although the fate of washed out fry is unknown. No juvenile spring-run salmon had been collected or observed subsequent to the January 1997 storm in the reach of Deer and Mill creeks where summer rearing typically occurs, suggesting that few spring-run remained to migrate from these creeks as yearlings this fall. Four juvenile spring-run salmon were observed rearing in Deer Creek during August 1997 snorkel surveys to count adults. Similar surveys in Mill and Butte creeks were conducted in August, providing another opportunity to verify that some juveniles did survive the high flows in January. No juvenile salmon were observed in Mill Creek and, in comparison with recent years, few juvenile salmon were observed in Butte Creek.

Sampling in the lower reach of both Mill and Deer creeks will be carried out this fall. Because they are not abundant, yearling salmon may not be detected as they leave the creeks. Thus environmental conditions associated with salmon movement are used as indicators of spring-run salmon movement. The Data Assessment Team (DAT) expects to examine all available data to determine the appropriate response to environmental triggers. Collection of chinook salmon between 70 mm and 150 mm FL at Knight's Landing, Sacramento, or beach seine sites near Sacramento or in the Delta would provide additional justification for an active response to environmental cues. Actions in the Delta also could be triggered by the other indicators related to detection of spring-run salmon moving from Big Chico or Butte creeks.

6. A 50 percent increase in daily flow from the previous days flow measured at stream flow gaging station on Butte Creek and a concurrent 25 percent increase in daily flow in the Sacramento River at Sacramento. Flow increases of these magnitudes, respectively, are presumed to be sufficient to initiate the downstream movement of spring-run yearlings from the tributaries and facilitate continued downstream migrations in the mainstem Sacramento River to the Delta.
7. A 50 percent increase in turbidity measured at fish sampling locations or stream flow gaging stations on Butte Creek and a concurrent 25 percent increase in daily flow or turbidity in the Sacramento River at Sacramento.

Conditions 1-7 indicate the likely arrival of spring-run salmon in the Delta. Conditions 8-10 comprise three indicators of an impact on spring-run salmon due to SWP/CVP operations in the Delta.

8. Collection of coded-wire tagged spring-run salmon at either the Skinner Fish Facility or the Federal Fish Facility at Tracy.

Condition 8 provides conclusive evidence that spring-run salmon have entered the Delta and are being impacted by the SWP/CVP water export facilities operation and strongly indicates the need for an operations response. In 1997, because none of the Mill, Deer, and Big Chico Creek spring-run will be tagged, this condition can only be met by the occurrence of spring-run from Butte Creek in the fish facility samples.

9. Collection of spring-run size salmon at either the Skinner Fish Facility or the Federal Fish Facility at Tracy, subsequent to having detected spring-run salmon leaving the tributaries and similar size salmon entering the Delta.

Condition 8 provides circumstantial evidence that some of the salmon being impacted by the SWP/CVP water export facilities operation are spring-run salmon. This condition is a less rigorous indicator of a spring-run salmon impact than Condition 7 because spring-run salmon cannot be distinguished from salmon of other runs based only on its size at capture in the Delta. The intent is to protect juvenile salmon that plausibly could be spring-run without requiring proof which, except for spring-run salmon that have been tagged in the tributaries, is not currently attainable.

10. Combined loss of more than one percent of the coded-wire tagged late-fall-run salmon released from Coleman National Fish Hatchery.

Several groups of yearling late-fall-run salmon, all marked with coded-wire tags, are released from Coleman National Fish Hatchery in the fall each year. When these marked salmon are migrating through the Sacramento River and Delta, observing them at the CVP and SWP fish facilities provides an indication that salmon from the Sacramento River basin, including spring-run yearlings migrating through the system at the same time, are being affected by CVP/SWP exports. The loss is estimated from the salvage CVP and SWP fish facilities.

The DAT will routinely receive and review the fish salvage reports from the SWP Skinner and CVP Tracy fish facilities throughout the spring-run salmon candidacy period. Salmon are seen at the fish facilities in all months, however, typically very few salmon are salvaged from July through November. Salmon in the 70-150 mm size range in the fall may be yearling spring-run. If salmon in this size range are observed at the fish facilities from November 1 through January 31, the DAT will convene and, use all available biological information to determine if the salvaged salmon includes some spring-run.

ACTIONS IN RESPONSE TO INDICATORS OF SENSITIVE PERIODS FOR SALMON IN THE DELTA

Decision-making

The process guiding decision-making for spring-run chinook protection is the CALFED Ops Group decision-making process. This process is depicted in Figure 2 and is explained below.

