

**ERP DIRECTED ACTION**  
**DEVELOPMENT OF A COMPREHENSIVE CENTRAL**  
**VALLEY ADULT CHINOOK SALMON ESCAPEMENT**  
**MONITORING PLAN**

**Reference**  
**Ecosystem Restoration Program**  
**Prop 50 Bond Funded**  
**Project No. DFG ERP-05D-S04**

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# **ERP DIRECTED ACTION DEVELOPMENT OF A COMPREHENSIVE CENTRAL VALLEY ADULT CHINOOK SALMON ESCAPEMENT MONITORING PLAN**

## **Project Lead**

**Name:** Alice Low, Department of Fish and Game

## **Regional Coordinator:**

See list of study collaborators below.

**Cost of Project:** \$373,349

**Cost Share Partners:** Cost-sharing will occur in the form of in-kind services of permanent staff time, equipment, and facilities and through the dedication of miscellaneous resources available from the agencies involved in the CVSEPWT. Specifically, it is estimated that the project collaborators at CDFG, NOAA Fisheries, and USFWS will provide approximately 15% time, or 1,900 hours of permanent biologist staff time over the course of the study to meet with the project team, provide study guidance, and assist the project team in preparation of the plan. Staff time for project collaborators is estimated at approximately \$56,000. Several other biologists from Department of Water Resources, U.S. Bureau of Reclamation, Yuba County Water Agency, and East Bay Municipal Water District, involved in Central Valley spawning escapement surveys, will also attend meetings with the project team, review the draft plan, and provide general project guidance. Staff time for these agency biologists is estimated at \$40,000.

**List of Subcontractors :** DFG will contract with Pacific States Marine Fisheries Commission (PSMFC) for personnel services. Personnel will be selected for the project by a panel consisting of the project lead, PSMFC personnel manager, and study collaborators. Recommendations for the project biometrician will be made by Michael Mohr, Biometrician at the NOAA Fisheries Southwest Science Laboratory.

**Other Technical Experts:**  
**Study collaborators:**

Randy Benthin  
California Department of Fish and Game

John Nelson  
California Department of Fish and Game

Dean Marston  
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NOAA Fisheries

Robert Null  
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# Proposal

## 1. Executive Summary

Restoration of Central Valley Chinook salmon populations is an important goal of the California Bay-Delta Authority (CALFED) program, Central Valley Project Improvement Act (CVPIA), and several other state and federally-mandated programs. A well-designed monitoring and evaluation program is a critical component of any conservation or restoration activity. Monitoring and evaluation is a key element in the CALFED Adaptive Management process feedback cycle.

Existing adult Chinook salmon escapement monitoring programs in the Central Valley are currently inadequate to estimate population status and evaluate population trends in a statistically valid manner for the following management purposes:

- Providing a sound basis for assessing recovery of listed stocks,
- Monitoring the success of restoration programs,
- Evaluating the contribution of hatchery fish to Central Valley populations, and
- Sustainably managing ocean and inland harvest.

The objective of this proposal is to develop a long-term monitoring plan to estimate population status and trends in abundance of adult Central Valley Chinook salmon at the watershed level in a statistically valid manner. The four Chinook salmon races for which annual estimates of abundance are needed include: fall, late-fall, winter and spring-run.

Despite their widespread use in the Central Valley, models to estimate in-river spawning escapement based on mark-recapture carcass survey data require a number of assumptions which may not be met in the surveys. A principal assumption of mark-recapture surveys is that the marked animals will distribute randomly among the population during the interval before the recapture sampling. This assumption is often violated for carcasses, with differing consequences on the final escapement estimate depending on the size of the run, the area sampled, and the degree to which random re-sampling designs are used.

Existing programs have not been reviewed for adequacy of statistical power or bias. NOAA Fisheries recovery planning guidance (NOAA 2000) states that a common failing of monitoring and evaluation efforts under the ESA is lack of statistical power. Statistical power can be described as the ability to detect a signal or pattern within a noisy dataset. Lack of statistical power means that the intensity of data collected may be too low, given sampling error and environmental variability, to determine trends and effects with reasonable statistical confidence within time frames that are useful for feedback into management actions. The statistical power of Central Valley salmon escapement monitoring needs to be evaluated to ensure that monitoring adequately assesses progress toward meeting population recovery goals.

Currently, data management and reporting in the Central Valley is conducted on a project-by-project basis. No standardized database is available for data storage and retrieval. Most projects prepare an annual report of survey results. However, escapement data and reports are not readily accessible in a timely way by other researchers, stakeholders, or the public.

In this project, a team consisting of a project coordinator, biologist/planner, database specialist, and biometrician/statistician will develop a Central Valley Adult Chinook Salmon Escapement Monitoring Plan. A thorough statistical review of methods currently used in Central Valley escapement surveys will be conducted. Sampling designs will be reviewed and recommendations made for improvement of existing programs. Comprehensive databases will be developed linking escapement, hatchery production, and coded-wire tag data.

This project is directly related to the goals of the CALFED ERP Program. Two key goals of the CALFED Ecosystem Restoration Program's (ERP) Draft Stage 1 Implementation Plan (CALFED 2001) include Goal 1 – Recovery of at-risk species, and Goal 3 – Maintenance/enhancement of populations for sustainable harvest. The CALFED Program Multi-Species Conservation Strategy (MSCS)-ERP milestones (2000) include: “Through the use of existing, expanded, and new programs, monitor adult anadromous salmonid returns in each watershed within the MSCS focus area...” The CALFED ERP Draft Stage 1 Implementation Plan (2001) also includes as a CALFED Science Program Goal: “*Coordinate and extend existing monitoring.* A strength of the CALFED Program is the monitoring systems already in place in the system. Common questions and subsequent investments are needed to tie together the existing monitoring.”

## **2. Project Background and Information**

Restoration of Central Valley Chinook salmon populations is an important goal of the California Bay-Delta Authority (CALFED) program, Central Valley Project Improvement Act (CVPIA), and several other state and federally-mandated programs. A well-designed monitoring and evaluation program is a critical component of any conservation or restoration activity. Monitoring and evaluation is a key element in the CALFED Adaptive Management process feedback cycle (Figure 1).

Existing adult Chinook salmon escapement monitoring programs in the Central Valley are currently inadequate to estimate population status and evaluate population trends in a statistically valid manner for the following management purposes:

- Providing a sound basis for assessing recovery of listed stocks,
- Monitoring the success of restoration programs,
- Evaluating the contribution of hatchery fish to Central Valley populations, and
- Sustainably managing ocean and inland harvest.

The ultimate goal of both the state and federal Endangered Species acts is to delist currently listed species—i.e., to recover them to the point that they are no longer threatened or endangered, at which point they can be removed from the list. For Central Valley salmonids to be delisted, two things are required: 1) a set of criteria has been agreed upon by the listing agency for establishing that recovery has occurred, and 2) a methodology has been implemented to determine whether the species' current (or future) status meets those criteria. NOAA Fisheries has initiated formal recovery planning for listed anadromous salmonids in the Central Valley domain, pursuant to requirements of the federal Endangered Species Act. (Sacramento River winter-run Chinook – state and federally-listed endangered, Central Valley spring-run Chinook – state and federally-listed threatened, and Central Valley fall/late fall-run Chinook – federal candidate species). Over the next two years, the Central Valley

Technical Recovery Team (TRT) will be developing population recovery goals for each listed stock in the Central Valley. Accurate escapement estimates in future years for listed salmon stocks will be essential to monitor progress toward meeting the recovery goals of the plan.

While hundreds of millions of dollars are being spent each year by the CALFED Ecosystem Restoration Program (ERP), CVPIA, and other programs, to restore ecosystems supporting salmon and steelhead populations, current adult escapement surveys are inadequate, as currently designed, to assess progress toward meeting the goals of these programs for increasing natural production of Central Valley Chinook salmon at the watershed scale. Therefore, it cannot be demonstrated with an acceptable degree of precision if restoration money has been wisely spent.

Until recently, hatchery marking programs for Central Valley salmon have been inadequate to evaluate hatchery contribution rates to the Central Valley populations. Currently, an implementation plan for a comprehensive and statistically-sound constant fractional marking and tagging program for hatchery-produced Central Valley salmon is being developed under a CALFED contract (CDFG 1999). Without well-designed recovery programs, however, we will not be able to recover and analyze the marks and tags from returning fish in a statistically valid way. Current tag recovery rates in adult escapement surveys are not adequate to determine hatchery contribution rates or straying rates among streams.

