Summary Information

Pacific States Marine Fisheries Commission

Upper Sacramento River Basin chinook salmon escapement monitoring program

Amount sought: $1,353,357

Duration: 36 months

Lead investigator: Mr. Stan Allen, Pacific States Marine Fisheries Commission

Short Description

The CALFED ERP, the CVPIA Program, and other programs, have provided millions of dollars for the restoration of Chinook salmon habitat in the Upper Sacramento River Basin (USRB), including the mainstem Sacramento River, Clear Creek, Battle Creek, Deer Creek and Mill Creek. The primary objective of this proposal is to continue to monitor the annual abundance, migration timing, and distribution of adult winter, spring, late−fall and fall−run Chinook salmon returning to spawn in the USRB for the next three years. Streams and species/runs to be monitored include: Sacramento River − winter, fall, and late fall−run Chinook; Clear Creek − fall−run Chinook; Battle Creek − fall−run Chinook; Mill Creek − fall and spring−run Chinook; Deer Creek − fall and spring−run Chinook; Beegum Creek − spring−run Chinook; Antelope Creek − spring−run Chinook.

Executive Summary

EXECUTIVE SUMMARY

Upper Sacramento River Basin Chinook Salmon Escapement Monitoring Program

Restoration of Central Valley Chinook salmon populations is an important goal of the CALFED Ecosystem Restoration Program (ERP), the Central Valley Project Improvement Act (CVPIA), and several other state and federally−mandated programs. In recent years, the CALFED ERP, the CVPIA Program, and other programs, have provided millions of dollars for the restoration of Chinook salmon habitat in the Upper Sacramento River Basin (USRB), including the mainstem Sacramento River, Clear Creek, Battle Creek, Deer Creek and Mill Creek. The basin supports large populations of fall and late fall−run Chinook, the endangered winter−run Chinook population, and two populations of the threatened spring−run Chinook.

CALFED ERP projects previously funded in the USRB include: fish passage, fish screens, riparian restoration, floodplain acquisition, flow modification, and gravel restoration. The problem addressed in this proposal is: the current adult escapement surveys, that monitor the number of adult fish escaping ocean harvest and returning to spawn in the USRB, are inadequately funded and staffed to thoroughly assess progress toward meeting the goals of the above−described restoration projects for increasing natural production of Chinook salmon at the watershed scale. Therefore, it cannot be demonstrated with an acceptable degree of precision if restoration funds have been wisely spent.

The CALFED Science Program selected adult escapement of Central Valley Chinook salmon and Sacramento River winter−run Chinook salmon as key performance indicators of the success of ecosystem restoration programs (Science Program Indicators Workshop, April 23−24, 2003). The status of adult returns of salmon will be used as a primary ecological indicator to translate the goals of ecological restoration in the ERP program into measurable benchmarks of program success in the USRB. The project is a collaborative effort involving the Department of Fish and Game (DFG), US Fish and Wildlife Service (USFWS), and Pacific States Marine Fisheries Commission. Field activities will be conducted from the DFG and USFWS offices in Red Bluff, California.

The primary objective of this proposal is to continue to monitor the annual abundance, migration timing, and distribution of adult winter, spring, late−fall and fall−run Chinook salmon returning to spawn in the USRB for the next three years. Streams and species/runs to be monitored include: Sacramento River − winter, fall, and late fall−run Chinook; Clear Creek − fall−run Chinook; Battle Creek − fall−run Chinook; Mill Creek − fall and spring−run Chinook; Deer Creek − fall and spring−run Chinook; Beegum Creek − spring−run Chinook; Antelope Creek − spring−run Chinook. Escapement monitoring techniques in the USRB have been continuously improved and refined since the 1960’s. From 1967 until 1986 the Red Bluff Diversion Dam (RBDD) provided a method of monitoring the four salmon runs as well as steelhead. Under this proposal, the DFG and USFWS will conduct mark−recapture carcass surveys, aerial redd surveys, hatchery counts, weir counts, and snorkel surveys of the mainstem Sacramento River and its major tributaries to estimate adult salmon escapement. Some of the escapement monitoring programs in the USRB have been conducted for over 30 years, providing baseline data for use in understanding population status and trends in relation to the benefits of ERP restoration activities. Funding the surveys together will improve coordination and consistency among programs.

In addition to monitoring the success of ERP restoration actions, data from the project will be used for assessing recovery of listed stocks (winter−run, spring−run), managing water project operations, evaluating the contribution of hatchery fish to assist in species recovery, and managing ocean and inland harvest at sustainable levels.

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."

Progress toward meeting the CVPIA goal of doubling the natural production of Chinook salmon in the Central Valley cannot be assessed without data from this project. Estimates of natural production depend in large part on surveys of in−river spawning escapement. In most years, over 25% of Central Valley Chinook salmon return each year to spawn in the USRB. Surveys in this proposal are all included in the CVPIA's Comprehensive Assessment and Monitoring Program (CAMP).

CALFED BAY-DELTA PROGRAM
ECOSYSTEM RESTORATION PROGRAM
2004 REQUEST FOR PROPOSALS

Title: Upper Sacramento River Basin Chinook Salmon Escapement Monitoring Program
Amount Requested: **$1,353,357**
Applicant: Pacific States Marine Fisheries Commission
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Principal Investigator: Stan Allen, Pacific States Marine Fisheries Commission

Collaborators: California Department of Fish and Game: Colleen Harvey-Arrison, Randy Benthin, Alice Low, and Doug Killam
U.S. Fish and Wildlife Service: Jim Smith, and Kevin Niemala,

A. Project Description: Project Goals and Scope of Work

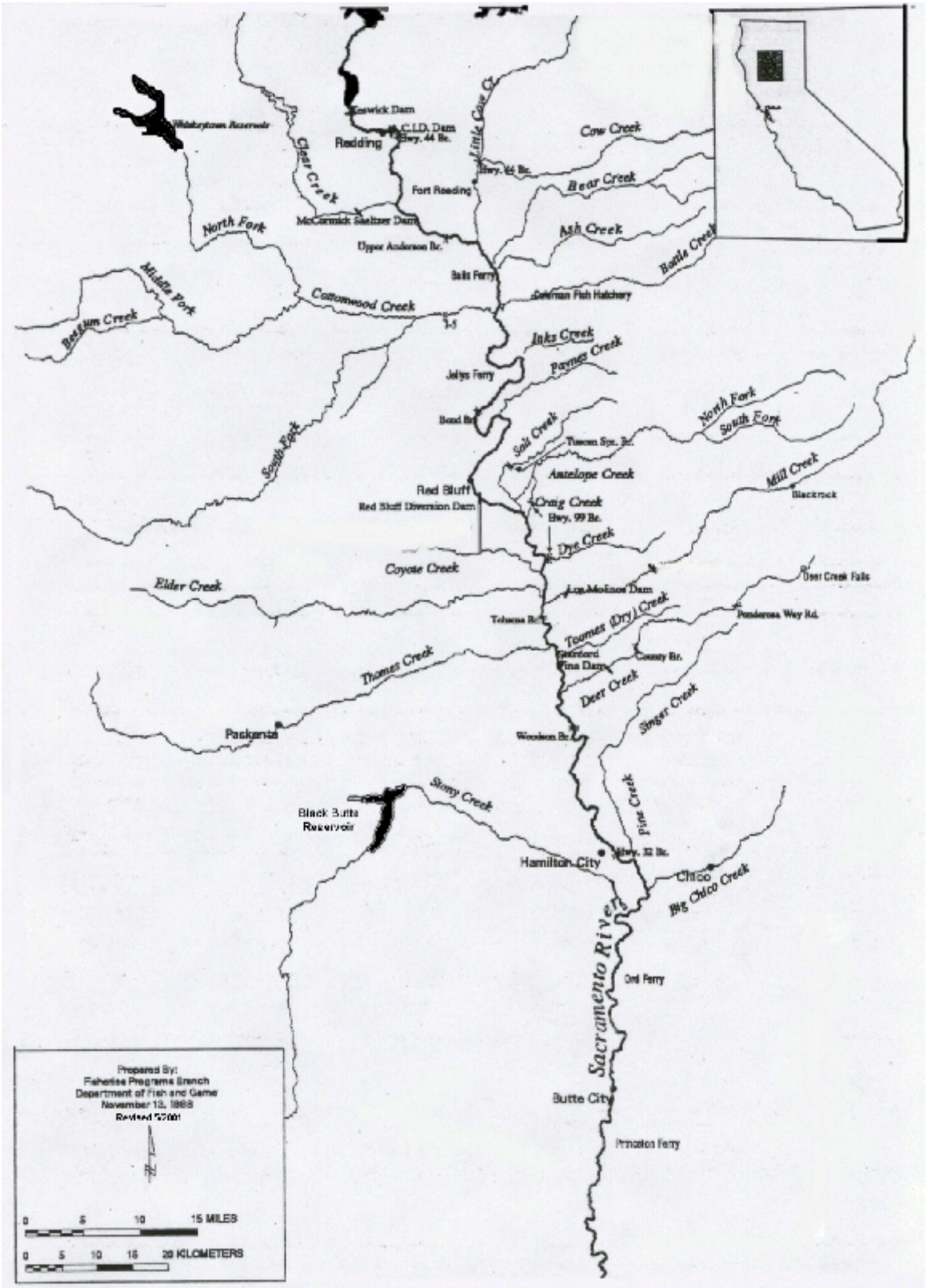
1. Problem, Goals, and Objectives

Restoration of Central Valley Chinook salmon (*Oncorhynchus tshawytscha)* populations is an important goal of the CALFED Ecosystem Restoration Program (ERP), the Central Valley Project Improvement Act (CVPIA), and several other state and federally-mandated programs. The ERP Program includes the goals of achieving recovery of at-risk native species and maintaining and/or enhancing populations of selected species for sustainable commercial and recreational harvest. A parallel goal of the federal Central Valley Project Improvement Act (CVPIA) is to ensure that the natural production of anadromous fish in Central Valley streams will be sustainable, on a long-term basis, at levels at least twice the average levels of natural production in the 1967 through 1991 period.

Sacramento River winter-run Chinook are state and federally-listed as endangered; Central Valley spring-run Chinook are state and federally-listed as threatened. Sacramento River fall-run Chinook support large sport and commercial fisheries, and are a key stock in the ocean harvest of West Coast fisheries. Chinook salmon are therefore a "big R" species included in the CALFED Multi-Species Conservation Strategy (MSCS). These are key species for which the ERP has established a goal for recovery within ERP ecological management zones.

In recent years, the CALFED ERP, the CVPIA, and other programs, have provided millions of dollars for the restoration of Chinook salmon habitat in the Upper Sacramento River Basin (USRB)-(Figure 1), including the mainstem Sacramento River, Clear Creek, Battle Creek, Deer Creek and Mill Creek (Table 1). The USRB has been an important area for Chinook salmon restoration for several reasons. In most years, over 25% of the fall-run Chinook returning to the Central Valley spawn in the USRB area (Killam and Harvey-Arrison 2004). Winter-run Chinook spawn exclusively in the USRB, and two of the three extant non-hybridized spring-run Chinook populations spawn in tributary streams within the USRB.

Figure 1. Upper Sacramento River Basin from Keswick Dam to Princeton, and associated tributaries.



CALFED ERP projects previously funded in the USRB (Table 1) and their goals for Chinook salmon restoration include:

- Fish passage – improve upstream passage of adult Chinook to reach spawning and rearing areas,
- Fish screens – improve survival rates of emigrating juvenile Chinook salmon by reducing entrainment in water diversions,
- Riparian restoration – improve survival of rearing juvenile Chinook by increasing nutrient levels, stream shading,
- Floodplain acquisition – improve survival of rearing juvenile Chinook by providing increased area and quality of rearing habitat,
- Flow modification – improve survival of all freshwater Chinook life stages: adult immigration, egg incubation, rearing, and emigration,
- Gravel restoration – improve habitat for Chinook spawning and egg incubation.

The focus of the current proposal solicitation is to monitor and evaluate the benefits of these previously-funded restoration actions. A 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 2). Information needs for "big R" species, including Chinook salmon, include annual estimates of abundance and trends of abundance in the species' populations.

The problem addressed in this proposal is that current surveys are inadequately funded to thoroughly assess whether the restoration project goals described above have been successful in increasing natural production of Chinook salmon. Statewide budget reductions have discontinued the California Department of Fish and Game's (DFG) funding for temporary help and supplies for these surveys, some of which have been conducted since 1952. Concurrently, the need for the escapement monitoring data has increased due to the need for monitoring ERP and CVPIA restoration activities (Table 1) taking place in the USRB.

The primary objective of this proposal is to continue to monitor the annual abundance, migration timing, and distribution of adult winter, spring, late-fall and fall-run Chinook salmon returning to spawn in the USRB for the next three years. The CALFED Science Program selected adult escapement of Central Valley Chinook salmon and Sacramento River winter-run Chinook salmon as key performance indicators of the success of ecosystem restoration programs (Science Program Indicators Workshop, April 23-24, 2003). The status of adult returns of salmon will be used as a primary ecological indicator to translate the goals of ecological restoration in the ERP program into measurable benchmarks of program success in the USRB.