To be effective in achieving the intended purpose, CALFED Ops Group decisions to make changes in CVP and SWP operations often must be made quickly. To accomplish this, the Ops Group established working groups to try to reach consensus

at the lowest possible level while assuring that all CALFED Ops Group participants are informed. The working groups include:

1. No-Name Group This group is comprised of a representative of each of the Ops Group member agencies and interested parties. It is the responsibility of NNG members to inform the parties they represent of information regarding take of listed species and any other factors deemed to be potential urgent issues that may be addressed by the Ops Group. NNG also may be directed by the Ops Group to develop operational responses for issues of concern raised by member agencies. It may also be used by USBR and DWR as a forum to discuss proposed operations plans.
2. Sub-groups A sub-group is the working level group which analyzes data and proposes an operation action. A sub-group can be a workgroup associated with endangered or threatened species such as winter-run chinook salmon or delta smelt, real-time fish monitoring, or a temporary workgroup formed to address a specific operational issue.

One such sub-group is the Data Assessment Team (DAT). DAT consists of biologists from the CALFED agencies and stakeholder groups, as well as CVP/SWP operators. DAT compiles and interprets fishery-related data, and disseminates the interpreted information to the Ops Group.

As shown in Figure 2, the sub-group proposes a change in operations to the CVP/SWP operators. After discussion with management and possible revision of the proposal (done in coordination with the sub-group) a decision regarding implementation of the proposal is made. If a decision is made to proceed with the proposal, the proposed operation is implemented and NNG is notified by USBR and DWR of the action taken. If any participant in NNG objects to the action, NNG is convened and the operation is evaluated. If, upon consensus of the CALFED agency representatives to NNG, a revised operation is developed, the action currently underway will be modified and the Ops Group will be informed. If no consensus is reached in NNG, the issue is raised to the Ops Group. The Ops Group will convene to evaluate the operation. If, upon consensus of the CALFED agency representatives to the Ops Group, a revised operation is developed, the action currently underway will be modified. If no consensus is reached within the Ops Group, the issue is raised to CALFED.

The Ops Group, through DAT and NNG, has developed specific actions that will be implemented by USBR and DWR in the event that fishery-related monitoring indicates that any of the criteria described above in "Indicators of Sensitive Periods" have been met. These actions are described below in "Operational Responses".

Data Reporting, Compiling and Distributing

Data collected at the sampling sites, identified in Table 2, will be transmitted by phone, fax, or e-mail to Bay-Delta DFG office in Stockton, California two times per week. These data will be compiled and posted on the Interagency Ecological Program Home Page within 24 hours of receipt. However, if sampling indicates that a warning condition exists, then the data will be immediately telephoned to Mr. Chuck Armor at DFG Stockton. Mr. Armor will immediately notify the DAT. Additionally, sampling frequency and data reporting from various stations may be modified by DAT, in coordination with the agencies responsible for the sampling programs.

Data Assessment and Dissemination

DAT will:

1. Determine the significance of the indicators of sensitive periods (indicators) for spring-run chinook salmon. At the request of DFG, the indicators, described above in "Indicators of Sensitive Periods", were developed by DAT for use during the candidacy period.
2. Develop appropriate recommendations within 24 hours of the an indicator being observed to USBR and DWR for CVP/SWP operations. The Ops Group has developed specific actions that will be implemented if indicators are determined by DAT to exist. These actions are listed below in "Operational Responses". In addition, DAT will continue to monitor fish occurrence, assimilate data, and make recommendations as needed to USBR and DWR for adjustments to CVP/SWP operations.
3. Notify the Ops Group that an indicator has been observed. DAT will immediately notify the No-Name Group chairperson, the CVP/SWP operators, and the Co-chairs of the CALFED Ops Group.

Operational Responses

When notified that an indicator has been observed, USBR and DWR will change the operations of the CVP/SWP as follows:

1. Close the Delta Cross Channel gates. Closure will be coordinated with DAT and will commence within 24 hours after USBR is notified that an indicator has been observed. During October and November, the default condition is to keep the DCC open until an indicator is observed. Once DCC closure is triggered,

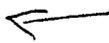
DAT will determine if or when the DCC may be opened based on DAT's assessment of biological information.