Central Valley fall-run Chinook salmon support major ocean sport and commercial fisheries and inland sport fisheries. Accurate estimates of the numbers of adult Chinook salmon spawning in Central Valley streams (spawner escapement) and harvested in freshwater are critical to sound scientific management of ocean and inland harvest. Currently, salmon escapement estimates in the Central Valley are not accurate enough for development of age-specific models of salmon abundance. Harvest rates for Central Valley stocks are now established based on the unrefined Central Valley Index (CVI), a relationship between 2-year-old and older fish. No information is currently available for the other races of Central Valley Chinook salmon that can be used to estimate ocean abundance and to regulate the ocean fisheries to meet stock rebuilding criteria. If age and race-specific escapement data were available in the Central Valley, as in the Klamath River basin, ocean harvest management could be based on more accurate models and possibly accelerate the recovery of listed stocks.

Monitoring programs for Central Valley salmon must be scientifically defensible. Ultimately, the wider scientific community will make decisions on whether species listed under the ESA (or an evolutionarily significant unit [ESU] of a species) has been recovered, or if ocean harvest goals are being met satisfactorily. Such support is unlikely if data are not collected in a statistically-rigorous way allowing unbiased estimates of trends and abundance.

The state of Oregon has demonstrated that such a monitoring effort can be successfully initiated (e.g. Jacobs et al. 2001). Their "Oregon plan for salmon and watersheds" includes a three-tiered system for estimating the abundance of adult salmon in coastal watersheds. Oregon has demonstrated that a statistically-rigorous monitoring approach is possible. In 2003, NOAA Fisheries and DFG received funding through the Fishery Restoration Grants Program to develop a comprehensive monitoring plan for salmonids in California coastal streams. The plan, to be developed in a series of workshops, will be patterned after the Oregon Plan.

In response to the need to improve escapement monitoring programs in the Central Valley, the Interagency Ecological Program's Central Valley Salmonid Escapement Project Work Team (CVSEPWT) was formed in 2001. The team, which includes biologists working on salmon escapement monitoring surveys throughout the Central Valley, is a satellite team of the IEP Central Valley Salmonid Project Work Team (CVSPWT).

In June 2003, the CALFED Science Program sponsored a Northwest/Central Valley Adult Salmon Escapement Monitoring Workshop. The purpose of this workshop, initiated in discussions of the CVSEPWT, was to provide a forum for biologists from the Pacific Northwest (Columbia River Basin, Puget Sound, and coastal streams) to share their experience with salmon escapement monitoring techniques with biologists working in California's Central Valley, prior to the development of the current escapement monitoring plan for Central Valley salmon. Over 100 scientists, mostly from California, attended the two-day workshop.

This proposal was developed by the CVSEPWT, with review by the parent CVSPWT. Agencies involved in the development of the proposal include California Department of Fish and Game, Department of Water Resources, NOAA Fisheries, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Pacific States Marine Fisheries Commission, Yuba County Water Agency, and East Bay Municipal Water District. Study collaborators include representatives from each of the state and federal fish and wildlife agencies.

### **Existing Escapement Monitoring Programs in the Central Valley**

Existing Central Valley adult salmon escapement monitoring programs have evolved over the years, and vary in methods used, intensity of sampling effort, and reliability of estimates. While mark-recapture carcass surveys are now widely used as the standard method to estimate in-river spawning escapement of most Chinook races, historic data were based on a variety of methods, including carcass surveys, extrapolation based on spatial and/or temporal subsets of an entire run, and expert judgment. For spring-run Chinook, snorkel surveys and redd counts have been used to estimate the run size. In some cases, run sizes were determined from actual live fish counts (e.g., Red Bluff Diversion Dam). For some older data, adequate documentation of sampling and estimation methods does not exist, making it impossible to determine the relative accuracy and reliability of such estimates, or to identify and adjust for sources of bias. The length of the data record varies from run to run, but, in general, data for several runs are available from the early 1950s and in some cases from the 1940s.

The original purpose of most existing programs was to provide general data for ocean harvest management and for evaluating the general status of the individual populations. Surveys were not designed to meet the current broad range of management needs, including recovery of listed stocks, nor to meet rigorous statistical objectives. Some streams have no existing monitoring surveys.

Data from inland harvest surveys are essential to estimating total escapement to the Central Valley; Central Valley sport harvest comprises as much as 21% of the total Chinook salmon spawner escapement into the Central Valley in some years. The Central Valley Salmon and Steelhead Inland Harvest Monitoring Program was initially implemented in the early 1990's. It was funded through a variety of sources including the Federal Aid in Sport Fish Restoration Act and the Central Valley Project Improvement Act. Because funding from

these sources was limited, the ability of this program to estimate inland harvest of Chinook salmon and steelhead throughout the Central Valley was never realized. Due to budget cuts, the program was discontinued in 2003.

### **Adequacy of Existing Survey Methodology**

Despite their widespread use in the Central Valley, models to estimate in-river spawning escapement based on mark-recapture carcass survey data require a number of assumptions which may not be met in the surveys. A principal assumption of mark-recapture surveys is that the marked animals will distribute randomly among the population during the interval before the recapture sampling. This assumption is often violated for carcasses, with differing consequences on the final escapement estimate depending on the size of the run, the area sampled, and the degree to which random re-sampling designs are used.

Another assumption in carcass mark-recapture sampling is that all fish are either available for marking or are available for recapture sampling. This assumption is likely not met in large streams with deep pools. In these areas, carcasses may be unavailable to sampling by field crews. This may result in under or over-estimation of the actual run size as it represents an unsampled portion of the run.

An example of these biases is the mark-recapture carcass survey conducted on Battle Creek in the Sacramento River basin. Until 2002, fall-run carcass surveys were typically conducted throughout the spawning period in the six mile spawning reach. Due to the large number of spawners, the survey sometimes took 3 weeks to complete. Time periods were therefore not consistent, violating an assumption of the Schaeffer model used, and biasing the estimate. Coded-wire tag recoveries are also not consistent. Currently, CWT heads are subsampled, but the current subsampling strategy is not statistically random. In 2002, due to an extremely large number of spawners returning, the carcass survey was conducted in only one reach of the stream, and results extrapolated to the entire spawning reach.

Existing programs have not been reviewed for adequacy of statistical power or bias. NOAA Fisheries recovery planning guidance (NOAA 2000) states that a common failing of monitoring and evaluation efforts under the ESA is lack of statistical power. Statistical power can be described as the ability to detect a signal or pattern within a noisy dataset. Lack of statistical power means that the intensity of data collected may be too low, given sampling error and environmental variability, to determine trends and effects with reasonable statistical confidence within time frames that are useful for feedback into management actions. The statistical power of Central Valley salmon escapement monitoring needs to be evaluated to ensure that monitoring adequately assesses progress toward meeting population recovery goals. However, we expect that analysis will substantiate that the current sampling program is inadequate for meeting species de-listing requirements and for evaluating current habitat projects.

In addition, data from existing Central Valley programs have not yet been validated through studies using more than one monitoring method. On Bogus Creek, in the Klamath River basin, a study was conducted to compare estimates made by a carcass survey and a weir count made at the creek mouth (Boydston 1994). The study found that carcass survey estimates based on the Schaefer (Schaefer 1951) and Jolly-Seber (Seber 1982) models closely estimated the true run size.



In the fall of 2003, four new Central Valley monitoring programs were initiated that may provide further data to evaluate carcass survey estimates. On the lower Stanislaus River, a portable resistance board weir with a Vaki Streamwatcher infrared monitoring system was operated to monitor upstream passage of fall-run Chinook. On the lower Yuba River, a Vaki infrared monitoring system was operated at Daguerre Point Dam to monitor upstream migration of fall-run Chinook. On lower Battle Creek, a weir and video monitoring system was operated throughout the immigration period of fall-run. Video monitoring and trapping continued in 2003 at Woodbridge Dam on the lower Mokelumne River to monitor fall-run escapement. On each of these streams, mark-recapture carcass surveys for fall-run Chinook were also conducted. By comparing the results of the carcass surveys to the weir or dam monitoring, further assessment can be made of the carcass survey estimation method. Analyses of these datasets will be part of the development of the Central Valley monitoring plan (See Subtask 1a).

Currently, data management and reporting in the Central Valley is conducted on a project-by-project basis. No standardized database is available for data storage and retrieval. Most projects prepare an annual report of survey results. However, escapement data and reports are not readily accessible in a timely way by other researchers, stakeholders, or the public.