In addition to monitoring the success of ERP restoration actions, data will be used for assessing recovery of listed stocks (winter-run, spring-run), managing water project operations, evaluating the potential for hatchery fish to assist in species recovery (winter-run), and managing ocean and inland harvest at sustainable levels (winter, spring, fall, and late fall-run). Some of the escapement monitoring programs in the USRB have been conducted for over 30 years, providing baseline data for use in understanding population status and trends in relation to the benefits of ERP restoration activities. Funding the surveys together will allow the trustee agencies to maintain coordination of these monitoring activities, and ensure consistency with previous monitoring efforts.

Streams and species/runs to be monitored include:

- Sacramento River - winter, fall, and late fall-run Chinook
- Clear Creek - fall-run Chinook
- Battle Creek - fall-run Chinook
- Mill Creek - fall and spring-run Chinook
- Deer Creek - fall and spring-run Chinook
- Beegum Creek - spring-run Chinook,
- Antelope Creek - spring-run Chinook

Escapement monitoring surveys in the USRB (Table 2) have been continuously improved and refined since the 1960's. From 1967 until 1986 the Red Bluff Diversion Dam (RBDD) provided a method of monitoring the four salmon runs as well as steelhead. Currently, the DFG and U.S. Fish and Wildlife Service (USFWS) conduct mark -recapture carcass surveys, aerial and in-stream redd surveys, hatchery counts, weir counts, and snorkel surveys of the mainstem Sacramento River and its major tributaries to determine adult salmon escapements.

In an effort to continue improvement of escapement monitoring programs in the Central Valley, the IEP Central Valley Salmonid Escapement Project Work Team (SEPWT) was formed in 2002. The mission of the team is to review methodologies used in salmonid escapement monitoring surveys, and work toward improvement in the precision of escapement estimates and coded-wire tag recovery programs. The team includes representatives from the DFG, Department of Water Resources, NOAA Fisheries, USFWS, U.S. Bureau of Reclamation, Pacific States Marine Fisheries Commission (PSMFC), Yuba County Water Agency, and East Bay Municipal Water District. Collaborators in this study proposal include the chair and active participants in the SEPWT process.

In 2003, the SEPWT completed a proposal for the development of a comprehensive Central Valley Chinook Salmon Escapement Monitoring Plan. The CALFED ERP Program has tentatively agreed to fund the plan's development. The goal of this plan is to develop a coordinated monitoring strategy to improve the precision of escapement estimates for Chinook salmon and improve coded-wire tag recovery programs throughout the Central Valley. To initiate the development of the Plan, the CALFED Science Program sponsored a Northwest/Central Valley Adult Salmon Escapement Monitoring Workshop in June 2003. The purpose of this workshop was to provide a forum or 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 escapement monitoring plan for Central Valley salmon. Over 100 scientists, mostly from California, attended the two-day workshop.

The monitoring project being proposed in this current PSP will allow the continuation of baseline monitoring for the next three years. By the end of this period, the comprehensive Central Valley Escapement Monitoring Plan will be used to guide future escapement monitoring programs in the USRB.

2. Justification

Monitoring Scales
Monitoring the restoration of the USRB salmon populations can occur at several scales:

1) **Implementation monitoring** - Determine that restoration actions were implemented as planned.
2) **Project effectiveness monitoring** - Evaluate of the success of individual restoration projects in meeting the goals of the project.

3) Population monitoring (watershed scale) - Long-term monitoring and evaluation of population trends in individual watersheds.
4) Population monitoring (ESU scale) - Long-term monitoring and evaluation of the status of each Evolutionary Significant Unit (ESU) throughout its range.
5) Habitat monitoring - Monitor habitat conditions and evaluate their effect on salmon populations. (Habitat factors independent of restoration activities, such as oceanic and freshwater environmental fluctuations, will affect salmon population parameters and progress toward recovery.)

This proposal specifically addresses continued monitoring of adult salmon escapement in USRB streams to meet needs for population monitoring at the watershed and ESU scales (Scales 3 and 4 above). Tracking the status and trends of Chinook salmon populations in the USRB ecosystem where restoration is occurring can be used to determine whether specific restoration projects are achieving the desired objectives.

Figure 3 illustrates the Chinook salmon life cycle and specific points in the cycle where population monitoring currently occurs in the USRB. This proposal focuses on monitoring in-river spawning escapement.

Conceptual Model
Figure 4 shows the conceptual relationship between stressors and USRB Chinook salmon populations. Stressors on salmon populations act to reduce population abundance, population growth rate, spatial structure and diversity. Restoration actions are on-going to reduce key stressors and improve these population parameters.

Figure 5 illustrates a conceptual model relating recovery programs, restoration actions, and monitoring of USRB Chinook salmon populations. The model shows the hypothesis that restoration actions for USRB Chinook such as those currently being implemented through the CVPIA Anadromous Fish Restoration Program (AFRP), CALFED ERP, and mitigation programs, will improve degraded habitat conditions that result in decreased populations. Implementation of restoration actions is designed to reduce stressors and restore and enhance habitat conditions. However, it is only through continual long-term field monitoring activities that informed adaptive management decisions can be made. Continual estimates of adult salmon escapements are essential for monitoring the cumulative effects of recovery actions, and these data are critical to evaluate progress toward population doubling goals and/or delisting criteria.

The overall conceptual model to be tested is as follows:
- Salmon and steelhead habitat restoration projects in the USRB:
    - Increase the numbers of adult salmon successfully reaching the spawning areas (fish passage projects, flow modifications)
    - Increase the success of spawning and egg incubation (gravel restoration, flow modifications)
    - Improve survival of rearing juveniles (fish screens, riparian restoration, floodplain acquisition, flow modification).
- As a result of habitat restoration projects, increased numbers of juvenile salmon and steelhead will emigrate from the USRB (monitor juvenile salmon and steelhead emigration at RBDD and sites in the lower Sacramento River).
- Increased numbers of adult salmon and steelhead will subsequently return to spawn from year classes affected by CALFED ERP restoration actions.
- Monitoring the status and trends in adult salmon and steelhead escapement to the USRB will be a key ecological indicator of the success of restoration projects funded through the ERP Program.

Continuation of the monitoring programs in this proposal will provide data that allow opportunities to evaluate the following questions relative to the causal linkages between management activities and USRB salmon population status and trends:

- Are restoration actions for USRB salmon funded by CALFED and others successful in restoring USRB salmon populations?
- What is the contribution rate of hatchery fish to overall production of USRB salmon?
- What is the straying rate of hatchery compared to wild fish on return?
- Are recovery goals for listed USRB salmon stocks being met on a stock-specific population scale?

Hypotheses

Information collected during the escapement surveys will allow assessment of implemented AFRP, CVPIA and/or CALFED ERP actions and activities. The general hypothesis being tested is that the current run-size estimate is greater than the estimate generated three years previous, assuming an age three maturation schedule for Chinook salmon. Formally stated:

H_o: A specific Chinook salmon run-size (i.e. fall, late-fall, spring or winter) estimate at time (t) is greater than the run-size estimate at time (t-3).

H_a: A specific Chinook salmon run-size (i.e. fall, late-fall, spring or winter) estimate at time (t). is less than the run-size estimate at time (t-3).

Satisfaction of the null hypothesis would document an increasing trend in the abundance estimate of stream-specific Chinook salmon runs and thus support restoration actions and activities as implemented.

Other hypotheses tested through this proposal include the verification of the presence of hatchery-origin salmon contributing to the natural spawning population for a given run in a stock specific location.

H_o: Number of hatchery-origin Chinook salmon successfully spawning >0;

H_a: Number of hatchery-origin Chinook salmon successfully spawning =0;

This hypothesis is verifiable for certain stocks in which all USRB hatchery fish are externally marked (winter, late-fall-run) but is uncertain for others (fall-run) which are not all externally distinguishable from natural spawners.

The ability to test the above hypotheses fully supports Goal 1-Achieve Recovery of At-Risk Species as presented in the PSP. Methodologies with acceptable error rates are essential to document effects of restoration actions and/or achieve delisting criteria.

3. Previously Funded Monitoring

The USRB is unique in that it has four runs of Chinook salmon each year. As a result it is necessary to monitor adult escapement during every month of the year. From 1967 until 1986 the RBDD provided a method of monitoring the four salmon runs as well as steelhead. During this period the RBDD was typically operated throughout the year allowing for complete accounting of escapement. Beginning in 1987, operation of RBDD was restricted to facilitate improved passage of winter-run salmon, which were at critically low and declining population levels and had been previously petitioned for listing (October 1985) under state and federal Endangered Species Act (ESA). Since 1995, the RBDD has been operated from approximately 15 May through 15 September which only allows for a partial count of the runs of Chinook salmon.

Current winter, fall and spring-run population estimates from RBDD are calculated by expanding weekly fish passage estimates based on the average proportion of passage recorded during historic, season-long counts. Based on complete season counts made prior to 1987, an average of only about 15%, 24% and 81% of the winter, fall and spring-run(s) salmon spawner populations, respectively, pass RBDD after 15 May and before 15 September (Killam and Harvey-Arrison 2004). With the majority (average approx. 85%, 76%) of winter and fall-run migration occurring outside the period of RBDD operation, the accuracy of spawner estimates based on fish ladder counts are, therefore, highly suspect, and sometimes result in estimates of negative numbers of salmon in the mainstem Sacramento River (fall-run 2001-2004).

The data collected at the RBDD does not determine spawning distribution or escapement numbers in the tributaries or mainstem Sacramento River upstream of RBDD and therefore does not provide data useful in evaluating whether the restoration goals set in the CALFED ERP and CVPIA are being achieved. Instead, the DFG and the USFWS now conduct combinations of mark-recapture carcass surveys, aerial redd surveys, hatchery counts, angler harvest surveys, weir counts, and snorkel surveys of the mainstem Sacramento River and it's major salmon tributaries to determine adult salmon escapements for specific runs and streams.

Mark-recapture carcass surveys were initiated in 1996 on the mainstem Sacramento River above the RBDD (Snider et al 2002). Currently, carcass surveys are used year-round to provide the only estimate of abundance of natural spawning late fall-run escapement in the USRB, in addition to a site specific estimate of fall-run escapement in the mainstem Sacramento River. In addition, the CALFED-funded Sacramento River winter-run Chinook carcass survey has provided the official escapement estimate for this federally and state-listed endangered species since 2001. This estimate is used to establish allowable take limits at the pumping facilities in the Delta. Mark-recapture carcass surveys are labor intensive compared to the data collection at RBDD and will need to be adequately funded each year.

Fall-run salmon inventories have been routinely conducted since 1953 on USRB tributary streams. Prior to 1988 various sampling strategies were used to estimate spawner abundance in tributaries to the upper Sacramento River, including: Peterson mark-recapture methodologies, ladder counts, and aerial redd surveys. Inconsistent sampling strategies likely resulted in unreliable estimates of abundance. Since 1988, mark-recapture surveys have been standardized into weekly surveys for the duration of the spawning run on each tributary. The mark-recapture estimator used on each creek (seasonal Peterson, Schaefer or Jolly-Seber), is based on the total carcasses encountered and weekly percent recovery of tags. In Battle Creek, a video counting station is in its second year of operation to compare carcass mark-recapture estimates with real time immigration monitoring.

Spring-run salmon inventories have been sporadically conducted since the 1940's on USRB tributary streams. Methodologies from the 1940's through the 1980's were incomplete, inconsistent and imprecise. In many years surveys were not conducted. Spawning escapement estimates were derived from incomplete spawning ground surveys, carcass surveys with unknown expansion factors, and partial ladder and weir counts. Since the early 1990's, in a effort to standardize sampling efforts and develop an annual index of abundance, a single escapement estimator has been selected for each spring-run tributary, recognizing the sampling limitations in each watershed. Unlike fall-run carcass surveys, too few spring-run carcasses are encountered to obtain an escapement estimate using a mark-recapture survey. In Deer, Antelope and Beegum Creeks a snorkel survey of the known holding habitat is conducted to obtain an annual count of holding salmon. In Mill Creek water clarity prohibits reliable underwater observation, consequently an annual redd survey is conducted and expanded into a population estimate.

Late-fall-run salmon carcass surveys are difficult to conduct on USRB tributaries due to high flow conditions, making consistent weekly mark-recapture surveys impractical. The late-fall-run escapement on the Sacramento River is monitored through a mark-recapture carcass survey and aerial redd counts. Late-fall-run salmon are also known to spawn in most tributaries to the upper Sacramento River. At present, surveys of late-fall spawner abundance are conducted in Clear Creek (USFWS-carcass count) and Battle Creek (hatchery count-USFWS).

Endangered winter-run salmon currently spawn only in the upper Sacramento River. This population has been monitored at RBDD since 1967 to present. A mark-recapture carcass survey began in 1996 and has been funded since 2001 through the CALFED ERP. The carcass survey was extended through the CALFED Amendment process for 2004 and another extension is in process for the 2005 survey (May-September-05). This proposal incorporates the winter-run carcass survey as a task for 3 additional years.