If the DCC gates are not already closed on December 1, USBR will close the DCC gates on December 1. DAT may make a recommendation to the Ops Group on biological criteria for opening the DCC. The gates will remain closed until the DAT recommends opening, or the CVP/SWP operators determine that compliance with D-1485 water quality standards is being compromised

If a dry hydrologic pattern continues through the fall of 1997, closure of the DCC may adversely affect water quality in the central Delta, particularly at the Contra Costa Canal intake. The extent of water quality degradation will depend on antecedent salinity levels, spring-neap tidal cycle, river flows, Delta channel depletions, weather, and CVP/SWP operations. A serious water quality problem for meeting the municipal and industrial D-1485 standard at Contra Costa Canal intake can be roughly defined using a salinity profile. This profile considers target electrical conductivity levels at key locations in the western and interior Delta. These locations and the respective target levels are:

Antioch	:	6.0 mS/cm
Jersey Point	:	1.8 mS/cm
Bethel Island	:	1.0 mS/cm
Holland Tract	:	0.8 mS/cm
Bacon Island	:	0.7 mS/cm

This profile is only indicative of conditions in the Delta which might be cause for concern and can vary substantially. However, exceeding the target electrical conductivity level at any profile location can be a precursor to exceeding water quality standards if no remedial action is taken.

USBR and DWR will monitor electrical conductivity at the profile locations and determine appropriate actions to meet water quality standards. In the event that water quality in the Delta degrades as a result of closing the DCC, USBR will open the gates and USBR/DWR will make other necessary adjustments to the operations of the CVP/SWP. USBR will close the DCC when electrical conductivity falls sufficiently below the target levels. 

- Increase the Delta outflow. CALFED Ops Group has developed a CVP/SWP make-up plan which includes reducing monthly average Delta outflow during November and December from 4,500 cfs to 4,000 cfs (7-day average must be within 80% of the required monthly average). Spring-run chinook are not likely to begin out-migration unless triggered by either a flow or turbidity event. If dry

hydrologic conditions persist through the fall and these environmental cues are not present, spring-run salmon will not likely be moving downstream into the Delta and will not be effected by a reduction in outflow. However, spring-run salmon out-migration may begin absent environmental cues. If any of the indicators are observed, USBR and DWR will immediately increase the Delta outflow to 4,500 cfs. DAT will develop criteria to determine if or when the Delta outflow may be reduced.

3. Make other operational adjustments as needed. When DAT concludes, based on the occurrence of salmon at the CVP or SWP fish facilities, that spring-run salmon are being impacted it will recommend CVP/SWP operational adjustments, such as export reductions or increases in river flows, to reduce the potential impacts¹. USBR and DWR will implement the DAT recommendation or an alternative based on operational needs within 24 hours.

If the action taken by USBR and DWR is different from the DAT recommendation, the CALFED process, described above in the section titled **Decision-making**, will be used to resolve conflicts over what appropriate action should be taken. To implement this process in a timely manner, the participants shall act as soon as possible, but no later than the following schedule:

- a. If any participant in the No-Name Group objects to the action, NNG will convene within two business days to evaluate the operation. If, upon consensus of the CALFED agency representatives to NNG, a revised operation is developed, the action currently underway will be modified and the Ops Group will be informed.
- b. If no consensus is reached in NNG, the issue may be raised to the Ops Group by any CALFED agency representative. The Ops Group will convene within two business days to evaluate the operation. If, upon

¹Because DFG and DWR representatives are on the DAT, the DAT recommendation constitutes informal consultation on project operations, pursuant to Fish and Game Code Section 2096. For purposes of this Spring-run Salmon Protection Plan, this informal consultation occurs upon the salvage of one spring-run salmon, and is comparable to recognizing a very low take of spring-run salmon incidental to project operations. Modifying project operations upon occurrence of low incidental take offers stronger protections for spring-run than is required for winter-run salmon under the National Marine Fisheries Service Biological Opinion. The NMFS Biological Opinion requires informal consultation when 1% of out-migrating juvenile winter-run salmon are incidentally taken by the CVP and SWP Delta fish protection facilities and re-initiation of consultation to consider project operational changes when 2% are taken.

consensus of the CALFED agency representatives to the Ops Group, a revised operation is developed, the action currently underway will be modified.

- c. If no consensus is reached within the Ops Group, the issue may be raised to the CALFED Management Team by any CALFED agency. The Management Team will convene within two business days to evaluate the operation. If, upon consensus of the Management Team, a revised operation is developed, the action currently underway will be modified.
- d. If no consensus is reached within the Management Team, the issue will be resolved by FGC.