### **3. Project Goals and Objectives**

The objective of this proposal is to develop a long-term monitoring plan to estimate population status and trends in abundance of adult Central Valley Chinook salmon at the watershed level in a statistically valid manner. The four Chinook salmon races for which annual estimates of abundance are needed include: fall, late-fall, winter and spring-run. Each race, because of its unique adult run timing and holding conditions, may require different sampling metrics to generate adult population estimates. Each stream will also require development of unique custom escapement monitoring programs, due to the wide variety of habitat types present. While there are recognized needs for improved monitoring of other Chinook life stages, this proposal focuses on the critical need for improved monitoring of adult Chinook returning to Central Valley streams.

### **4. Approach/Methodology**

A project team consisting of a project coordinator, biologist/planner, database specialist, and biometrician/statistician with a high degree of familiarity with salmon escapement monitoring techniques will develop a Central Valley Adult Chinook Salmon Escapement Monitoring Plan. The plan will include:

- Monitoring program objectives
- Use of escapement data in management and restoration planning
- Existing study designs, field, data analysis, and reporting techniques
- Proposed study designs, field, data analysis, and reporting techniques
- Summary tables

Nineteen Central Valley watersheds currently support spawning and rearing habitat for Chinook salmon. The following watersheds will be included in the plan:

**Upper Sacramento River Basin**

Upper Sacramento River  
Clear Creek  
Cow Creek  
Cottonwood Creek  
Battle Creek  
Antelope Creek  
Butte Creek  
Big Chico Creek  
Beegum Creek  
Deer Creek  
Mill Creek

**Lower Sacramento River Basin**

Yuba River  
Feather River  
American River

**Delta Tributaries**

Cosumnes River  
Mokelumne River

**San Joaquin River Basin**

Stanislaus River  
Tuolumne River  
Merced River

All steps in the development of the plan will be closely coordinated with the CVSEPWT, CVSPWT, and the NOAA Fisheries Central Valley Technical Recovery Team. Development of the plan also will be closely coordinated with development of the California Coastal Salmonid Monitoring Plan.

Proposed work is divided into four primary tasks described below:

**Task 1. Review of Existing Programs.** Project team will review study methodology (sampling design, field and data analysis protocols) proposed and currently used to estimate in-river spawning escapement and in-river harvest in each of the watersheds listed above; the statistical validity of escapement estimates based on these surveys will be evaluated.

**Subtask 1a.** Project team will conduct a series of meetings with sub-teams of the CVSEPWT. Sub-teams will consist of biologists familiar with existing in-river salmon spawning surveys in each of the watersheds. The project team will document and conduct a comprehensive review of existing escapement monitoring techniques, including study designs, field methods (including coded-wire tag recoveries, otolith, and scale collections), laboratory analysis methods of scales, otoliths and coded-wire tags, data analysis methods, estimation models used, data storage, and data reporting techniques.

The project biostatistician will analyze the statistical validity of Central Valley escapement estimates based on existing surveys. Biases in existing survey estimates will be thoroughly evaluated.

Several existing data sets will be comprehensively reviewed in this subtask. The weir/dam escapement monitoring and carcass surveys conducted on the lower Mokelumne, Yuba, Stanislaus rivers, and Battle Creek in the fall of 2003 will provide data sets for comparing the methodologies and assessing the accuracy of the carcass survey method in Central Valley streams. Department of Water Resources staff has also collected intensive carcass survey data on the lower Feather River that may allow detailed analysis of the problems with mark-recapture methods in estimating escapement.

Subtask 1b. The project team will meet with staff from the former Central Valley Inland Harvest Program to document and conduct a thorough review of the inland harvest program discontinued in 2003.

Subtask 1c. The project team will meet with staff from the CDFG Ocean Salmon Project to determine needs for Central Valley salmon escapement data in the development of improved models for ocean harvest management.

Subtask 1d. The project team will meet with restoration project leaders to determine needs for escapement estimates to meet restoration project evaluation goals.

Subtask 1e. Staff will meet with appropriate NOAA Fisheries staff to identify recovery criteria for listed stocks and appropriate sample sizes needed to evaluate changes in population status and abundance trends in those stocks.

Subtask 1f. Project staff will meet with DFG and NOAA Fisheries staff regarding the status of genetic studies and the archiving of genetic samples for Central Valley stocks.

**Task 2. Development of Revised Monitoring Programs.** Based on a comprehensive review of existing Central Valley adult salmon escapement monitoring methods in Task 1, project team will develop and document revised or new statistically-sound sampling, data analysis, data storage, and reporting protocols for in-river spawning escapement and in-river harvest surveys in each Central Valley watershed listed above, in close coordination with project collaborators, the CVSEPWT and the CVSPWT. Revised programs will be designed to integrate with the constant fractional marking program at Central Valley hatcheries, currently under development. Development of revised monitoring programs also will be closely coordinated with development of the coastal salmonid monitoring plan. Each Chinook salmon race, because of its unique adult run timing and holding conditions, may require different sampling metrics to generate adult population estimates. Each stream will also require development of unique escapement monitoring programs, due to the wide variety of habitat types present.

Subtask 2a. Project team will develop and document revised or new instream escapement and harvest monitoring programs, including field, laboratory, and data analysis methods.

Subtask 2b. Project team will develop statistically valid coded-wire tag recovery, otolith and scale aging programs for each Central Valley watershed as integral components of in-river spawning escapement and harvest monitoring programs. The coded-wire tag recovery program will integrate with the constant fractional marking program currently under development for Central Valley hatcheries.

Subtask 2c. Database expert on project team will develop a coordinated data management system and procedures for analysis of Central Valley salmon escapement monitoring data (escapement estimates, coded-wire tag recoveries, aging data), in coordination with CDFG, NOAA Fisheries, USFWS, PSMFC, and the CALFED Science Program.

Subtask 2d. Project team will develop a consistent, integrated data reporting and communication system for Central Valley salmon escapement monitoring data, in coordination with CDFG, NOAA Fisheries, USFWS, PSMFC, and the CALFED Science Program.

Task 3. **Development of Cost Estimates.** In coordination with the CVSEPWT, project team will develop cost estimates for implementing revised and new instream escapement and inland harvest monitoring programs, including field, laboratory, data management and data reporting. Potential funding sources and funding priorities for each monitoring program will be identified.

Task 4. **Project Management and Reporting.** Project team will prepare semi-annual reports, and draft and final versions of the Central Valley Adult Salmon Escapement Monitoring Plan.

Subtask 4a. Project team will submit semi-annual fiscal and programmatic reports by the 10th day of the month in January and July. The reports will summarize the activities and expenditures, separated to specific task level performed during the previous six months.

Subtask 4b. Project team will prepare and submit draft Central Valley Adult Salmon Escapement Monitoring Plan to the CVSEPWT, CVSPWT, and the NOAA Fisheries Central Valley Technical Recovery Team, for review.

Subtask 4c. Project team will revise draft Monitoring Plan based on comments of the teams listed in Subtask 4b. Project team will prepare and submit final Central Valley Adult Salmon Escapement Monitoring Plan.

Subtask 4d. At five year intervals, programs implemented through this plan will be reviewed by an independent science panel. Funding for this review is not included in the current proposal.

### **Project Feasibility/Timeline**

The proposed approach will be both feasible and appropriate to the development of the proposed plan. The proposed work and completion schedule is commensurate with development of previous large-scale plans for Central Valley Chinook salmon.

The CDFG, USFWS, and NOAA Fisheries, study collaborators, are well experienced to guide the development of a Central Valley Chinook Salmon Escapement Monitoring Plan. Biologists have extensive field and data analysis experience with Central Valley escapement surveys.

Since the proposal only includes development of a plan, no permits or agreements will be necessary to complete the tasks. No landowner access is required.

Project timeline is shown in Table 1. The timeline assumes completion of the contract process by January 2006.

### **5. Subcontractors (include description of tasks and qualifications)**

DFG will contract with Pacific States Marine Fisheries Commission (PSMFC) for personnel services for all project tasks. Personnel will be selected for the project by a panel consisting of the project lead, PSMFC personnel manager, and study collaborators. Recommendations for the project biometrician will be made by Michael Mohr, Biometrician at the NOAA Fisheries Southwest Science Laboratory.