4. Approach and Scope of Work

The approach used in this proposal will be to divide the planned monitoring in the USRB into four tasks.

1. Project Management
2. Winter-run Chinook Escapement Survey
3. Spring-run Chinook Escapement Surveys
4. Fall and Late-fall-run Chinook Escapement Surveys

Task 1. Project Management. Project management tasks will be coordinated jointly by the PSMFC, DFG, and USFWS. The PSMFC, as the Principle Investigator, will be responsible for ensuring that all semi-annual fiscal and programmatic reports are completed and delivered to the CBDA. Additionally the PSMFC will manage project personnel for the project. Four Biological Technicians hired through the PSMFC will assist DFG biologists with the USRB surveys.

The DFG will be directly responsible for overall project coordination, and for any invoices and other costs primarily related to major equipment items. The DFG will be responsible for writing semi-annual fiscal and programmatic reports detailing work performed during each half year of the program. An annual report will be developed each year presenting results and analysis of the USRB escapement and other Chinook salmon surveys.

The USFWS will be directly responsible to CALFED through a separate contract which is funded within this proposal. Invoicing of receipts and other costs will be sent directly to the California Bay-Delta Authority (CBDA) for payment processing. The USFWS will be responsible for semi-annual fiscal and programmatic performance reports detailing activities in that half year period. An annual report will be developed each year presenting results and data analysis from the work performed during the winter-run Chinook carcass survey.

Task 2. Winter-run Chinook Carcass Survey. This task was formerly a stand alone CALFED-funded proposal under the 2001 PSP process as ERP-01-N46, (Sacramento River Winter Chinook Salmon Carcass Survey). The work to be performed under this task is described in Attachment 1, and is similar to the work descriptions of the present ERP-01-N46 (Killam, Tech Rpt 04-1, 2004). The Sacramento River winter-run Chinook salmon carcass survey takes place in Shasta County, from Keswick Dam at river mile (RM) 301 downstream to Cottonwood Creek (RM 273). This area, included in CALFED Ecozone 3.1 (Sacramento River, Keswick Dam to RBDD), includes the majority of available spawning habitat for state and federally listed endangered winter-run Chinook salmon. Staff from the PSMFC, DFG and USFWS

work cooperatively to collect and sample carcasses. The data from the survey serves two purposes and this task is subdivided into two sub-tasks each of which has separate goals.

Sub-task 1. The winter-run Chinook carcass survey collects both mark-recapture data and biological data from all observed carcasses. Biological samples and data collected from carcasses will include: scales, otoliths, sex, fork length, and numbers of hatchery origin carcasses with coded wire tags (CWT's), carcass location (GPS, and river mile), spatial and temporal spawning distributions, and spawning condition. A fundamental goal of the winter-run Chinook salmon carcass survey is to gather information necessary to evaluate the effectiveness of the USFWS winter-run hatchery supplementation program. Data collected during spawning ground surveys provides the information to assess and recommend improvements to the winter-run Chinook salmon supplementation program. Additionally, recoveries of coded-wire tagged (hatchery) winter-run Chinook salmon from the carcass survey are used by a multi-agency team to complete a winter Chinook cohort reconstruction model each year, which provides the basis for evaluating the effects of ocean harvest upon this endangered species (Grover et al. 2004).

The Livingston Stone National Fish Hatchery was constructed at the base of Shasta Dam to improve imprinting/homing and promote integration of hatchery-origin adults with the natural spawning population of winter–run salmon in the mainstem Sacramento River. Continued assessment of the effectiveness of this supplementation program to contribute to the recovery of endangered winter-run salmon is dependent upon information gathered through the Sacramento River mainstem carcass surveys. Information collected/analyzed for the purpose of evaluating the hatchery supplementation program includes: abundance of natural- and hatchery-origin spawners; recovery of coded-wire tagged (hatchery origin) winter-run; and life history attributes (i.e., age structure, sex ratio, pre-spawning mortality, and spawning success) (Killam, Tech Rpt 04-1, 2004). The mainstem carcass surveys allow the generation and comparison of cohort replacement rates of natural- and hatchery-origin winter-run Chinook salmon. Tissue samples collected from a sample of carcasses will be maintained in long-term storage in the DFG and USFWS genetic archives.

Sub task 2. Data is used by the DFG to produce a total spawner escapement using the Jolly-Seber mark-recapture methodology. The estimate of female spawners is used by NOAA Fisheries to develop a Juvenile Production Estimate (JPE) which is used to set allowable take limits of juvenile winter-run Chinook salmon at the state and federal pumping facilities in the Sacramento-San Joaquin Delta.

Draft delisting criteria for winter-run Chinook salmon requires a geometric mean cohort replacement rate of greater than or equal to 1.0 in addition to an abundance of 10,000 female spawners (Botsford and Brittnacher 1998). The timeframe for delisting is contingent upon the level of certainty in measuring spawner abundance. The RBDD winter-run estimates do not provide this level of certainty. The Interagency Ecological Program (IEP) Winter-run Salmon Project Work Team recommends the use of estimates of spawner escapement based on the mark-recapture carcass survey because these estimates are believed to be more precise.

Reviews of the winter-run carcass survey and the population models used to calculate an estimate have resulted in the development of a Jolly-Seber/Schaefer electronic template that has been distributed to other Central Valley biologists through the SEPWT. This template allows straightforward escapement estimate calculations for mark-recapture carcass surveys. The population models (Jolly-Seber, Schaefer, and Peterson) used in the USRB have undergone review through the DFG Winter-run Technical Team, the SEPWT and by statisticians from both the DFG and NOAA Fisheries. The Jolly-Seber template used on the Sacramento River carcass surveys has undergone independent review by a NOAA Fisheries statistician using a software package available via the internet (POPAN5-Jolly-Seber) that produced

similar results to the DFG template (Glenn Szerlong, NOAA Fisheries, personal comm.). A workshop on the use of the POPAN5 model was given by Mr. Szerlong to biologists of the SEPWT in 2004. The software has the advantage of producing confidence limits around escapement estimates but is significantly more difficult to use than the DFG template. Work is continuing on development of a single template that can easily produce escapement estimates with confidence limits for the USRB surveys and other salmon mark-recapture surveys on the Pacific Coast.

Significant refinements to the winter-run carcass survey have been made over the past few years in response to questions about the assumptions of the mark-recapture population models and how they are affected when used for carcass survey data (Killam, Tech Rpt 04-1, 2004). Recent improvements in data collection techniques have allowed for calculation of a separate estimate for female salmon. Estimates of female abundance are of primary interest to NOAA Fisheries in setting take limits at the Delta pumping facilities. Additionally, the use of handheld GPS units and the tagging of individual fish have provided data which is being used to address a critical assumption of the population models: that random mixing of the carcass population occurs within the survey area. CALFED funding for this survey has resulted in major improvements which can now be used to improve other surveys in the USRB and Central Valley.

Task 3. Spring-run Chinook Escapement Surveys. Due to the depressed population levels of spring-run Chinook salmon in Deer, Mill, Antelope, and Beegum Creeks, too few carcasses are encountered and marked to obtain statistically valid recapture rates for population estimates. Consequently, methods involving direct counts of pre-spawning (holding) salmon or redds are used to obtain indices of abundance useful to assess population trends. Of equal importance is not only the methodology used to obtain counts, but the ability to consistently apply each monitoring method to obtain long-term population trends.

In Deer, Antelope and Beegum Creeks underwater snorkel counts will be made to obtain annual indices of abundance. Snorkel counts have been used consistently since 1989. To make annual counts comparable between years, each creek will be surveyed during the same Julian week each year using consistent sampling reaches. Surveys will be conducted in August and September after the adult immigration period but before adult salmon leave the holding habitats to initiate spawning activity. Deer Creek has a total of 53 km (33miles) of holding habitat, Antelope Creek has 23.5 km (14.6 miles) and Beegum Creek has 14.7 km (9.2 miles). In each creek the entire known holding area will be separated in reaches. Each stream reach will have a minimum of two snorkelers. All reaches within a stream will be surveyed the same day to minimize salmon movement between survey reaches. Surveys will not repeated to minimize harassment and stress to holding fish and reduce snorkeler avoidance behavior by salmon. During the survey, all pools, runs and riffles deep enough to swim through will be surveyed. The surveys will be conducted in a downstream direction. The maximum number of salmon observed in each holding area will be recorded. The total salmon observed within each stream represents an annual index of abundance.

Spawning surveys will be completed in these same reaches of Deer, Antelope and Beegum Creeks to record spawning distribution and to collect spring-run tissue samples for the CALFED-funded "Comprehensive Assessment of Genetic Population Structure and Diversity for Central Valley Chinook Salmon".

In Mill Creek, the natural turbidity of the steam precludes a reliable count of holding salmon using underwater observation techniques. However, visibility on spawning riffles permits reliable counting of salmon redds. Redd counts will be standardized by conducting counts during the same Julian week annually. The 43.2 km (27 miles) of spawning habitat will be separated into reaches 2 to 4 miles in length. Surveys will be conducted the first two weeks in October, after the peak of spawning but before redds blend into surrounding substrate. Individual and complete redds are identified by discernable ova

pockets and tailspills. Redd counts will be expanded to account for redd to female ratios and male to female ratios. These expanded redd counts will represent the annual population estimate of spring-run Chinook in Mill Creek. Spring-run tissue samples will also collected on Mill Creek.

Task 4. Fall and Late-fall-run Chinook Escapement Surveys. In tributary fall-run Chinook surveys, including Clear, Battle, Mill and Deer Creeks weekly surveys will be made beginning one week after the commencement of spawning activities. These surveys will continue until all fish are spawned out. In each tributary the known fall-run Chinook spawning habitat will be surveyed, including 3.5 miles of Battle Creek, 4.2 miles of Clear Creek, and 4.5 miles of Mill Creek and 6.2 miles of Deer Creek. Salmon carcasses will be marked by attaching colored tags to the jaw with a hog-ring and placing the fish back into running water for recovery during subsequent surveys. Using fresh carcass mark-recapture data with either the seasonal Peterson or Schaefer model, a spawner escapement estimate will be made for each creek. The statistical model applied to each creeks data will be dependent upon the weekly recapture rate of marked carcasses. Additionally, tissue samples will be collected on each creek for the CALFED-funded Comprehensive Genetics Study and CWT'ed fish will be collected for use in determining contribution rates of hatchery-origin fish to streams with naturally spawning salmon.

5. Feasibility

The proposed approach will be both feasible and appropriate to the completion of the escapement surveys. The proposed work and completion schedule is commensurate with the tasks and schedules of previous large scale escapement monitoring in the USRB that was adequately funded. Environmental conditions can be of significant consequence (flooding) to certain surveys (late-fall-run), but are typically sporadic and often temporary in nature. The continuation of these surveys over many years has allowed most of the operational and environmental problems to be overcome by adaptive management designs that have tailored individual surveys to each watershed in the USRB.

The staffs of the PSMFC, DFG and USFWS are covered under the existing DFG and USFWS ESA permits for the work to be performed in this proposal.

In 1993 SB779 amended sections of Fish and Game Code to require Department employees to obtain written permission to enter onto private property. Fall–run Chinook escapement surveys on Battle, Mill, and Deer Creek(s) occur on private land. The DFG has written permission from landowners to access their properties for survey activities. These numerous individual agreements are stored at the DFG Red Bluff office. A letter of cooperation from the Watershed Conservancy of Mill Creek outlining the intent and willingness of the landowner's approval is shown in Figure 6. Copies of the individual permission slips are available if desired.

6. Expected Outcomes and Products

Semi-annual fiscal and programmatic reports will be submitted. Two annual reports will be generated describing field activities, data analysis and management, and survey results, in each of the three project years. The California Department of Fish and Game will produce a report that estimates escapement, examines the reliability of using mark-recapture techniques, and describes baseline information on spawning distribution (temporal), environmental conditions at the time of spawning, and length, sex ratios, and relative success of the spawning population. The USFWS will generate a report evaluating the winter Chinook salmon hatchery propagation program.

7. Data Handling and Storage

Data from USRB Program surveys will be stored at the DFG Red Bluff office (2440 Main Street, Red Bluff, CA). Additional data (genetic, hatchery) from the joint Winter-run Chinook carcass survey will be stored at the USFWS Northern Central Valley Fish and Wildlife Office (NCVFWO) (10950 Tyler Road, Red Bluff, CA). Data will be stored on hard copy originals consisting of paper field data sheets from boat and aerial surveys and on paper datasheets transcribed from plastic re-useable sheets from underwater (snorkel) or walking carcass surveys. Datasheets will be used to input data into Microsoft Excel or Access files. Computer based databases and paper databases will undergo at least one (typically three) quality control (QC) review(s) to ensure accuracy. After QC review the electronic database will be considered final and the paper copies will be stored on site(s).