1997 Plan for Spring/Winter Actions

October 7, 1997 Update

This operation includes export reductions and the actions that are being planned to recover them. It includes reduction of Shasta releases in January through March, reduction of Oroville releases in January, relaxation of export/inflow ratio, and relaxation of monthly outflow standards. USBR recovery in September and October requires SWRCB approval of CVP pumping at the SWP facilities (joint point of diversion). This operation intends to totally recover export impacts. Should conditions change, CALFED will evaluate other measures to achieve the objectives. *Forecasts are based on 90% level of hydrology for 1997 wy and 75% for 1998.wy; actual hydrology will likely be different resulting in water recovery different than that shown.*

	APR 15-30	MAY 1-15	MAY 16-31	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	Impact Summary	
Vernalis (CFS)	5220	5410	4000											Exports	Storage
Exports (CFS)	2170	2270	3750												
Export Impacts (TAF)	-82	-56	-14	-10 ⁴										-162	
Export recovery (TAF)				+48 ²			+45.3 ³	+27	+30 ⁵	11.7 ⁶				+162	
Total														0	
Shasta storage withdrawal (TAF)				-12 ⁵			-42	-27							-81
Shasta storage recovery (TAF)											+30 ¹	+30 ¹	+21 ¹		+81
Oroville storage withdrawal (TAF)				-30 ⁵											-30
Oroville storage recovery (TAF)											+12 ¹	+12 ¹	+6 ¹		+30
Total														0	
Cumulative Impacts (TAF)	-82	-138	-152	-156	-156	-156	-153	-153	-123	-111	-69	-27	0		

¹ Storage recovery may require relaxation of minimum instream flow requirements in the Feather River.

Shasta's (Keswick's) Jan-Mar release could be decreased 500 cfs to an objective flow of 3750 cfs.

Minimum instream flow requirement adjustments may not be required if hydrology is wetter than assumed herein.

² Export recovery required adjustment of export/inflow ratio up to 40% for an export recovery of about 48 taf.

Adjustments were based on Delta Smelt salvage and distribution, and water quality conditions in coordination with DFG, USFWS, USBR, DWR.

Water quality standards were controlling.

³ A relaxation of E/I ratio from 65% to 70% provided for additional 3300 ac-ft export recovery.

⁴ Export reduction of 1000 cfs for 5 days for smelt protection.

⁵ Additional storage withdrawal required to take advantage of the increased E/I ratio. Exact shares of storage withdrawal are compensated in the COA accounting.

⁶ A relaxation of monthly outflow standard (4500 cfs) to a level that meets M&I chloride standard (approx. 4000 cfs) could save an estimated maximum of 30 taf/month.

The E/I ratio may control the amount of makeup export available in December

CALFED Ops Group Spring-run Chinook Salmon Protection Plan

October 27, 1997

E-034706

Table 2. Fish Sampling Locations Contributing Data to the 1997-1998 Spring-run Salmon Protection Plan

	LOCATION	GEAR	SEASON	EFFORT	UNIT	NOTES
1	Sacramento R. At Ball's Ferry (RM 276)	RST	Temporarily discontinued as of 9/13/97	Daily	DFG	salmon from Sac.R. and tribs. upstream of Battle Creek
2	Red Bluff Diversion. Dam (RM 243)	RST, Beach Seine	when gates up	Daily	FWS	salmon from Sac. R and tributaries u/s of Mill and Deer Cr.
3	Sacramento R. at Hamilton City (GCID) (RM 206)	Fish Screen	Continuous	Daily	DFG	includes above salmon plus spring-run from Mill and Deer creeks
4	Sacramento R. at Knight's Landing (RM 90)	RST	Continuous	Daily	DFG	includes above plus spring-run from Big Chico Creek
5	Sacramento R. at Sacramento (RM 55)	MWT KT KT MWT	10/1/97- 10/14 10/15 - 12/31 1/1/98 - 3/31 4/1 -6/30	2.5 days/wk 5 days/wk 3 days/wk 5 days/wk + RMT	FWS	spring-run from all tributaries
6	Sacramento R. Near Sacramento (RM 49-80)	beach seine	10/15/97 - 1/31/98	3 days/wk	FWS	spring-run from all tributaries
7	Sac.-S.J. Delta	beach seine	continuous	weekly or bi-weekly	FWS	spring run from all tributaries
8	Mill Creek, valley reach	RST	10/1/97 - ? 1-1-98 or 1-31-98	Daily	DFG	spring-run from Mill Creek
9	Deer Creek, valley reach	RST	10/1/97 - ?	Daily	DFG	spring-run from Deer Creek
10	Butte Creek at Parrott-Phelan Diversion Dam	RST, fish screen	10/1/97-6/98 Continuous when diverting	Daily	DFG	spring-run from Butte Creek
11	Big Chico Creek	Fyke net	12/97-5/98	Daily	DFG	spring-run from Big Chico Creek
11	Sutter Bypass near Tisdale Bypass	RTS	11/1/97 - 6/98	Daily	DFG	spring-run from Butte Creek, potentially from Mill, Deer, Chico crks and salmon from upper Sac. R and tribs. when weirs overflow
12	SWP and CVP Delta Fish Facilities	fish screen	continuous	Daily	DFG	salmon from all Central Valley rivers

CALFED Ops Group Decision Process