### **6. Tasks and Deliverables (Description)**

Semi-annual fiscal and programmatic reports will be submitted by the 10<sup>th</sup> day of the month in January and July. The reports will summarize the activities and expenditures, separated to specific task level, that were performed during the previous six months.

As described, at the end of the planning period, a draft and final Central Valley Escapement Monitoring Plan will be provided.

### **7. Special Equipment and Supplies required**

Computers, printers, telephones, and office supplies will be needed for project team.

### **8. Environmental Permitting Requirements**

Since the project only includes development of a plan, no environmental permits or agreements will be necessary to complete the tasks.

### **9. Species Impacted/Affected**

Central Valley Chinook salmon (winter, spring, fall, and late fall-run)

### **10. Stakeholders and Interested Parties**

Agencies involved in this project include California Department of Fish and Game, Department of Water Resources, NOAA Fisheries, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Pacific States Marine Fisheries Commission, Yuba County Water Agency, and East Bay Municipal Water District. Study collaborators include representatives from each of the state and federal fish and wildlife agencies.

Currently, data management and reporting in the Central Valley is conducted on a project-by-project basis. No standardized database is available for data storage and retrieval. Most projects prepare an annual report of survey results. However, escapement data and reports are not readily accessible in a timely way by other researchers, stakeholders, or the public. This project will develop a consistent, integrated data reporting and communication system for Central Valley salmon escapement monitoring data that will be readily available to all interested CALFED stakeholders.

## **11. Exhibits**

**Table 1 – Project Timeline**

**Exhibit A – Budget Detail**

**Exhibit B – Task Deliverables**

**Response to Review Comments**







Cost Estimates											
4: Project Mgmt & Admin	5,697	2,2027	6,000	5,000	4,000	5,000		4,000		4,759	36,483
<b>Totals</b>	62,476	23,510	6,000	8,000	20,000	5,000		4,000		19,349	148,335

### Year 2 (Months 13 to 24)

Task	Labor	Benefits	Travel	Supplies and Expendables	Services and Consultants	Equipment	Lands and Rights of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
1: Review Existing Programs					15,000					2,250	17,250
2: Develop Revised Monitoring Programs	59,411	23,172		1,000	15,000					14,787	113,370
3: Develop Cost Estimates	15,521	5,218		1,000						3,261	25,000
4: Project Mgmt & Admin	27,229	10,413	10,650	2,000	2,000			8,050		9,052	69,394
<b>Totals</b>	102,161	38,803	10,650	4,000	32,000			8,050		29,350	225,014

## EXHIBIT B – TASK DELIVERABLES

### DEVELOPMENT OF A COMPREHENSIVE CENTRAL VALLEY ADULT CHINOOK SALMON ESCAPEMENT MONITORING PLAN

<u>Task</u>	<u>Task Title</u>	<u>Deliverable</u>	<u>Estimated Completion Dates</u>
1	Review Existing Programs	<ul style="list-style-type: none"> <li>• Summary report on existing Central Valley salmon escapement monitoring programs</li> </ul>	<ul style="list-style-type: none"> <li>• July 2006 (6 months after contract execution)</li> </ul>
2	Develop Revised Monitoring Programs	<ul style="list-style-type: none"> <li>• Semi-annual Progress Reports</li> </ul>	<ul style="list-style-type: none"> <li>• Throughout the contract term. Due 10<sup>th</sup> of July, January.</li> </ul>
3	Develop Cost Estimates	<ul style="list-style-type: none"> <li>• Semi-annual Progress Reports</li> </ul>	<ul style="list-style-type: none"> <li>• Throughout the contract term. Due 10<sup>th</sup> of July, January.</li> </ul>
4	Project Mgmt & Admin	<ul style="list-style-type: none"> <li>• Semi-Annual Progress Reports</li> <li>• Monthly Invoices</li> <li>• Draft Escapement Monitoring Plan</li> <li>• Final Escapement Monitoring Plan</li> <li>• Project Close Out Report</li> <li>• Final Invoice</li> </ul>	<ul style="list-style-type: none"> <li>• Throughout the contract term. Due 10<sup>th</sup> of July, January.</li> <li>• 10<sup>th</sup> of each month following billing period</li> <li>• March 31, 2007 (15 months after contract execution)</li> <li>• June 30, 2007 (18 months after contract execution)</li> <li>• August 2007</li> <li>• September 2007</li> </ul>

Note: Public Participation and Environmental Compliance and Permitting are not separate tasks in this proposal since they are not required as part of this project. Draft and Final Plans and Project Close Out are included in Task 4, Project Management and Administration.

## Response to Review Comments

Following approval as a Directed Action, this project proposal received external independent review through the CALFED Ecosystem Restoration Program. The following are responses to review comments.

### Review #1

#### Research and Restoration External Scientific Review Form CALFED Bay-Delta Program Ecosystem Restoration Program

**Proposal Title:** *Development of a Comprehensive Central Valley Adult Chinook salmon Escapement Monitoring Plan*

**Review:**

(SEE ATTACHED REVIEW)

1. **Goals.** *Are the goals, objectives and hypotheses (1) clearly stated, (2) internally consistent, (3) timely and (4) important?*

2. **Justification.** *Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?*

3. **Approach.** *Is the approach well designed and appropriate for meeting the objectives of the project? Is the proposed approach likely to result in a statistically-valid outcome? Are results likely to add to the base of knowledge? Does the project reflect state-of-the-art methods and approaches to monitoring? Will the information ultimately be useful to decision-makers?*

4. **Feasibility.** *Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?*

5. **Project-Specific Performance Measures.** *Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified?*

6. **Products.** *Are products of value likely from the project? Are interpretative outcomes likely from the project?*

7. **Capabilities.** *What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?*

8. **Cost/Benefit Comments.** *Is the budget reasonable and adequate for the work proposed?*

**Miscellaneous comments:**

**Please provide an overall evaluation summary rating: Excellent: outstanding in all respects; Good: quality but some deficiencies; Poor: serious deficiencies.**

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
- Excellent	Poor/Good Resubmit after significant revision (See Attached)
- Good	
- Poor	

Referee Report: "Development of a Comprehensive Central Valley Adult Chinook Salmon Escapement Monitoring Plan"

This is an exceptionally tough proposal to evaluate fairly. Given the enormous and, to me, self-evident importance of establishing a rigorous long-term program for estimating spawning escapement and freshwater catch of CV Chinook salmon, it's tough not to let the importance of that objective outweigh the shortcomings of the proposal itself. The proposal, however, provides little evidence that the requested \$373k would be well spent or that this substantial amount of funding is required to achieve the objectives of the proposal.

Reviewing historic data sets and procedures used to estimate escapement is a worthy objective, but the overall cost of the project seems exceedingly high for this project. Is \$93k of a database specialist's time really required over the course of an 18 month project? If so, just exactly what would this individual be doing? Why is project PI from the PSMFC, where do PSMFC funds go and how are they used? (I suspect this has to do with CDFG contract laws, but this issue is not explained at all.) Is \$33k really needed to write checks (if that is the PSMFC role)?

Response

We concur that the establishment of a statistically-valid long-term escapement monitoring program is very important. We also believe that the budget is well justified. The project team consists of a coordinator, statistician (both part time), and a biologist and database specialist (full time) for an 18-month planning period. The database specialist will design databases for the Chinook escapement, coded-wire tag, and inland harvest monitoring programs. Database development will require coordination with DFG's Wildlife and Habitat Data Analysis Branch and the IEP program, to ensure compatibility with existing databases. The objective of designing a comprehensive database, accessible by all interested CALFED agencies, stakeholders, and the general public, is an essential component of this project. If both this proposal and the Central Valley Steelhead Monitoring Plan proposal are funded concurrently, some cost savings may be possible by sharing the database specialist's time on both projects.

PSMFC's role in this project will not be merely "writing checks"; the agency will have the responsibility for overall project administration and personnel management. The PSMFC has a proven track record for high-quality project management, and recruiting, hiring, and supervising quality personnel for fishery research and monitoring projects. The agency is involved in major projects throughout the Northwest and California. Pay scales for project personnel are based on the federal GS system, budgeted at the appropriate level for the expertise needed on the project. Complete pay scale information can be provided on request. Recruitment for the project team will be conducted nationwide. Mr. Stan Allen (PSMFC) will provide administrative, project coordination, and personnel management support and assistance to the study. Stan is a Senior Program Manager and has over 20 years of fisheries project administration and data collection/management experience. He has spent the last 17 years developing, coordinating and administering multi-agency cooperative projects, including many monitoring and management plans. The PSMFC was chosen to manage this project because overhead rates are considerably lower than federal or state agency rates.