Electronic databases will be backed up daily during QC reviews and upon QC review will be copied and stored on at least one other computer in a separate office. Due to the complexity and nature of individual surveys not all databases are compatible with each other so no single database is able to contain all the data collected in the USRB. Instead, analytical files will be used to link individual survey files into one or more master files which summarize the adult escapement into the USRB for each year. Once complete these databases and master files will be available upon completion of required written products.

8. Public Involvement and Outreach

This program does not involve any direct public involvement. However the staff is often contacted by resource managers, biological consultants and the general public requesting salmon escapement numbers or generalized salmon life history information. This program is broadly supported by multiple watershed groups throughout the USRB. DFG and USFWS staff will inform affected stakeholders about the status of salmon populations by giving presentations to watershed groups, news media, city, county governments, local Fish and Game Commissions and other state and federal agencies. Project biologists will give annual presentations to the Mill Creek Conservancy, Deer Creek Watershed Conservancy, and others, as requested, on fisheries issues addressed in Existing Conditions Reports and Watershed Management Plans. Project data will be used in biennial reports to the state Fish and Game Commission on the status of winter and spring-run Chinook populations.

Project biologists are responsible for updating the USRB data in the Department's "GrandTab", which reports salmon escapement numbers for all runs in the Central Valley from 1952 to present. Copies of GrandTab and annual escapement reports will be given to various stakeholders including Watershed Conservancies and local Resource Conservation Districts on Clear, Cow, Cottonwood, Battle, Mill and Deer Creeks, NorCal Guides, and individual landowners. GrandTab and annual escapement reports will continue to be made available to other agencies and partners, including Department of Water Resources-Northern and Sacramento Districts, USFWS - Red Bluff, Sacramento and Stockton offices, NOAA Fisheries - Sacramento and Long Beach offices, Lassen National Forest, and Sierra Pacific Industries. In addition, report copies will be available at the Pacific States Marine Fisheries Commission (PSMFC) Calfish website (http://www.calfish.org). Calfish is a multi-agency cooperative program designed to gather, maintain, and disseminate fish and aquatic habitat data and data standards. Databases generated will be made available for use by co-management agencies upon request. Information on the current status of salmon escapements will increase understanding about the USRB ecosystem for all stakeholders directly or indirectly involved in restoration actions.

9. Work Schedule

Project activities by month are shown in Table 3. Annual reports by the DFG summarizing the previous year's escapement estimates will be completed by 30 September. The annual report for the USFWS portion of the winter-run carcass survey will be due by 30 September of the following year. This project covers a three-year period, but activities and tasks are similar for each year.

Task 1 Project Management, is inseparable from other tasks. The remaining three tasks are separable but cannot be funded incrementally as they occur on a repeated annual basis and the fisheries technicians funded by this project are expected to work frequently on overlapping task activities on a weekly or daily basis.

The monitoring of the USRB's Chinook salmon escapements will need to continue past the 3 year duration of this project. It is anticipated that the development of a comprehensive Central Valley adult Chinook salmon escapement monitoring plan will provide a specific means for future funding opportunities for monitoring in the USRB.

B. Applicability to CALFED Bay-Delta ERP Goals, the ERP Draft Stage I Implementation Plan, and CVPIA Priorities.

1, 2. ERP and CVPIA Priorities, and Relationship to Other Ecosystem Restoration Actions, Monitoring Programs or System-wide Ecosystem Benefits.

As stated earlier, this proposal responds to the following management needs for Upper Sacramento River Basin (USRB) Chinook salmon:

A. Providing a sound basis for assessing recovery of listed stocks
B. Monitoring the success of restoration programs
C. Evaluating the contribution of hatchery fish to USRB populations
D. Sustainably managing ocean and inland harvest

In responding to these needs, this proposal has direct applicability to CALFED ERP and Science Program goals, the Implementation Plan, CVPIA priorities, and other programs, as described below.

A. Provide a sound basis for recovery planning – 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 USRB salmon stocks 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.

This proposal directly responds to the first key goal of the CALFED Ecosystem Restoration Program's (ERP) Draft Stage 1 Implementation Plan (CALFED 2001):

> **At-Risk Species (Goal 1): Achieve recovery of at-risk native species dependent on the Delta and Suisun Bay as the first step toward establishing large, self-sustaining populations of these species; support similar recovery of at-risk native species in the Bay-**

Delta estuary and its watershed; and minimize the need for future endangered species listings by reversing downward population trends of native species that are not listed.

NOAA Fisheries has initiated formal recovery planning for listed anadromous salmonids in the Central Valley domain including the USRB, pursuant to requirements of the federal Endangered Species Act. 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 stocks will be essential to monitor progress toward meeting the recovery goals of the plan. The Viable Salmonid Populations (VSP) concept (McElhany et al. 2000), developed by NOAA Fisheries scientists, will be used by the TRT as a framework for establishing biological delisting goals for Central Valley stocks. The VSP concept is designed to facilitate establishment of ESU-level delisting goals by identifying key parameters related to population viability (abundance, productivity, spatial structure, diversity), providing guidance on how these parameters should be evaluated, and finally relating the viability of individual populations to the viability of the ESU as a whole. The TRT will also identify research, monitoring, and evaluation needs. The monitoring described in this proposal will facilitate an understanding by the Central Valley TRT of many of these future needs.

B. **Monitor the success of restoration programs (CALFED/CVPIA/State of California)** – Several state and federal programs have a mandate to increase the natural production of salmon and steelhead in the USRB/Central Valley. The 1988 California Salmon, Steelhead Trout, and Anadromous Fisheries Program Act (Fish and Game Code Sections 6900-6924) declares that it is the policy of the State to significantly increase the natural production of salmon and steelhead trout by the end of the century. The federal Central Valley Project Improvement Act (1992) directs the Secretary of the Interior to develop and implement programs and actions to ensure that by 2002, the natural production of anadromous fish in USRB/Central Valley streams will be sustainable, on a long-term basis, at levels at least twice the average levels of natural production in the 1967 through 1991 baseline period. The CALFED Bay-Delta Program, ERP, was established to help restore and improve the health of the Bay-Delta system for all native species.

The USRB Chinook escapement surveys are part of the Comprehensive Assessment and Monitoring Program (CAMP), designed to monitor the progress toward meeting the doubling goals of the CVPIA program (USFWS 1997). Yet, current adult escapement surveys in the USRB are inadequately funded for their continuation. We therefore cannot demonstrate if restoration money has been wisely spent. A recent CALFED-funded statistical study of USRB/Central Valley salmon escapement data concluded:

> **"Improving the quality of escapement estimates may be the most beneficial management action that can be taken to increase the chance of determining whether or not progress is being made toward the CVPIA objective of doubling natural production." (Newman 1999)**

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. Monitoring techniques, data compilation and analysis, and reporting should be standardized among researchers and watersheds to the greatest extent possible."**

The CALFED ERP 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…"**

The CALFED ERP Implementation Plan, in its identification of restoration priorities for the Sacramento Region, also included:

> **"*Annual population estimates*. Annual estimates of fish populations on the Sacramento River are a key ingredient in management actions to protect fish in the Delta. A strong need exists to understand and reduce the uncertainties in those estimates via more field studies, and data analysis as well as applying advanced field methodologies and modeling capabilities. Models and basic studies that might allow better connection of management actions and specific stressors to population responses of key species of native fish are critical to managing fish protection and water supplies (Strategic Goal 1, At-risk Species Assessments)."**

C. **Evaluate the contribution of hatchery fish to USRB populations** - To evaluate the relative contribution of hatchery fish to Chinook salmon populations in the USRB, the DFG and USFWS plan to implement a program of constant fractional marking for hatchery-reared Central Valley salmon. An implementation plan for a comprehensive and statistically-sound marking and tagging program for hatchery-produced Central Valley Chinook salmon has been developed under a CALFED contract (DFG 1999). The tagging of a large proportion of fish began on a pilot basis in 2000. Without properly funded recovery programs, however, we will not be able to recover and analyze the tags from returning fish in a valid way. This proposal is therefore an essential component of the Constant Fractional Marking program.

A joint NOAA Fisheries/DFG subcommittee on hatchery evaluation recently submitted recommendations to the agencies that included the development of adequate sampling programs to recover marked fish in the USRB (CDFG/NMFS 2001):

> **"The DFG should establish a process to coordinate and oversee the methodologies for estimating salmon escapements to the Central Valley. The process should:**
>
> **1) establish standardized techniques for estimating the size and age-composition of spawning runs;**
>
> **2) standardize the training of stream crews to ensure the goals of CWT sampling are met;**
>
> **3) develop strategies for improving the recovery rate of CWTs in the river recreational fishery."**

The CALFED Program MSCS-ERP milestones include:

> **"Assess the impact of hatchery practices on naturally spawning populations of Chinook salmon and steelhead and operate hatcheries in a manner consistent with safe genetic practices that will maintain genetic integrity of all Central Valley anadromous salmonid populations."**

D. **Contribute to sustainable ocean harvest management** – Sustainable ocean and inland harvest is a goal of the CALFED program. Ocean salmon harvest of USRB stocks is managed according to an annual

plan developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce. The annual plan provides spawning escapement goals that drive ocean sport/commercial and inland sport harvest regulations. The PFMC uses inland escapement data from the spawning surveys of the USRB and other Central Valley surveys to make important management decisions.

This proposal directly responds to the third key goal of the CALFED Ecosystem Restoration Program's (ERP) Draft Stage 1 Implementation Plan (CALFED 2001):

> **Harvestable Species (Goal 3): Maintain and/or enhance populations of selected species for sustainable commercial and recreational harvest, consistent with the other ERP strategic goals.**

3. Additional Information for Proposals Containing Land Acquisition: Not Applicable to this proposal.

C. *Qualifications*

Principal Investigator:
Mr. Stan Allen, Pacific States Marine Fisheries Commission. Mr. Allen (PSMFC) is a Senior Program Manager for PSMFC and has over 20 years of fisheries project administration and data collection/management experience. Mr. Allen has spent the last 17 years developing, coordinating and administering multi-agency cooperative projects. Mr. Allen will provide administrative, project coordination, and personnel management support and assistance to the study.

Collaborators:
Mr. Randy Benthin, (DFG) is a Senior Supervisory Biologist in the Northern California-North Coast Region. Mr. Benthin received a Bachelors Degree from CSU, Chico and has over 24 years of experience in fisheries management. Mr. Benthin supervises fisheries management and research activities in the northern Sacramento Valley and northeastern California. Mr. Benthin will provide general study guidance and will provide overall supervision of the DFG collection activities for this study.

Ms. Alice Low (DFG) 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 a Masters degree from San Diego State University and has more than 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 internal coordination for this project, ensuring consistency with DFG management objectives for Chinook salmon, and will provide interagency coordination through the SEPWT and CVSPWT teams.

Mr. Doug Killam (DFG) is an Associate Fisheries Biologist in the Sacramento River Salmon and Steelhead Assessment Program (SRSSAP) in the Northern California-North Coast Region of the DFG. Mr. Killam has a Master's Degree from the Pennsylvania State University and has 13 years experience in fisheries monitoring activities in northern California. Mr. Killam will share the direct supervision of the PSMFC Fisheries Technicians and be responsible for the mainstem Sacramento River escapement surveys

(winter, fall, late-fall-runs), the video monitoring of fall-run in Battle Creek and the spring-run surveys on Beegum Creek.

Ms. Colleen Harvey-Arrison (DFG) is an Associate Fisheries Biologist in the Sacramento River Salmon and Steelhead Assessment Program (SRSSAP) in the Northern California-North Coast Region of the DFG. Ms. Harvey-Arrison has a bachelor's degree from California State University, Chico and has been the DFG lead person for salmon escapement surveys in Upper Sacramento River tributaries for the past seventeen years. Ms. Harvey-Arrison has had extensive experience in training work crews and applying salmon escapement methodologies including, carcass mark-recapture using Peterson, Schaefer and Jolly-Seber analysis, Smith-Root Electronic Fish Counters, and direct observation techniques utilizing Area-Under-Curve, snorkel and redd counts. Ms. Harvey-Arrison has maintained constructive working relationships with watershed conservancies and serves as a technical advisor for fisheries monitoring of restoration activities in Mill and Deer Creeks. Since 1992 Ms. Harvey-Arrison has successfully maintained access for DFG crews to survey private lands on Mill, Deer, Clear and Battle Creeks.

Mr. James G. Smith (USFWS) is the Project Leader at the Service's Northern Central Valley Fish and Wildlife Office (NCVFWO) in Red Bluff, California. The NCVFWO been extensively involved with monitoring Chinook salmon in the Northern Sacramento River since 1978, and has been involved in the Sacramento River winter-run Chinook salmon carcass survey since 1994. The office is staffed with approximately 80 personnel, and has responsibilities that include identifying and defining factors affecting the abundance and survival of anadromous salmonids in the Sacramento River Basin. Mr. Smith has a B.S. from Humboldt State University (1975) and conducted post-graduate study in Fisheries also from Humboldt State University (1976-1979). Mr. Smith has been with the USFWS for 26 years, and for the past 22 years, has been involved with numerous fishery studies directly in the upper Sacramento River (e.g., investigations at RBDD, monitoring juvenile outmigrants, hatchery evaluation efforts at Coleman NFH, Battle Creek restoration, and mainstem Sacramento River spawning gravel evaluations). Mr. Smith works on a daily basis with numerous federal, state, and private entities in developing actions and programs for restoring, conserving, and enhancing anadromous salmonids in the upper Sacramento River.