The proposal was developed by the IEP Salmonid Escapement Project Work Team, with review by the parent Central Valley Salmonid Project Work Team. Study collaborators include representatives from each of the state and federal fish and wildlife agencies, California Department of Fish and Game, NOAA Fisheries, and U.S. Fish and Wildlife Service. The collaborators have

agreed to spend significant effort on this project, at no cost to CALFED. Other agencies involved in Central Valley escapement surveys have agreed to participate in the project; significant resources will be expended from agency staff at Department of Water Resources, U.S. Bureau of Reclamation, Yuba County Water Agency, and East Bay Municipal Utility District.

I am most concerned, however, that the proposal does not indicate that a competent biometrician has been involved in development of the proposal. Neither does the proposal provide any assurance that the biometrician who would be hired under subcontract would be equal to the task or have an appropriate background. For this project, I think that knowledge of mark-recapture theory and the general area of estimation of abundance of animal (fish and wildlife) populations and for estimation of recreational catch of salmon would be far more important than knowledge of survey designs for estimating status and trends. I believe that estimates of spawning escapement and freshwater catches of Chinook salmon are needed throughout the CV and they need to be available on an annual basis. The only real issue is how accurate these estimates need to be to detect changes in abundance, etc..

I do not think that the proposal should be funded as is. Instead, I think that the project collaborators need to identify/fund a consulting biometrician to assist them in proposal development and to identify an individual who is willing to serve as the subcontracted biometrician identified in the proposal budget. A brief CV should be included for all PIs, especially for the biometrician, so that a referee could assess whether or not he/she possessed the required expertise in the areas noted above. Rather than outright rejecting the proposal, I think that CALFED should instead request a resubmitted proposal that reflects the addition of a biometrician to the planning team and which also addresses some of the issues noted below.

#### Response

The proposal received review by two competent biometricians, Phil Law at Department of Fish and Game, and Michael Mohr at NOAA Fisheries Santa Cruz Lab. We do not have a biometrician at any of the fishery agencies who can devote the substantial effort needed to complete a comprehensive plan like the one proposed. We sought outside funding in order to hire a statistician and other experts for this planning effort. We are not able to hire a statistician for the project team until we have funding approval; that is why the project personnel were not identified in the proposal.

Recruitment of personnel for the project team will be conducted on a nationwide basis. Referrals to statisticians with appropriate background and experience for this project are being obtained from Michael Mohr and Pete Adams at NOAA Fisheries Santa Cruz Lab. They are currently in the process of preparing that list. Every effort will be made to hire a competent biometrician with appropriate expertise for this work.

#### Additional Minor Concerns.

1. p. 2, first full para, last sentence. Increased escapement will not necessarily imply that restoration activities have been responsible for such improvements. Increased escapement can result from other factors such as improved ocean survival and/or reduced ocean fishery impacts that have absolutely nothing to do with improvements in freshwater habitat.

#### Response

We are fully aware that factors other than restoration activities affect Central Valley Chinook salmon escapement. However, without improved escapement estimates, we will not be able to assess whether restoration goals are being met.

2. p.3, last para. and elsewhere. It is VERY unclear whether or not design of freshwater sport fishery surveys is to be included in this proposal. I believe strongly that design of FW recreational fisheries creel surveys needs to be part of the project. This area is a huge hole in the CV system, especially wrt the mainstem Sacramento river itself.

Response

Re-design of the freshwater sport harvest survey will definitely be included in the plan. On page 8 of the proposal, Subtask 1b states the “The project team will meet with staff from the former Central Valley Inland Harvest Program to document and conduct a thorough review of the **inland harvest program** discontinued in 2003.” On page 9 of the proposal, Subtask 2a states that the “Project team will develop and document revised or new **instream escapement and harvest monitoring programs**, including field, laboratory, and data analysis methods”.

3. p. 4. The discussion of statistical "power" is off target and should be revised by the Biometrician who should be added to the proposal team.

Response

A biometrician will be part of the project team (see response above).

4. p. 4, para. 5. The Bogus Creek studies were especially valuable because the weir count theoretically provided true abundance which could then be compared to two different mark-recapture estimates based on the Schaefer or Jolly-Seber methods applied to carcasses. Comparison between estimates generated using two alternative methods is problematic when the true target value is unknown.

Response

We have more recent data from Central Valley streams where both mark-recapture carcass survey data and weir data are available for the same years. These data will be evaluated thoroughly in this project. On page 8, Subtask 1a describes the plans to review these data in detail: “Several existing data sets will be comprehensively reviewed in this subtask. The weir/dam escapement monitoring and carcass surveys conducted on the lower Mokelumne, Yuba, Stanislaus rivers, and Battle Creek in the fall of 2003 will provide data sets for comparing the methodologies and assessing the accuracy of the carcass survey method in Central Valley streams. Department of Water Resources staff has also collected intensive carcass survey data on the lower Feather River that may allow detailed analysis of the problems with mark-recapture methods in estimating escapement.”

5. p. 5, top. This paragraph about a standardized database just hangs out all by itself. Are the proposal proponents proposing to develop such a database?

Response

On page 9, Subtask 2c states that the “Database expert on project team will develop a coordinated data management system and procedures for analysis of Central Valley salmon escapement monitoring data (escapement estimates, coded-wire tag recoveries, aging data), in coordination with CDFG, NOAA Fisheries, USFWS, PSMFC, and the CALFED Science Program.” This is the reason for inclusion of a database specialist on the project team.

6. Hypotheses seem forced and arbitrary; straying rates and contribution of hatchery fish requires knowledge of and agreement on hatchery marking rates and strategies. What would "similar" hypotheses be at the ESU level? That's not so obvious to me!

Response

This plan will be developed in concert with a comprehensive coded-wire tagging/marketing program. With a constant proportion of hatchery-reared Chinook salmon marked, and a statistically-valid CWT recovery program, the data will be available to identify straying rates and contributions of hatchery-reared fish.

7. p. 9, subtask 1f. The proposal provides no clear connection between the proposed research and the status of genetic studies. How would these genetic studies influence the proposal?

Response

Tissue samples for genetic analysis are collected as a routine part of Chinook escapement surveys. This project will need to incorporate tissue collection and archiving into the survey designs in the plan.

8. p. 10, item 4) I found no level at which the proposal would be relevant to "environmental indicators".

Response

Adult escapement of Central Valley Chinook salmon (all runs), Sacramento River winter-run Chinook salmon, Butte Creek spring-run Chinook salmon, and Tuolumne River fall-run Chinook salmon have been selected by the CALFED Science Program as performance indicators to monitor the success of ecosystem restoration programs (CALFED Science Program, Performance Indicators Workshop, April 2003).

9. p. 11, Data Handling - What is the \$93k for the database specialist for? What will be produced, etc.?

Response

The database specialist will be involved primarily in Tasks 1 and 2 of the project. The specialist will be involved in all subtasks of Task 1, the review of existing programs. In Task 2, the primary responsibility will be for Subtask 2c (page 9) which states that the "Database expert on project team will develop a coordinated data management system and procedures for analysis of Central Valley salmon escapement monitoring data (escapement estimates, coded-wire tag recoveries, aging data), in coordination with CDFG, NOAA Fisheries, USFWS, PSMFC, and the CALFED Science Program." This coordinated database will be an essential component of the revised escapement programs.

**Review #2**  
**Research and Restoration External Scientific Review Form**  
**CALFED Bay-Delta Program Ecosystem Restoration Program**

**Proposal Title:** *Development of a comprehensive Central Valley Chinook Salmon Escapement Monitoring Plan*

**Review:**

1. **Goals.** *Are the goals, objectives and hypotheses (1) clearly stated, (2) internally consistent, (3) timely and (4) important?*

The goals are vague; authors have not clearly shown that there is a data problem (this does not mean there isn't a problem!). The authors are inconsistent in several ways: They state that CVPIA directed agencies to meet production goals by 2002. Goals are unclear and deadline is over 2 years old. The overall idea for a comprehensive monitoring project is extremely important. However, it is unclear as to why money is needed and how a finished project is to be implemented. Example, the authors state that the CMARP program (1999), for monitoring the success of CALFED, have to date, not been funded. Then why spend money and time on another program that appears to replicate some of the CMARP document?