Mr. Kevin Niemala (USFWS) Mr. Niemela is a 1992 graduate from University of Minnesota (B.S., Fisheries and Wildlife) and a 1995 graduate from University of Idaho (M.S., Fisheries Resources). While pursuing his Masters degree, Mr. Niemela worked for the Idaho Cooperative Fish and Wildlife Research Unit and the Office of Naval Research evaluating effects of U.S. Navy acoustical testing on salmonids in Lake Pend O'reille, Idaho. Mr. Niemela has been with the U.S. Fish and Wildlife Service for nine years. Mr. Niemela is currently assistant Project Leader at the NCVFWO and serves as the program leader for monitoring and evaluations of Coleman and Livingston Stone National Fish Hatcheries.

D. Cost

1. Budget. The total cost requested for this proposal is $1,353,357. This cost is based on a 36 month project period. The project is subdivided into 4 tasks based upon Chinook salmon run timing into the USRB. Other than Task 1- Project Management, the tasks could be funded separately, but doing so would result in a lack of information about a particular salmon run (late-fall, winter, spring or fall) in the USRB.

The budget can also be divided into three sections based on the agency contracts sought. The ERP Monitoring and Evaluation Proposal Solicitation Package, September 2004 describes collaborative projects and the use of separate interagency agreements (contracts) rather than subcontracting for some government agencies. This proposal plans to utilize separate contracts for the following:

USFWS: Task 2, Sub-task 1 Winter-run Escapement Survey. The USFWS does not allow payment in arrears. A separate contract for the USFWS portion of Task 2 for the amount of $496,896 (3 yr. total) will be contracted directly to the USFWS through this proposal.

DFG: Task 2, Sub-task 2 Winter-run Escapement Survey. The DFG will contract directly for the major equipment purchases to be made for this task for the amount of $42,000 (3 yr. total).

The above amounts for the separate contracts are included in the total cost ($1,353,357) of this proposal.

2. Cost Sharing. There are no cost-sharing requirements for the proposed project. However, cost-sharing will occur in the form of in-kind services of permanent staff time, equipment, and facilities. Specifically, it is estimated that the DFG will provide funding of approximately $705,000 over the length of the project, or 15,840 hours of permanent biologist (2.5 PY per year) staff time over the course of the study.

3. Long-term funding strategy. This project is planned for 3 years at which point the comprehensive Central Valley Adult Chinook Salmon Escapement Monitoring Plan will be complete and will be used to coordinate the funding and design of future adult escapement surveys in the USRB.

E. Compliance with Standard Terms and Conditions

The applicant has reviewed the State and Federal standard terms contained in Attachments D (state) and E (federal) and will comply with all terms.

F. Literature Cited

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Figure 2. Adaptive management process for restoration of Upper Sacramento River Basin Chinook salmon populations, showing (bold italics) where monitoring activities in current Proposal occur in the process.

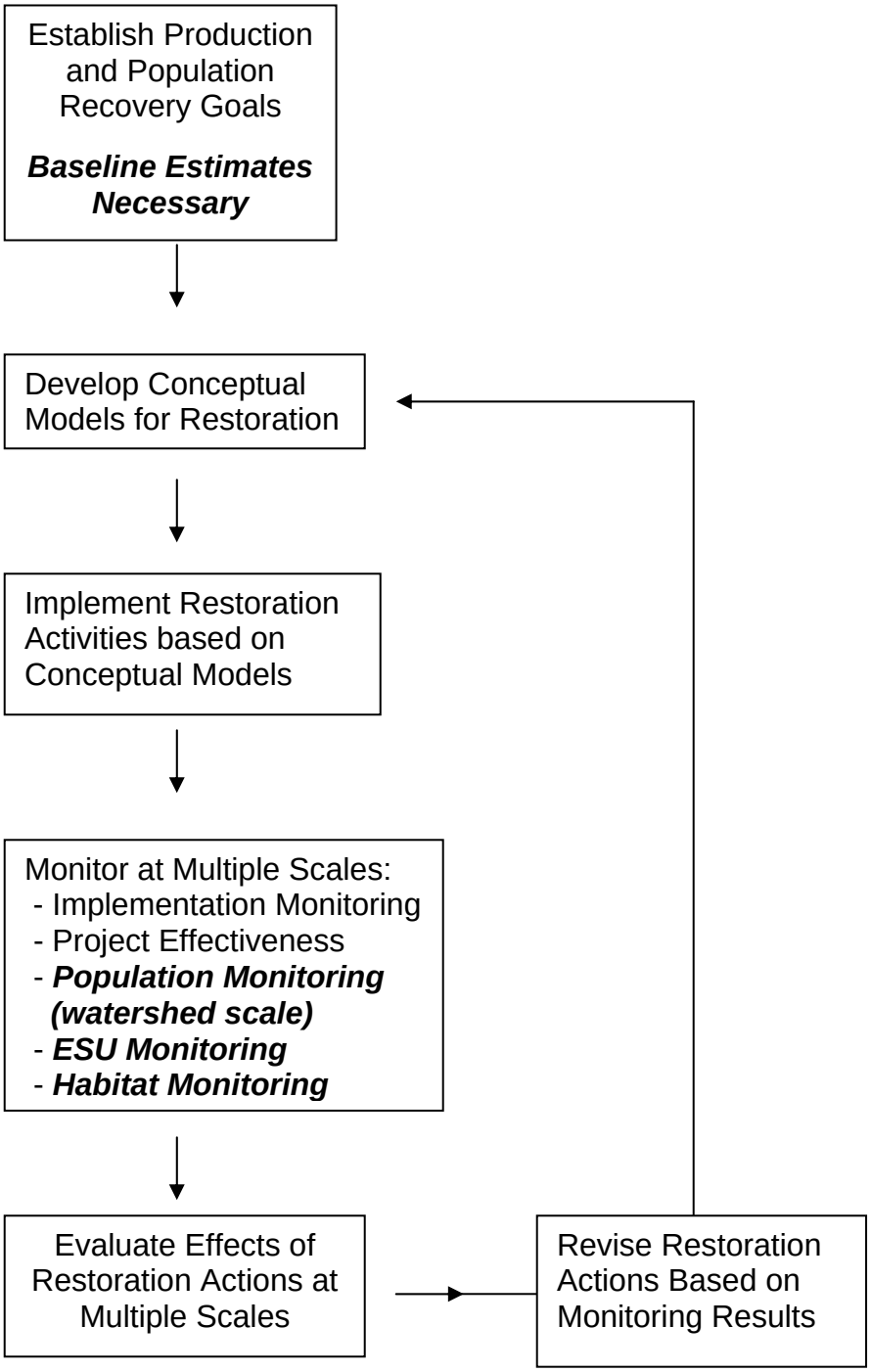


Figure 3. Model of the USRB Chinook Salmon Monitoring by Life stage. Monitoring activities included in this proposal are in bold-italics

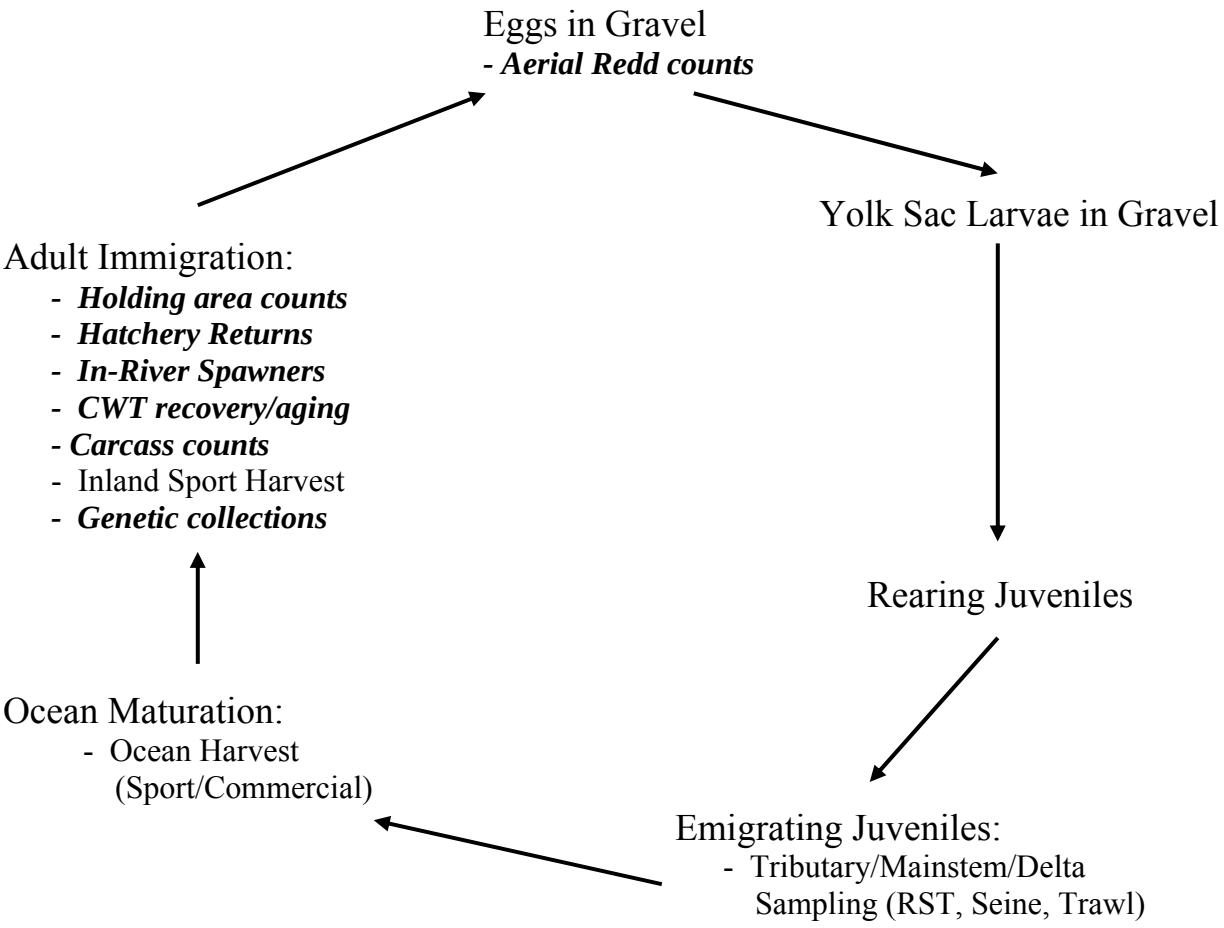
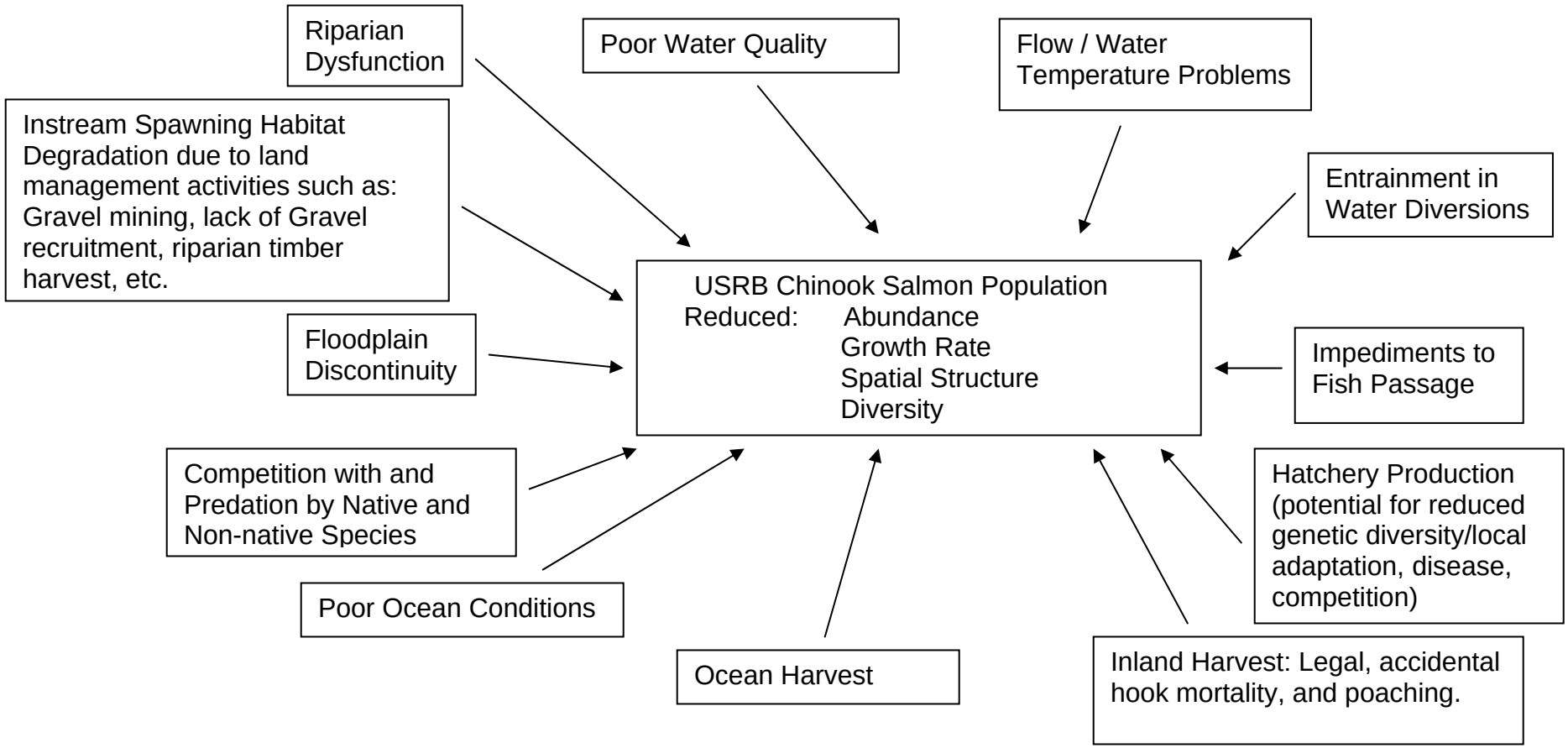


Figure 4. Conceptual relationship between stressors and USRB Chinook salmon population parameters.