Response

The goals of the project are clearly stated. Existing adult Chinook salmon escapement monitoring programs in the Central Valley are inadequate to estimate population status and evaluate population trends in a statistically valid manner for current management purposes. Programs have evolved over the years, and vary in methods used, intensity of sampling effort, and reliability of estimates. Despite their widespread use in the Central Valley, models to estimate in-river spawning escapement based on mark-recapture carcass survey data require a number of assumptions which may not be met in the surveys. An example of these biases, described in detail on page 4 of the proposal, is the mark-recapture carcass survey conducted on Battle Creek in the Sacramento River basin. Many more examples could be given in the proposal; due to length constraints, the authors did not believe it was necessary to include a complete description of the problems with the escapement survey estimates for each stream in the Central Valley. A detailed analysis will be conducted and documented as part of the plan development.

Existing programs have not been reviewed for adequacy of statistical power or bias. Data from existing Central Valley programs have also not yet been validated through studies using more than one monitoring method. No standardized database is available for data storage and retrieval; escapement data and reports are not readily accessible in a timely way by other researchers, stakeholders, or the public. Development of this Plan will remedy these problems.

The anadromous fish doubling goal in the CVPIA legislation is still a viable goal of the on-going CVPIA programs.

The goal of this project is to develop a plan that will be implemented, not sit on a shelf. The project will not duplicate the effort spent in developing the CMARP plan. The objective of that plan was to describe general monitoring, assessment, and research needs for all of the CALFED programs. The Chinook salmon and steelhead component of CMARP does not include a detailed statistical review of escapement monitoring programs and stream-specific recommendations for revised programs. The current project will result in a much more detailed plan for statistically-valid escapement monitoring on each Central Valley stream.

2. **Justification.** *Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?*

While the study is justified, the authors do not support it well. There is virtually no literature cited. Nor have they provided concrete evidence as to what gaps there are in the data sets.

Response

The proposal assumes some familiarity with Central Valley Chinook escapement monitoring surveys. An example of program biases, described in detail on page 4 of the proposal, is the mark-recapture carcass survey conducted on Battle Creek in the Sacramento River basin. Many more examples could be provided. The literature cited were key references



in the design of escapement monitoring programs. To keep the proposal a reasonable size (under 20 pages), the authors did not include references for each of the Central Valley surveys.

3. ***Approach.*** *Is the approach well designed and appropriate for meeting the objectives of the project? Is the proposed approach likely to result in a statistically-valid outcome? Are results likely to add to the base of knowledge? Does the project reflect state-of-the-art methods and approaches to monitoring? Will the information ultimately be useful to decision-makers?*

The approach is ambiguous and unclear. For instance, on page 7, the authors write, “Nineteen Central Valley watersheds currently support spawning and rearing habitat for Chinook salmon”. According to whom? If the monitoring program is presently faulty, then how can this statement be made? There are many more streams in the Central Valley that provide habitat for one or more life stages of Chinook salmon (ie Dry Creek in Placer and Dry Creek in Sacramento counties). Again, virtually no literature is cited here. An example of literature that should be cited is, but is not limited to: “USFWS. 1997. Comprehensive Assessment and Monitoring Program. Implementation Plan. Sacramento, California. The purpose of the CAMP plan is, “...to assess the effectiveness of actions taken pursuant to Section 3406 (b), primarily actions to restore anadromous fish populations.

On page 6, “Hypotheses”, the authors use a precision of 25%. Why? This is a very large variation. It would be very difficult to show statistically significant annual variation in population sizes. Wouldn't a 20% change in population size be dramatic? Under this scheme, it may not be detected. If this is appropriate, state why and support with literature.

#### Response

Adequate surveys have been conducted over the years to determine that there are nineteen Central Valley watersheds that currently support spawning and rearing habitat for Chinook salmon populations. We concur that Chinook salmon are sometimes found in other small tributaries in the Sacramento-San Joaquin River system, but those tributaries do not consistently support spawning populations. Conducting routine adult escapement surveys in those streams would not merit the cost or effort.

The CAMP Implementation Plan (CVPIA 1997) and other plans could have been cited, although the current proposal includes a much more detailed effort than was conducted in the development of the CAMP Plan.

The 25% level of precision is the same level being used in development of the current California Coastal Salmonid Monitoring Plan. It is a somewhat arbitrary level, but it is a reasonable and achievable objective based on analyses of these types of surveys.

4. ***Feasibility.*** *Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?*

Designing a statewide monitoring program for salmon escapement is daunting, yet feasible. The authors could make a much stronger case if they could demonstrate how the monitoring program could be implemented. With so many different agencies monitoring, how could we get them all to buy in? Furthermore, if such a project were ever achieved, there is no guarantee that it could be implemented. For instance, CAMP put together a rotary screwtrap monitoring protocol. Several teams have also put together numerous documents stating the shortfalls of salmonid monitoring in the Central Valley and have made numerous suggestions as to how to gather data yet none of these are being implemented state-wide (see CMARP, Draft Programmatic EIS/EIR Technical Appendix June 1999, as example).

#### Response

The rotary screw trap monitoring protocol developed by the CAMP program is still used as a standard methodology for rotary screw trap sampling in the Central Valley (as discussed at a recent meeting of the IEP Juvenile Monitoring Project Work Team).

We concur that designing a Central Valley-wide escapement monitoring plan is daunting yet feasible, and the study collaborators believe that it will also be implementable. This proposal was developed by the IEP Salmonid Escapement Project Work Team, with review by the parent Central Valley Salmonid Project Work Team. Study collaborators include representatives from each of the state and federal fish and wildlife agencies, California Department of Fish and Game, NOAA Fisheries, and U.S. Fish and Wildlife Service. The collaborators have agreed to spend significant effort on this project, at no cost to CALFED. Other agencies involved in Central Valley escapement surveys have agreed to

participate in the project; significant resources will be expended from agency staff at Department of Water Resources, U.S. Bureau of Reclamation, Yuba County Water Agency, and East Bay Municipal Utility District. There is considerable buy-in and momentum at this time to complete a comprehensive plan and implement improved escapement monitoring for Central Valley Chinook. The project team will be directly involved over the planning period with the on-the-ground field staff conducting the surveys. Through this close collaboration, the plan will be both statistically sound and practical to implement.

The project will not duplicate the effort spent in developing the CMARP plan or similar plans. The objective of the CMARP plan was to describe general monitoring, assessment, and research needs for all of the CALFED programs. The Chinook salmon and steelhead component of CMARP does not include a detailed statistical review of escapement monitoring programs and stream-specific recommendations for revised programs. The current project will result in a much more detailed plan for statistically-valid escapement monitoring on each Central Valley stream.

**5. Project-Specific Performance Measures.** *Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified?*

Not really. It is very unclear as to what success is. Is it simply a plan to build a state-wide monitoring program or build one that will actually be implemented? Statistical tools etc. are vague and unclear.

On page 6, authors state that, "...estimates ...are critical to evaluation of the achievement of population doubling goals and/or delisting criteria". The doubling goals deadline is over 2 years old and the state already has "escapement" estimates. This makes the purpose and performance measurements vague. The authors need to clearly show why present estimates are not good enough to meet these goals. Authors state the "...plan will be closely coordinated with the CVSEPWT, CVSPWT and NOAA Fisheries Central Valley Technical Recovery Team" (pg. 8). How will coordination with the various work teams be met and why?

#### Response

The goal of this project is to develop a plan that will be implemented, not sit on a shelf. The anadromous fish doubling goal in the CVPIA legislation is still a viable goal of the on-going CVPIA programs. The Department of Fish and Game reports Chinook escapement estimates each year to the PFMC, but those estimates are not accurate enough to meet the variety of current uses for those data. See response to previous comment on project approach.

The plan will be developed through coordination between the project team and subteams of the CVSEPWT. The proposal clearly describes the role of the CVSEPWT members in development of the plan. The project team will also coordinate directly with the CVSPWT and the Central Valley Technical Recovery Team on a regular basis, as this planning effort is integral with the responsibilities of those teams. For example, the Central Valley Technical Recovery Team is tasked with development of a Central Valley salmonid monitoring program. By utilizing the efforts of this planning team, the recovery team can include much more detail in the adult monitoring program section of their monitoring plan.

**6. Products.** *Are products of value likely from the project? Are interpretative outcomes likely from the project?*

Unclear. Even, if a program was designed, how would it be implemented? There is no guarantee that the large number of agencies currently monitoring would buy into it. Where would all of the data be stored (IEP?)? How do you insure that databases are compatible? Again, I point to the CAMP rotary screwtrap protocols. These were state-wide guidelines for the operation and data collection of outmigrating salmonid traps. Unfortunately, much of what was suggested is not implemented by many monitoring programs. How would the authors suggest that this plan would be any different?

#### Response

See response above to # 4. Subtask 2c states that "Database expert on project team will develop a coordinated data management system and procedures for analysis of Central Valley salmon escapement monitoring data (escapement estimates, coded-wire tag recoveries, aging data), in coordination with CDFG, NOAA Fisheries, USFWS, PSMFC, and the CALFED Science Program." The database developed through this project will be compatible with the IEP database, and databases developed by the listed agencies. This will be achieved by close coordination between the database expert on the project team and agency staff developing database programs.

7. **Capabilities.** *What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?*

This is completely unclear. The authors provide no information about who will perform the work. Is it going out to bid? Who will interview and assess potential candidates? Whose responsibility is it to ensure the project is completed?

Response

The project team consisting of a project coordinator, biologist/planner, database specialist, and biometrician/statistician cannot be hired until funding is obtained for the project. The Pacific States Marine Fisheries Commission (PSMFC) will have the responsibility for overall project administration and personnel management. The PSMFC has a proven track record for high-quality project management, and recruiting, hiring, and supervising quality personnel for fishery research and monitoring projects. The agency is involved in major projects throughout the Northwest and California. Pay scales for project personnel are based on the federal GS system, budgeted at the appropriate level for the expertise needed on the project. Recruiting for project staff will be conducted nationwide. Mr. Stan Allen (PSMFC) will provide administrative, project coordination, and personnel management support and assistance to the study. Stan is a Senior Program Manager and has over 20 years of fisheries project administration and data collection/management experience. He has spent the last 17 years developing, coordinating and administering multi-agency cooperative projects. The PSMFC was chosen to manage this project because overhead rates are considerably lower than federal or state agency rates. The PSMFC will ensure that project staff perform the tasks described in the proposal.

Ms. Alice Low (DFG) will be the principal study collaborator. Ms. Low is a Senior Fisheries Biologist in the Native Anadromous Fish and Watershed Branch of the DFG and is the DFG Recovery Coordinator for Threatened and Endangered Salmon. Ms. Low has over 22 years experience in fisheries management, primarily in management of Central Valley salmon. She is a member of the NOAA Fisheries Technical Recovery Team for the Central Valley domain. She currently chairs the IEP Salmonid Escapement Project Work Team (SEPWT) and is a member of the Central Valley Salmonid Project Work Team (CVSPWT). Ms. Low will provide coordination for the project, ensuring consistency with DFG management objectives for Chinook salmon, and will provide interagency coordination through the CVSEPWT and CVSPWT teams. In addition, Shirley Witalis, NOAA Fisheries, Sacramento, Robert Null, U.S. Fish and Wildlife Service Red Bluff Office, and John D. Wikert, U.S. Fish and Wildlife Service Stockton Office will be study collaborators.

The study collaborators are well experienced to guide the development of a Central Valley Chinook Salmon Escapement Monitoring Plan. The collaborators have agreed to spend significant effort on this project, at no cost to CALFED. Other agencies involved in Central Valley escapement surveys have agreed to participate in the project; significant resources will be expended from agency staff at Department of Water Resources, U.S. Bureau of Reclamation, Yuba County Water Agency, and East Bay Municipal Utility District. There is considerable buy-in and momentum at this time to complete a comprehensive plan and implement improved escapement monitoring for Central Valley Chinook.

8. **Cost/Benefit Comments.** *Is the budget reasonable and adequate for the work proposed?*

It is unclear what the ultimate goal is. Therefore, no. Example: Why is there budgeting for air travel?

Response

The project budget is reasonable to meet the goals of the project. Pay scales for project personnel are based on the federal GS system, budgeted at the appropriate level for the expertise needed on the project. Complete pay scale information can be provided on request. Recruitment for project positions will be conducted nationwide. The biostatistician hired (part-time) may not be based in California; the budget therefore includes air travel to allow for the biostatistician to travel to project meetings with agency staff, and for the PSMFC Senior Program Manager to travel to hire and supervise the project staff.

**Miscellaneous comments:**

I have serious reservations about this proposal. One could argue that several federal and state laws already mandate that valid monitoring should be performed by the agencies responsible for protecting these resources. Why more funding is

warranted to do this is unclear. Several multi-agency groups meet monthly to discuss monitoring. Shouldn't this be the responsibility of these groups? How would such a monitoring program (if completed) be implemented?

Many broad statements are made in this proposal with no clarity as to why. Example: Authors allude to the need to assess the contribution of hatchery fish to over-all production. Why?

Response

The fishery agencies responsible for protecting and managing Chinook salmon resources in the Central Valley conduct most of the monitoring programs, primarily using Sportfish Restoration Act, or CALFED ERP funding. Funding levels cover basic field activities and data analysis, but do not allow detailed examination of programs for statistical bias, or development of coordinated databases. There are several active Interagency Ecological Program salmon and steelhead coordination teams in the Central Valley. Meeting and workshop activities of these teams are supported by the participating agencies; the teams do not receive specific funding for their activities. This proposal was developed through the Central Valley Salmonid Escapement Project Work Team, but that Team does not have funding to develop the Escapement Monitoring Plan.

As stated earlier, the goal of this project is to develop a plan that will be implemented, not sit on a shelf. The study collaborators have agreed to spend significant effort on this project, at no cost to CALFED. There is considerable buy-in and momentum at this time by many agencies to complete a comprehensive plan and implement improved escapement monitoring for Central Valley Chinook. The project team will be directly involved over the planning period with the on-the-ground field staff conducting the surveys. Through this close collaboration, the plan will be both statistically sound and practical to implement.

Proposal authors assumed some familiarity with salmon management in the Central Valley. We assumed that statements such as those relating to the need to assess the contribution of hatchery fish to over-all production of Chinook salmon would be clear. If the proportion of hatchery-origin fish in the Central Valley Chinook escapement is unknown, it will not be possible to evaluate the success of habitat restoration actions, evaluate the propagation programs' genetic and ecological effects on natural populations, including impacts of disease transfer, competition, predation and genetic introgression, or evaluate straying rates or exploitation rates.

**Please provide an overall evaluation summary rating: Excellent: outstanding in all respects; Good: quality but some deficiencies; Poor: serious deficiencies.**

<b>Overall Evaluation Summary Rating</b>	<b>Provide a brief explanation of your summary rating</b>
- Excellent	Good/poor
- Good	
- Poor	

**Review #3**  
**Research and Restoration External Scientific Review Form**  
**CALFED Bay-Delta Program Ecosystem Restoration Program**

**Proposal Title:** *Development of a Comprehensive Central Valley Adult Chinook Salmon Escapement Monitoring Plan*

**Review:**

1. **Goals.** *Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?*

The main goal of this proposal is clearly stated. The overall objective is “to develop a long-term monitoring plan to estimate population status and trends in abundance of adult Central Valley chinook salmon at the watershed level in a statistically valid manner.” The proposal lists a set of four additional objectives in the problem statement section that remain internally consistent throughout. This proposal aims to serve as the blueprint to set the criteria in determining delisting status, a very tall order indeed, but one that needs immediate attention. This research is very important here in the Central Valley as indicated by the current inadequacies in the way California currently measures fishery escapement. Hypotheses are presented, but the ability to test them at the ESU scale (which is the objective of this proposal) seems highly unlikely due to the uncertainties that exist in the basic organizational structure of this ‘developmental proposal’.

Response

We concur with this comment. We concur that it will be difficult to test each of the hypotheses at the ESU scale. The proposal states that there is a certain degree of conflict between the multiple hypotheses; we anticipate that the Plan will include a description of the tradeoffs between them in terms of effort, sampling design, and statistical power.

2. **Justification.** *Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?*

The need for this type of study needs very little justification for anyone familiar with the how CDFG (who is constrained by funding and available manpower) coordinates their monitoring of Central Valley salmonids. Funding for anadromous salmonid restoration projects is on the increase even though the proper steps haven’t been taken to monitor the success of these stream alterations. This is a lose-lose situation in which the money is being spent, but fishery managers are left unable to assess the benefits to salmon escapement. This author makes a good argument to end this type of practice by implementing a comprehensive monitoring plan.

This proposal makes good use of conceptual models, referring to four different diagrams to clarify their experimental approach. The models used are not just included to fulfill a requirement, but instead they truly assist the reader comprehend how the proposed monitoring plan will be developed. The proposal does a good job justifying the need for planning critically needed improved salmon escapement models and monitoring at a watershed scale.