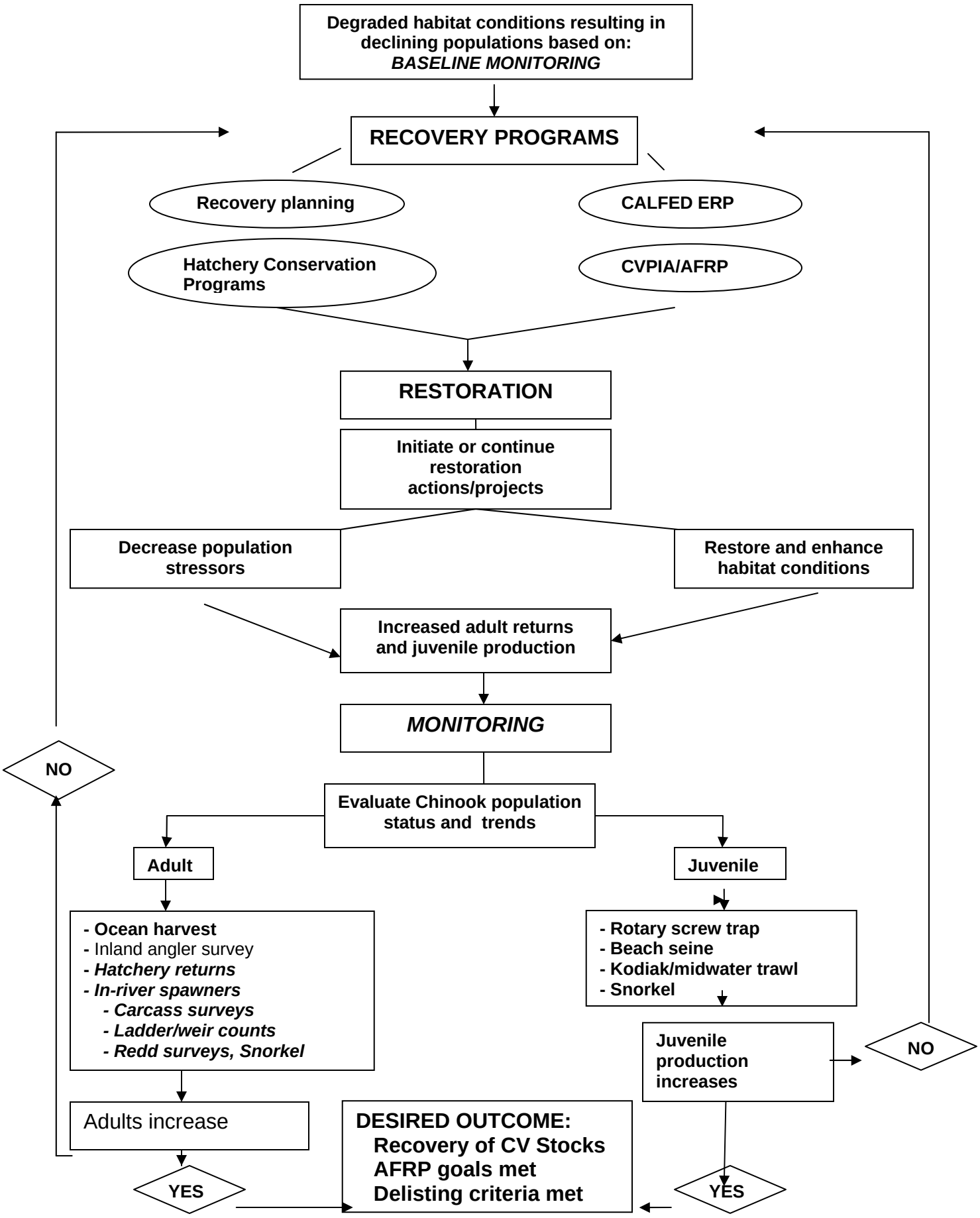


Figure 5. Conceptual model relating Upper Sacramento River Basin Chinook salmon restoration and monitoring programs.

Table 1. Previously-funded CALFED ERP and AFRP funded projects that have relied on adult salmon estimates generated by the Department of Fish and Game's Sacramento River Salmon and Steelhead Assessment Program (SRSSAP) as a performance measure(s) of their projects' success.

ERP Project	Title	Stream	Performance Indicator
ERP-01-C02	Real-Time Flow Monitoring	Mill , Deer	Improve survival and long-term survival of spring-run Chinook and steelhead
ERP-01-N26	Lassen Nation Forest Watershed Stewardship	Deer, Mill	Improved fisheries habitat
ERP-01-N58	Fish Passage Improvement Project at RBDD	RBDD, Sacramento River	Minimize impacts on upstream migration of anadromous fish
ERP-02-P26	Mill and Deer Creeks Protection and stewardship	Mill, Deer	Conservation easements to preserve salmon habitat
ERP-95-M05	Gravel Restoration Project	Sacramento River, Keswick Dam	Improve spawning success for Chinook salmon
ERP-97-C04A	Selected Fish Screens on Sacramento River and Tributaries	Sacramento River, RBDD to Keswick	Reducing fish entrainment
ERP-98-B31	Anadromous Fish Passage at Clough Dam on Mill Creek	Mill	Improving fish passage, design fish screen
ERP-98-F15	Lower Clear Creek Floodway Restoration Project (Phase II)	Clear	Restore creek channel to support anadromous fish, reduce salmonid stranding and mortality
ERP-98-F20	Deer and Mill Creeks Acquisition and Enhancement	Deer, Mill	Improve sustainability of natural production of anadromous fish
ERP-99-B01	Battle Creek Salmon and Steelhead Restoration Project	Battle	Restore habitat for anadromous fish populations, increase flow releases
ERP-99-B02 ERP-99-N01 ERP-99-B03 ERP-98-B03	ACID Fish Passage and Fish Screen Improvement Project, Phase III	Sacramento River	Improve fish passage and habitat for salmon and steelhead, reduce stranding and entrainment, improve access to under utilized habitat, increase production of natural runs of anadromous salmonids

ERP-99-B08	Improve Upstream Ladder and Barrier Weir at CNFH at Battle Creek	Battle	Improve fish ladder at CNFH, assist management in restoring fish populations
ERP-01-N44	Estimating the Abundance of Sacramento River Juvenile Winger Chinook Salmon with Comparisons to Adult Escapement	Sacramento River	Comparing juvenile Chinook abundance to adult escapement
ERP-01-N45	Battle Creek Anadromous Salmonid Monitoring Projects	Battle	Comparing juvenile Chinook abundance to adult escapement
ERP-01-N46	Sacramento River Winter Chinook Salmon Carcass Study	Sacramento River	Monitoring winter run Chinook escapement
ERP-01-N47	Clear Creek Juvenile Salmonid Monitoring Project	Clear	Comparing juvenile Chinook abundance to adult escapement
ERP-01-N24	Battle Creek Riparian Protection	Battle	Improving habitat for Salmon and Steelhead

AFRP Project	Title	Stream	AFRP goal
2002-08	Sex-reversal in Central Valley Chinook Salmon	Central Valley	
1132-6-0186 1132-0-5011	Maintain real-time flow monitors on Antelope, Mill, Deer Creeks	Antelope, Mill, Deer	Improve habitat through provision of flows
10181-0-M712	Analysis of alternate management strategies designed to integrate CNFH Operations with restoration of natural populations of Chinook salmon in Battle Creek	Battle	Ensure sustainable populations of natural produced Chinook
11332-7-J011	Install stream flow gages and thermographs in Spring-run Chinook streams	Central Valley	Improve habitat through provision of flows

11330-0-J079a	Expand the winter run Chinook carcass survey on the upper main stem Sacramento River	Sacramento River	Ensure sustainable populations of natural produced Chinook
11332-6-0194	Mill Creek water exchange pump	Mill	Improve habitat through provision of flows
1132-0-J013	Engineering and environmental documents for erosion control projects in Upper Deer Creek.	Deer	Improve survival rates of juveniles
1132-6-0191	Evaluate intermittent Upper main stem Sacramento River tributaries as rearing habitat for juvenile Chinook	Sacramento River tributaries	Improve survival rates of juveniles
11332-7-J133	Increased law enforcement to enhance protection of anadromous fish and habitat	Sacramento River and tributaries	Improve opportunity to reach spawning grounds

Table 2. Current USRB Adult Salmon Escapement Monitoring Programs, bold italics indicate Monitoring activities included in this proposal.

Stream	Species/run	Monitoring Method	Variable Measured	Agency
UPPER SACRAMENTO RIVER BASIN				
Upper Sacramento River	Chinook	*Carcass Surveys*	Annual escapement (fall, late-fall, and winter-run)	DFG-fall, late-fall DFG/USFWS-winter-run
		RBDD ladder counts	Annual escapement (fall, winter-run, spring, steelhead)	DFG/USFWS
		Trapping (Keswick Dam)	Adult returns (winter, late-fall)	USFWS
		Aerial redd surveys	Spawning distributions (all runs)	DFG (NOAA Fisheries funding for winter-run)
Clear Creek	Chinook (Fall-run)	*Carcass survey*	Annual escapement	DFG/USFWS
	Chinook (Late fall-run)	Carcass survey	Carcass counts	USFWS
	Chinook (Spring-run),	Snorkel survey	Annual escapement	USFWS
	Chinook (Fall, late-fall, spring-run), Steelhead	Redd counts	Spawning distributions	USFWS
Battle Creek	Chinook (fall-run)	*Carcass survey*	Annual escapement	DFG
		Video monitoring	Annual escapement	DFG/USFWS
		Hatchery counts	Annual returns	USFWS
	Chinook (Late-fall, spring, winter-run), Steelhead	Barrier weir trap	Annual escapement	USFWS
	Chinook (Spring, winter-run), Steelhead	Redd/Snorkel survey	Annual escapement	USFWS
Antelope Creek	Chinook (spring-run)	*Snorkel survey*	Annual escapement	DFG
Cottonwood Creek	Chinook (Fall-run)	*Carcass counts*	Carcass counts	DFG
Beegum Creek	Chinook (Spring-run)	*Snorkel survey*	Annual escapement	DFG
Deer Creek	Chinook (Spring-run)	*Snorkel survey*	Annual escapement	DFG
Mill Creek	Chinook (Fall/Spring-run)	*Carcass/ Redd counts*	Annual escapement	DFG

Table 3. Annual summary of project activities by task and the month that activity is occurring in.

Task	Task Title	Annual Task Activity by Month											
		J	F	M	A	M	J	J	A	S	O	N	D
1	**Project Management**												
	Fiscal and Programmatic reports	X						X					
	DFG Annual report due									X			
	Invoicing and administration responsibiltities	X	X	X	X	X	X	X	X	X	X	X	X
2	**Winter-run Carcass Survey**	J	F	M	A	M	J	J	A	S	O	N	D
Sub-Task-1	Survey preparation				X								
USFWS	Data collection				X	X	X	X	X	X			
	Quality control-data checking									X	X		
	Report preparation	X	X	X						X			
	Annual Report due											X	
Sub-Task-2	Survey preparation				X								
DFG	Data collection					X	X	X	X	X			
	Quality control-data checking									X	X	X	
	Final estimate reported										X		
	Report preparation		X	X	X								
3	**Spring-run Escapement Surveys**	J	F	M	A	M	J	J	A	S	O	N	D
	Antelope Creek snorkel survey							X		X	X		
	Beegum Creek snorkel survey			X	X	X	X			X	X		
	Deer Creek snorkel survey								X	X	X		
	MillCreek								X	X	X		
4	**Fall & Late-Fall-Run Escapement Surveys**	J	F	M	A	M	J	J	A	S	O	N	D
	Video Monitioring on Battle Creek and analysis	X							X	X	X	X	X
	Mainstem Sacramento Fall-run and analysis	X								X	X	X	X
	Clear, Battle, Mill, Deer Fall-run and analysis	X								X	X	X	X
	Mainstem Sacramento Late-Fall-run and analysis	X	X	X	X								X

Figure 6. A letter of support by the Mill Creek Conservancy documenting approval of project surveys.

MILL CREEK CONSERVANCY

P.O. Box 188 • Los Molinos, CA 96055
Phone/Fax: (530) 595-4470
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November 8, 2004

California Bay-Delta Authority
Ecosystem Restoration Program

Since the formation of Mill Creek Conservancy in 1994, local landowners have been dedicated to the continued preservation and management of the Mill Creek ecosystem. In pursuit of that goal, the Conservancy prepared a Mill Creek Watershed Management Strategy and Implementation guidelines to provide for long-term protection, sustainability and stewardship of Mill Creek. In our management report, the Department of Fish and Games continued monitoring was critical in documenting historical and present status of the salmon resource. Ten years later, the Mill Creek Conservancy Board reinforces its dedication to DFG's long-term monitoring of the salmonid resource in our watershed as a measurement of not only the health of our watershed but the effectiveness of restoration activities.

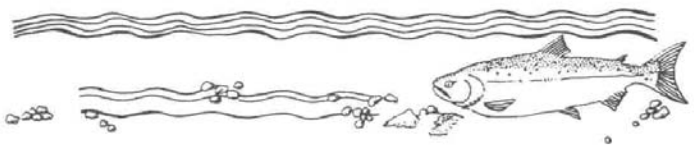
The Mill Creek Conservancy has worked in the past with Colleen Harvey Arrison, DFG, to contact landowners along Mill Creek for access to conduct both Spring and Fall run Chinook Salmon migration surveys. As President of the Conservancy and a riparian landowner, I look forward to the information gained through Colleen's efforts. It helps us understand the needs of the fish and develop practical ways we can help in being responsible stewards of Mill Creek.

Through the conscientious efforts of Colleen, Randy Benthin, and Cal Crawford, the Dept of Fish & Game has gained respect and support from all interests near Mill Creek. Many members of our Board of Directors have participated in both contacting landowners for written access, and helping the Department conduct surveys. We look forward in continuing those monitoring efforts and support the work being done to improve the fishery.

We hope that funding can be made available to continue these efforts.

Burt Bundy, President

Mill Creek Conservancy



ATTACHMENT 1

Winter-run Chinook Salmon Carcass Survey Methods (from Killam Winter-run Tech. Report. 04-1, 2004.)

METHODS

The 2003 winter-run Chinook salmon spawner escapement survey was conducted from 30 April through 4 September 2003.

Figure 1 *(not included in ERP Proposal)* shows the survey's location and prominent landmarks. The survey was conducted from boats, each having two or more observers. Typically, two boats were used. On some days a third boat was sent out behind the two primary boats to determine if a third boat would be useful in future surveys in recovering carcasses that the primary boats had missed. Each boat usually surveyed the areas from one shore out to the center of the river. In some areas of high carcass concentrations (e.g. Turtle Bay at RM 296.5) the boats would work side by side to process the carcasses. Crews were requested to search the entire river bottom and to not pre-determine where they would search based on prior experience. Some sections of the river were naturally not accessible for viewing due to hazards or deep water.

The survey was divided into three sections. Sections were chosen as convenient areas for crews to start or stop work for the day. The sections were as follows:

1.1 --Keswick Dam to ACID DAM - RM 302.1 to RM 298.8,
1.2 --ACID Dam to Cypress Street Bridge - RM 298.8 to RM 295.3
2.0 --Cypress Street Bridge to Anderson Mill Riffle - RM 295.3 to RM 286.4

The lower most point of the survey (RM 286.4) was chosen based on previous winter-run surveys. Few carcasses are encountered downstream of Clear Creek (RM 289.5) but in 2002 some were observed at RM 287.4 so the survey was extended downstream to encompass this area.

The entire survey consisted of 43 survey periods. Each period consisted of two sampling days and a third day of no sampling. A new period was started every fourth day. During periods and days with low numbers of carcasses, crews would attempt to collect data from all carcasses encountered. During busy periods, crews would sub-sample the amount of data collected from carcasses to allow for completion of the survey section by the end of the day.

Population Estimate

The winter-run spawner population was estimated using a mark and recapture design. Typically, all carcasses not in an advanced state of decay were marked (tagged). Carcasses not tagged were counted then cut in two (chopped). All chopped carcasses were disregarded in subsequent surveys. All tagged carcasses were returned to flowing water near where they were collected in an attempt to simulate "natural" carcass dispersion.

Carcass Data

Carcasses were collected using a 15-foot (4.6m) long wooden pole with a five-pronged gig attached to one end. Data was collected from carcasses after they were speared and lifted onto the deck of the boat. Each carcass was then categorized using the following criteria:

1. Adipose fin absent, (hatchery), present, partial, or unknown.
2. Male or female.
3. Recaptured (previously tagged) or new encounter.
4. Fresh (recently died) or non-fresh (decayed).
5. Spawned or not spawned (eggs present in females).
6. Fork length and genetic samples taken or not taken.
7. Carcass to be tagged or chopped.

In accordance with the Service's task to evaluate the hatchery supplementation at LSNFH, the heads of all carcasses with adipose fins missing, partially present, or unknown, were collected for coded-wire-tag (CWT) analysis. The remaining headless carcasses were then chopped in half and returned to the river.

A carcass with the adipose fin present (natural fish) was processed (steps 2-7) and returned to the river either chopped in half or with a tag (i.e. mark) placed in the upper or lower jaw. All carcasses handled were accounted for in this manner. Carcasses to be tagged were typically classified as fresh or recently non-fresh. A fresh carcass was one with at least one clear eye or red/pink gills. Fresh carcasses were tagged in the upper jaw and non-fresh carcasses were tagged in the lower jaw if they were deemed suitable for tagging (not too decayed).

Tags were aluminum or copper coated steel hog ring staples with a small (1-2 cm) square piece of thin colored plastic sheet pushed onto them. Tags were applied with hog-ring pliers to the carcass by squeezing the ends of the staple around the jaw. The tags of each sample period had a unique color to enable the subsequent analysis of recaptured carcasses by period.

Spawn condition was determined for female carcasses only. Female carcasses were classified as spawned if few eggs remained in the carcass and the caudal (tail) fin was worn from redd construction. Unspawned females typically were those with unworn caudal fins indicating they had not constructed redds or those where numerous eggs remained in the carcass after it had died.

A recaptured carcass was one that had been previously tagged and was recaptured on a subsequent survey. Sex, tag color, and location of the tag (upper or lower jaw) were recorded for all recaptured carcasses. (Note: In previous surveys, sex was not recorded for recaptures allowing population estimates only to be done on adult fish, i.e. male and female combined. Recording the sex of the recaptures allows estimation of the population of adult female fish separate from male fish). Recaptured carcasses were chopped and returned to the river.

Most fresh carcasses were measured for fork length to determine age structure of the population. Additionally, tissue samples were collected from many fresh carcasses for genetic analysis. For each carcass that was measured the river mile was recorded. (This allows analysis of carcass distribution to determine if differences exist between male and female distribution).

Sub-sampling for biological samples (tissue, scales) occurred when carcass counts were expected to be high. For example, a sub-sample ratio (e.g. 1:3) was chosen at the start of the day and every third fresh carcass would be tissue sampled.

Environmental Data

Other data collected by survey period included the following:

1. Flow from Keswick Dam.
2. Water temperature.
3. Water clarity.
4. Weather conditions.

River flow based on the outflow from Keswick Dam was obtained from the California Data Exchange Center at www.cdec.water.ca.gov. Water temperature was collected for each survey section via a handheld thermometer and recorded in degrees Fahrenheit. Water clarity was measured by lowering a Secchi disc attached to a measuring tape graduated in tenths of a foot into the water column. When the Secchi disc disappeared from view the measurement at the water surface was recorded. Water clarity distances above 15 feet were recorded as 15+ for survey purposes. Weather conditions were noted as to the daily conditions (rain, clear, etc) encountered for each section.

ATTACHMENT 2

List of Acronyms

AFRP	Anadromous Fish Restoration Program
CAMP	Comprehensive Assessment and Monitoring Program
CBDA	California Bay-Delta Authority
CVPIA	Central Valley Project Improvement Act
CVSPWT	Central Valley Salmonid Project Work Team
CWT	Coded-Wire-Tag
DFG	California Department of Fish and Game
ERP	Ecosystem Restoration Program
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
GPS	Global Position Sensor
IEP	Interagency Ecological Program
JPE	Juvenile Production Estimate
MSCS	Multi-Species Conservation Strategy
NCVFWO	Northern Central Valley Fish and Wildlife Office
NOAA Fisheries	National Marine Fisheries Service
PFMC	Pacific Fishery Management Council
POPAN5	Population Analysis Software
PSMFC	Pacific States Marine Fisheries Commission
PSP	Proposal Solicitation Package
QC	Quality Control
RBDD	Red Bluff Diversion Dam
RM	River-mile
SEPWT	Salmonid Escapement Project Work Team
SRSSAP	Sacramento River Salmon and Steelhead Assessment Program
TRT	Central Valley Technical Recovery Team
USFWS	U.S. Fish and Wildlife Service
USRB	Upper Sacramento River Basin
VSP	Viable Salmonid Populations

Tasks And Deliverables

Upper Sacramento River Basin chinook salmon escapement monitoring program

Task ID	Task Name	Start Month	End Month	Deliverables
1	Project Management	1	36	Semiannual fiscal and programmatic reports, and final reports. Periodic invoices
2	Winter−run Chinook Carcass Survey	1	36	Two annual reports in each of the three project years. CDFG report on winter−run escapement estimate; USFWS report on hatchery evaluation program.
3	Spring−run Chinook Escapement Surveys	1	36	One annual report in each of the three project years.
4	Fall and Late−Fall−run Chinook Escapement Surveys	1	36	One annual report in each of the three project years.

Comments

If you have comments about budget justification that do not fit elsewhere, enter them here.

Each of the three survey tasks (2−4) occur each year, but not for 12 months. This form does not give the flexibility to describe the following: Task 2 Winter−run is a 5 month task, Task 3 Spring−run is a one month task, and Task 4 Fall and Late−Fall−run is a 5 month project. Since salmon runs overlap, activities may involve daily work on the seperate tasks at some times of the year.

Budget Summary

Project Totals

Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
$658,921	$297,875	$7,800	$105,207	$0	$71,000	$0	$28,644	$1,169,447	$183,910	$1,353,357

Do you have cost share partners already identified?
Yes.

If yes, list partners and amount contributed by each:

There are no cost−sharing requirements for the proposed project. However, cost−sharing will occur in the form of in−kind services of permanent staff time, equipment, and facilities. Specifically, it is estimated that the DFG will provide funding of approximately $705,000 over the length of the project, or 15,840 hours of permanent biologist (2.5 PY per year) staff time over the course of the study.

Do you have potential cost share partners?
No.

If yes, list partners and amount contributed by each:

Are you specifically seeking non−federal cost share funds through this solicitation?
No.