Response

We concur with this comment.

3. **Approach.** *Is the approach well designed and appropriate for meeting the objectives of the project? Is the proposed approach likely to result in a statistically-valid outcome? Are results likely to add to the base of knowledge? Does the project reflect state-of-the-art methods and approaches to monitoring? Will the information ultimately be useful to decision-makers?*

I am impressed by the project teams approach to look outside of California for answers to the problems managers face with managing the Central Valley fishery. The ‘Oregon Plan’ is a good choice to use as a guide since it has successfully met the goals Oregon faced in monitoring its fisheries. But, there is not one simple solution for all management applications. It is true that the Central Valley salmon fishery shares some similarities with Oregon’s coastal systems, but the Central Valley is very much a unique system with a very different set of confounding factors. Differences in public relations, water management and hydrological issues like the Delta and having the largest West coast estuary make the Central Valley system a special case that demands a management plan that is tailored to its special needs. The proposed approach relies on the statistical approach used by the Oregon Plan, again the success of this monitoring approach will

depend on how well it can be adapted to fit the Central Valley ESU. The results from this Comprehensive Monitoring Plan (CMP) would add to the base of what is known about chinook salmon, but I think a State or Federally administered plan would be better able to monitor the fishery over time. Any information that we can obtain about ESA listed species is valuable information that will be useful to decision makers. The most important aspect to think about here is whether or not this information will continue to be available 5, 10, 15 years down the road, or is this CMP just a quick band-aid fix to the problem that will soon need fixing itself?

Response

We concur that there are many differences between coastal Oregon streams and streams in the Central Valley that will make it infeasible to adopt the approach developed in the Oregon Plan to Central Valley streams. We included reference to the Oregon Plan only to present the feasibility of developing and implementing a large-scale, statistically-valid, comprehensive monitoring plan for salmonids that meets multiple objectives. Development of the Central Valley Plan will not involve merely copying the strategies used in the Oregon Plan. The budget was developed for this proposal assuming the need for a complete review of existing programs and design of revised programs tailored specifically for each Central Valley stream.

This effort is expected to provide a long-term, statistically-valid plan for Chinook escapement monitoring in the Central Valley, not a short-term band-aid fix. Of course, modifications to the monitoring programs will be needed in future years, as conditions change in the Central Valley and new technologies are developed. It is probable that following implementation of the Plan, monitoring programs will need to be continually refined on an adaptive basis. The proposal specifies that program implementation will be reviewed every five years.

4. **Feasibility.** *Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?*

This CMP approach to monitoring Central Valley chinook salmon is technically feasible on the sub-watershed basis, but the big question is whether or not it can be implemented in all 19 Central Valley watersheds? Uncertainties and inconsistencies exist with California hatchery marking programs. The CMP wants to model their plan after the Oregon Plan, but they aren't willing to mark all hatchery-produced fish as Oregon does in accordance with the Oregon Plan. One can appreciate the honesty of the proposal's author when he comments on the differences that exist between watersheds that call for different monitoring programs in each. But, at the same time it raises a red flag in that standardized methods will not be used across the entire watershed. I believe there is a high likelihood that the CMP would have its successes and failures, and will rely heavily on 'adaptive management'. Adaptive Management is usually a good thing, but in this case I can imagine it would be used as a crutch and that the cohesiveness of the monitoring program would be dependent on additional funding and time before it achieves the success it authors are hoping for.

Response

Improved coordination and consistency among monitoring programs is a primary goal of this proposal. We believe that there is considerable momentum at this time to improve Central Valley Chinook monitoring programs as a basis for improving hatchery and harvest management. This plan will be developed in parallel with a comprehensive marking/tagging program for hatchery-reared Central Valley Chinook, and will be consistent with the needs for statistically-valid recovery of tagged fish.

5. **Project-Specific Performance Measures.** *Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?*

Progress reports, meetings and number of methodologies reviewed and revised will serve as performance measures for this CMP. The reports and meetings are standard expected outcomes that will hopefully provide guidance to managers. The part that is less clear is how this monitoring plan will "provide improved environmental indicator metrics for Central Valley chinook salmon populations". None of the objectives or hypotheses in this proposal address how this information will be collected or deduced which causes me to doubt the validity of this performance measure.

Response

Adult escapement of Central Valley Chinook salmon (all runs), Sacramento River winter-run Chinook salmon, Butte Creek spring-run Chinook salmon, and Tuolumne River fall-run Chinook salmon have been selected by the CALFED

Science Program as performance indicators to monitor the success of ecosystem restoration programs (CALFED Science Program, Performance Indicators Workshop, April 2003). This plan includes design of revised monitoring programs that will improve the accuracy of the escapement estimates defined as performance indicators.

6. **Products.** *Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?*

Yes, the CMP would result in programmatic reports that could be useful in making ESA listing and delisting decisions. Another potential outcome may be increased communication between the different agencies doing the field monitoring that may eventually lead to some standardization of methodologies.

Response

Improved coordination and consistency among monitoring programs is a primary goal of this project.

7. **Capabilities.** *What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?*

The track record of past collaboration was not provided in the proposal. All agencies involved, CDFG, USFWS and NOAA, have well-qualified salmon specialists capable of carrying out the work described in this proposal.

Response

We concur with this comment.

8. **Cost/Benefit Comments.** *Is the budget reasonable and adequate for the work proposed?*

The budget seems pretty straightforward and appears to fairly represent the work described for the most part. It would be nice to see a more detailed breakdown of the \$16,650 travel allotment. I assume this is for staff travel to meet and discuss the ‘Review Phase’ of the CMP, but this is not entirely clear.

Response

Recruitment for project positions will be conducted nationwide. The biostatistician hired (part-time) may not be based in California; the budget therefore includes travel funds to allow for the biostatistician to travel to project meetings. Personnel management may also require travel funding. In-state travel funds will be needed by the project team to attend meetings in Redding, Red Bluff, LaGrange, and Fresno, to meet with study collaborators and watershed teams in the development of the plan.

**Miscellaneous comments:**

**Please provide an overall evaluation summary rating: Excellent: outstanding in all respects; Good: quality but some deficiencies; Poor: serious deficiencies.**

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
Good (w/deficiencies)	Proposal made adequate justification that this problem needs to be addressed. Goals were clearly defined and objectives remained consistent throughout the proposal. Project leader has assembled a team of agency fishery professionals capable of carrying out the project to completion. Problems with the proposal stem from the scale at which it is going to be implemented and the uncertainties that exist with the basic biology of the study species (range and run unknowns). Additionally, it is assumed that the Oregon Plan will work in California’s Central Valley when it is a world apart from coastal Oregon where the Oregon

	Plan has had its success. Would like to see a list of names and the credentials of the agency personnel that have agreed to work on this project. Are these individuals as qualified to carry out this project as we are led to believe? Need to identify funding sources/cost-sharing for the proposed monitoring programs on page 26 of proposal.
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Response to summary rating

See responses to previous comments. Agency personnel who have agreed to serve as study collaborators are listed on page 1 of the proposal. Ms. Alice Low (DFG) will be the principal study collaborator. Ms. Low is a Senior Fisheries Biologist in the Native Anadromous Fish and Watershed Branch of the DFG and is the DFG Recovery Coordinator for Threatened and Endangered Salmon. Ms. Low has over 22 years experience in fisheries management, primarily in management of Central Valley salmon. She is a member of the NOAA Fisheries Technical Recovery Team for the Central Valley domain. She currently chairs the IEP Salmonid Escapement Project Work Team (SEPWT) and is a member of the Central Valley Salmonid Project Work Team (CVSPWT). Ms. Low will provide overall coordination for the project, ensuring consistency with DFG management objectives for Chinook salmon, and will provide interagency coordination through the CVSEPWT and CVSPWT teams.

In addition, Shirley Witalis, NOAA Fisheries, Sacramento, Robert Null, U.S. Fish and Wildlife Service Red Bluff Office, and John D. Wikert, U.S. Fish and Wildlife Service Stockton Office will be study collaborators. The study collaborators are well experienced to guide the development of a Central Valley Chinook Salmon Escapement Monitoring Plan.

Sub-teams of the Salmon Escapement Project Work Team will be formed to work with the project team in development of the plan. These biologists have extensive field and data analysis experience with Central Valley escapement surveys. A complete list of sub-team members will be provided on request.

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