Upper Sacramento River Basin chinook salmon escapement monitoring program

Upper Sacramento River Basin chinook salmon escapement monitoring program

Year 1 (Months 1 To 12)

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: project management (12 months)	**10673**	**5442**	**2600**	**835**	**0**	**0**	**0**	**9548**	$29,098	**4365**	$33,463
2: Winter−run Chinook Carcass Survey (12 months)	**131858**	**55110**	**0**	**29017**	**0**	**59000**	**0**	**0**	$274,985	**44368**	$319,353
3: Spring−run Chinook Escapement Surveys (12 months)	**10673**	**5442**	**0**	**835**	**0**	**0**	**0**	**0**	$16,950	**2542**	$19,492
4: Fall and Late−Fall−run Chinook Escapement Surveys (12 months)	**56031**	**28571**	**0**	**4382**	**0**	**0**	**0**	**0**	$88,984	**13348**	$102,332
Totals	**$209,235**	**$94,565**	**$2,600**	**$35,069**	**$0**	**$59,000**	**$0**	**$9,548**	**$410,017**	**$64,623**	**$474,640**

Year 2 (Months 13 To 24)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of	Other Direct Costs	Direct Total	Indirect Costs	Total

							Way				
1: project management (12 months)	**11206**	**5714**	**2600**	**835**	**0**	**0**	**0**	**9548**	$29,903	**4485**	$34,388
2: Winter−run Chinook Carcass Survey (12 months)	**138225**	**57787**	**0**	**29017**	**0**	**12000**	**0**	**0**	$237,029	**38191**	$275,220
3: Spring−run Chinook Escapement Surveys (12 months)	**11206**	**5714**	**0**	**835**	**0**	**0**	**0**	**0**	$17,755	**2663**	$20,418
4: Fall and Late−Fall−run Chinook Escapement Surveys (12 months)	**58832**	**29999**	**0**	**4382**	**0**	**0**	**0**	**0**	$93,213	**13982**	$107,195
Totals	**$219,469**	**$99,214**	**$2,600**	**$35,069**	**$0**	**$12,000**	**$0**	**$9,548**	**$377,900**	**$59,321**	**$437,221**

Year 3 (Months 25 To 36)

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: project management (12 months)	**11766**	**6000**	**2600**	**835**	**0**	**0**	**0**	**9548**	$30,749	**4612**	$35,361
	144911	**60597**	**0**	**29017**	**0**	**0**	**0**	**0**	$234,525	**37916**	$272,441

2: Winter−run Chinook Carcass Survey (12 months)											
3: Spring−run Chinook Escapement Surveys (12 months)	**11766**	**6000**	**0**	**835**	**0**	**0**	**0**	**0**	$18,601	**2790**	$21,391
4: Fall and Late−Fall−run Chinook Escapement Surveys (12 months)	**61774**	**31499**	**0**	**4382**	**0**	**0**	**0**	**0**	$97,655	**14648**	$112,303
Totals	**$230,217**	**$104,096**	**$2,600**	**$35,069**	**$0**	**$0**	**$0**	**$9,548**	**$381,530**	**$59,966**	**$441,496**

Budget Justification

Upper Sacramento River Basin chinook salmon escapement monitoring program

Labor

YEAR 1

Task 1: PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.10 p/hr (avg.) PSMFC GS−7 Fisheries Technician 175 hrs. @ 17.47 p/hr (avg.)

Task 2: PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.10 p/hr (avg.) PSMFC GS−7 Fisheries Technician 921 hrs. @ 17.47 p/hr (avg.)

USFWS GS−5 Fisheries Technician 696 hrs. @ 13.77 p/hr (avg.)
USFWS GS−5 Fisheries Technician 696 hrs. @ 13.77 p/hr (avg.)
USFWS GS−5 Fisheries Technician 696 hrs. @ 13.77 p/hr (avg.)
USFWS GS−7 Fisheries Technician 696 hrs. @ 17.06 p/hr (avg.)
USFWS GS−7 Fisheries Technician 347 hrs. @ 17.06 p/hr (avg.)
USFWS GS−9 Fisheries Biologist 320 hrs. @ 20.84 p/hr (avg.)
USFWS GS−11 Fisheries Biologist 120 hrs. @ 26.90 p/hr (avg.)

Task 3: PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.10 p/hr (avg.) PSMFC GS−7 Fisheries Technician 175 hrs. @ 17.47 p/hr (avg.)

Task 4: PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.10 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.10 p/hr (avg.) PSMFC GS−7 Fisheries Technician 921 hrs. @ 17.47 p/hr (avg.)

YEAR 2

Task 1: PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.81 p/hr (avg.) PSMFC GS−7 Fisheries Technician 175 hrs. @ 18.34 p/hr (avg.)

Task 2: PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.81 p/hr (avg.) PSMFC GS−7 Fisheries Technician 921 hrs. @ 18.34 p/hr (avg.)

USFWS GS−5 Fisheries Technician 696 hrs. @ 14.46 p/hr (avg.)
USFWS GS−5 Fisheries Technician 696 hrs. @ 14.46 p/hr (avg.)
USFWS GS−5 Fisheries Technician 696 hrs. @ 14.46 p/hr (avg.)
USFWS GS−7 Fisheries Technician 696 hrs. @ 17.91 p/hr (avg.)
USFWS GS−7 Fisheries Technician 347 hrs. @ 17.91 p/hr (avg.)
USFWS GS−9 Fisheries Biologist 320 hrs. @ 21.88 p/hr (avg.)
USFWS GS−11 Fisheries Biologist 120 hrs. @ 28.23 p/hr (avg.)

Task 3: PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 14.81 p/hr (avg.) PSMFC GS−7 Fisheries Technician 175 hrs. @ 18.34 p/hr (avg.)

Task 4: PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.81 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 14.81 p/hr (avg.) PSMFC GS−7 Fisheries Technician 921 hrs. @ 18.34 p/hr (avg.)

YEAR 3

Task 1: PSMFC GS−5 Fisheries Technician 175 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 15.55 p/hr (avg.) PSMFC GS−7 Fisheries Technician 175 hrs. @ 19.26 p/hr (avg.)

Task 2: PSMFC GS−5 Fisheries Technician 921 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 15.55 p/hr (avg.) PSMFC GS−7 Fisheries Technician 921 hrs. @ 19.26 p/hr (avg.)

USFWS GS−5 Fisheries Technician 696 hrs. @ 15.18 p/hr (avg.)
USFWS GS−5 Fisheries Technician 696 hrs. @ 15.18 p/hr (avg.)
USFWS GS−5 Fisheries Technician 696 hrs. @ 15.18 p/hr (avg.)
USFWS GS−7 Fisheries Technician 696 hrs. @ 18.81 p/hr (avg.)
USFWS GS−7 Fisheries Technician 347 hrs. @ 18.81 p/hr (avg.)
USFWS GS−9 Fisheries Biologist 320 hrs. @ 22.97 p/hr (avg.)
USFWS GS−11 Fisheries Biologist 120 hrs. @ 29.65 p/hr (avg.)

Task 3: PSMFC GS−5 Fisheries Technician 175 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 175 hrs. @ 15.55 p/hr (avg.) PSMFC GS−7 Fisheries Technician 175 hrs. @ 19.26 p/hr (avg.)

Task 4: PSMFC GS−5 Fisheries Technician 921 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 15.55 p/hr (avg.) PSMFC GS−5 Fisheries Technician 921 hrs. @ 15.55 p/hr (avg.) PSMFC GS−7 Fisheries Technician 921 hrs. @ 19.26 p/hr (avg.)

Benefits

USFWS: Task 2 Subtask 1 ALL CATEGORIES Benefits 35% PSMFC: All Tasks Fisheries Technicians Benefits 28% + $639 p/mo (medical/dental) Medical/dental has been adjusted in years 2 and 3 to reflect 5% increase

Travel

Year 1 Task 1 $2600

Year 2 Task 1 $2600

Year 3 Task 1 $2600

All travel will comply with State of California reimbursement rules. All non−local travel is for PSMFC project management and coordination purposes.

Supplies And Expendables

Year 1 $35000

Year 2 $35000

Year 3 $35000

Supplies will consist of field and office supplies such as boots, waders, drysuits, wetsuits, gaffs, machetes, field paper, notebooks, rain gear, computers, software, cameras, fuel, repairs/maintenance of vehicles and boats, training, communications, photocopying, rents, etc.

Services And Consultants

Not applicable

Equipment

Year 1 $20,000 Boat and motor (USFWS) $9,000 50% of vehicle cost (USFWS) $30,000 100% of vehicle cost (CDFG)

Year 2 $12,000 Boat motor (CDFG)

Lands And Rights Of Way

Not Applicable

Other Direct Costs

Year 1 $9,548 PSMFC Program Management/coordination

Year 2 $9,548 PSMFC Program Management/coordination

Year 3 $9,548 PSMFC Program Management/coordination

Indirect Costs/Overhead

PSMFC Indirect Rate: 15% USFWS Indirect Rate: 17%

Comments

This proposal will contract directly to the USFWS for the activities in Task 2 Subtask 1 (Winter−run Chinook salmon Escapement Surveys, (total contract $496,886), in addition to direct contracts with the PSMFC ($814,475)and the DFG (major equipment $42,000).

Environmental Compliance

Upper Sacramento River Basin chinook salmon escapement monitoring program

CEQA Compliance

Which type of CEQA documentation do you anticipate?
X none
− negative declaration or mitigated negative declaration
− EIR
− categorical exemption

If you are using a categorical exemption, choose all of the applicable classes below.
− Class 1. Operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination. The types of "existing facilities" itemized above are not intended to be all−inclusive of the types of projects which might fall within Class 1. The key consideration is whether the project involves negligible or no expansion of an existing use.
− Class 2. Replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced.
− Class 3. Construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. The numbers of structures described in this section are the maximum allowable on any legal parcel, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 4. Minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 6. Basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies. These may be strictly for information gathering purposes, or as part of a study leading to an action which a public agency has not

yet approved, adopted, or funded.
– Class 11. Construction, or placement of minor structures accessory to (appurtenant to) existing commercial, industrial, or institutional facilities, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.

Identify the lead agency.

Is the CEQA environmental impact assessment complete?

If the CEQA environmental impact assessment process is complete, provide the following information about the resulting document.

Document Name

State Clearinghouse Number

If the CEQA environmental impact assessment process is not complete, describe the plan for completing draft and/or final CEQA documents.

NEPA Compliance

Which type of NEPA documentation do you anticipate?
– none
– environmental assessment/FONSI
– EIS
X categorical exclusion

Identify the lead agency or agencies.

US Fish and Wildlife Service

If the NEPA environmental impact assessment process is complete, provide the name of the resulting document.

If the NEPA environmental impact assessment process is not complete, describe the plan for completing draft and/or final NEPA documents.

The type of proposed monitoring projects are categorically excluded in the Fish and Wildlife Service Departmental Manual at 516 DM 6 Appendix 1.4 Categorical Exclusions Section B. Resource Management: (1) Research, inventory, and information collection activities directly related to the conservation of fish and wildlife resources

Successful applicants must tier their project's permitting from the CALFED Record of Decision and attachments providing programmatic guidance on complying with the state and federal endangered species acts, the Coastal Zone Management Act, and sections 404 and 401 of the Clean Water Act.

Please indicate what permits or other approvals may be required for the activities contained in your proposal and also which have already been obtained. Please check all that apply. If a permit is *not* required, leave both Required? and Obtained? check boxes blank.

Local Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
conditional Use Permit	–	–	
variance	–	–	
Subdivision Map Act	–	–	
grading Permit	–	–	
general Plan Amendment	–	–	
specific Plan Approval	–	–	
rezone	–	–	
Williamson Act Contract Cancellation	–	–	
other	–	–	

State Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
scientific Collecting Permit	–	–	
CESA Compliance: 2081	–	–	
CESA Complance: NCCP	–	–	
1602	–	–	

CWA 401 Certification	–	–	
Bay Conservation And Development Commission Permit	–	–	
reclamation Board Approval	–	–	
Delta Protection Commission Notification	–	–	
state Lands Commission Lease Or Permit	–	–	
action Specific Implementation Plan	–	–	
other	–	–	

Federal Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
ESA Compliance Section 7 Consultation	X	X	
ESA Compliance Section 10 Permit	X	–	
Rivers And Harbors Act	–	–	
CWA 404	–	–	
other	–	–	

Permission To Access Property	Required?	Obtained?	Permit Number (If Applicable)
permission To Access City, County Or Other Local Agency Land Agency Name	–	–	
permission To Access State Land Agency Name	–	–	
permission To Access Federal Land Agency Name	–	–	
permission To Access Private Land Landowner Name Numerous Landowners – See Proposal Text	X	X	

If you have comments about any of these questions, enter them here.

All ESA permitting documentation necessary has been submitted to NOAA Fisheries for review. Verbal agreement has been given to continue monitoring activities as scheduled until such time as permits are issued by NOAA Fisheries.

Permission to access private land has been obtained for all project sites. Documents are available at the CDFG Red Bluff Office. See proposal text.

Land Use

Upper Sacramento River Basin chinook salmon escapement monitoring program

Does the project involve land acquisition, either in fee or through easements, to secure sites for monitoring?
X No.
– Yes.

How many acres will be acquired by fee?

How many acres will be acquired by easement?

Describe the entity or organization that will manage the property and provide operations and maintenance services.

Is there an existing plan describing how the land and water will be managed?
– No.
– Yes.

Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?
– No.
X Yes.

Describe briefly the provisions made to secure this access.

Fall-run Chinook escapement surveys on Battle, Mill, and Deer Creek(s) occur on private land. The DFG has written permission from landowners to access their properties for survey activities.

Do the actions in the proposal involve physical changes in the current land use?
X No.
– Yes.

Describe the current zoning, including the zoning designation and the principal permitted uses permitted in the zone.

Describe the general plan land use element designation, including the purpose and uses allowed in the designation.

Describe relevant provisions in other general plan elements affecting the site, if any.

Is the land mapped as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance under the California Department of Conservation's Farmland Mapping and Monitoring Program?
X No.
– Yes.

Land Designation	Acres	Currently In Production?
Prime Farmland		–
Farmland Of Statewide Importance		–
Unique Farmland		–
Farmland Of Local Importance		–

Is the land affected by the project currently in an agricultural preserve established under the Williamson Act?
X No.
– Yes.

Is the land affected by the project currently under a Williamson Act contract?
X No.
– Yes.

Why is the land use proposed consistent with the contract's terms?

Describe any additional comments you have about the projects land use.