

## **APPENDIX A SCOPE OF WORK**

### **LOWER CALAVERAS RIVER CHINOOK SALMON AND STEELHEAD LIFE HISTORY LIMITING FACTORS ANALYSIS**

#### **BACKGROUND**

The Calaveras River, a tributary of the Lower San Joaquin River, drains a 590 square mile catchment with a mean unimpaired runoff of 152,100 acre-feet per year. Flow in the Lower Calaveras River is regulated by New Hogan Dam located some 38 miles upstream from the river's mouth at Stockton. New Hogan Lake has a storage capacity of 317,000 acre-feet at gross pool and is operated by the US Army Corps of Engineers (Corps) for flood control, water supply and recreation. Rights to releases from New Hogan Lake are contracted for by the Stockton East Water District (SEWD) and the Calaveras County Water District (CCWD) through the Bureau of Reclamation.

Prior to the drought of 1988-1992, the Lower Calaveras River (LCR) supported a modest (<1,000) winter-run chinook salmon population with documented returns in 1972, 1975, 1976, 1978, 1982, 1984 and 1987 ranging from <100 to some 1,000 adults. During the 1988-1992 drought, flows were not sustained during the summer and the fishery reverted to a warmwater assemblage of primarily spotted bass, sucker, carp, sunfish, and pikeminnow. Since 1992, the anadromous fishery has been dominated by fall-run chinook salmon and steelhead trout. The LCR also supports a popular rainbow trout fishery. In 1998, the National Marine Fisheries Service (NMFS) listed the Central Valley steelhead as "threatened." In June 2000, NMFS declared the LCR as "critical habitat" for Central Valley steelhead and entered into informal consultation with the Corps. Consultations with Bureau of Reclamation and SEWD are pending.

The January 2001 Final Restoration Plan for the AFRP recommends evaluations and actions required to make all reasonable efforts to at least double natural production of anadromous fish in the Calaveras River. Proposed actions include:

- Supplement flows with water acquired from willing sellers consistent with applicable guidelines or negotiate agreements to improve conditions for all life history stages of chinook salmon.
- Provide flows of suitable water temperatures for all salmonid life stages.
- Facilitate passage of adult and juvenile salmonids at existing diversion dams and barriers.
- Screen all diversions to protect all life history stages of anadromous fish.

Proposed evaluations include:

- Monitor sport fishing and evaluate the need for regulations to protect salmonids.
- Evaluate instream flow, water temperature and fish habitat use in the Calaveras River to develop a real-time management program so that reservoir operations can maintain suitable habitat when fish are present.

Some of the actions recommended in the Restoration Plan are starting to be addressed. A \$670,000 FY2001 CALFED grant to SEWD is intended to develop and evaluate alternatives for screening all diversions between New Hogan and the SEWD intake at Bellota; the Department of Water Resources (DWR) Fish Passage Improvement Program will be conducting field studies to evaluate migration barriers between New Hogan and the mouth; the Corps of Engineers will be evaluating its reservoir operations for New Hogan as part of the consultation process with NMFS; and AFRP continues to explore ways to acquire water for increasing fish flows. These efforts are hampered, however, by a paucity of scientific data on salmonid habitat conditions, population dynamics and behavior in the LCR.

Recognizing a common need for scientific information and a shared desire to avoid duplication of effort, SEWD, DWR, the Corps, NMFS, the Fishery Foundation of California, Stillwater Sciences and AFRP formed a sub-committee of the Calaveras River Technical Advisory Committee (CRTAC) to consolidate public scoping, stakeholder meetings and other outreach efforts, to coordinate data collection efforts and to share the results of data analyses. The CRTAC was established to advise the Calaveras River Stakeholder Group (CRSG) as part of an effort to develop a Watershed Management Plan. This planning effort is being sponsored by the State Water Resources Control Board using Proposition 204 funds. To date, however, this watershed management planning effort has been focused primarily on water quality issues upstream of New Hogan Lake with little emphasis on anadromous fisheries and limited stakeholder participation from residents along the LCR.

## **SCOPE**

The scope of this project encompasses the entire LCR from its mouth to New Hogan Dam; including the Old Calaveras River channel, the Mormon Slough channel and the Stockton Diverting Canal. Compilation of available water temperature data will include the LCR and New Hogan Lake. This Scope of Work covers only the first year of potentially multi-year investigation.

## **GOAL AND OBJECTIVES**

The ultimate goal of this project is to help provide the scientific basis for real-time management of the LCR to optimize conditions for water supply, flood control, power production and natural production of anadromous fish. The principal goals of the first-year effort are to (1) initiate a quantitative evaluation of salmonid habitat, population density, distribution and life history and (2) facilitate stakeholder involvement in anadromous fish habitat restoration in the LCR. In addition to information on salmonid populations and habitat, the project will provide ancillary information on non-salmonid fish community species composition and distribution.

The principal objectives of the first year are to: (1) help establish and facilitate a Lower Calaveras River Stakeholder Group (LCRSG); (2) prepare a Quality Assurance Program Plan; (3) assemble and synthesize available hydrographic, water quality and biological data, including information on salmonid life history patterns; (4) conduct reconnaissance-level field surveys to assess instream habitat conditions; (5) collect field data on salmonid abundance, distribution, movement, growth rate and food habits; (6) monitor water temperature; (7) conduct preliminary population modeling; and (8) report and broadly disseminate study results.

The objectives of year two work will be to (1) conduct targeted studies to assess factors identified during Year 1 as likely to limit population abundance; (2) to develop a refined model of limiting factors and estimate total carrying capacity of habitat, given the range of possible restoration actions; and (3) identify actions to increase chinook salmon and steelhead abundance.

## **JUSTIFICATION AND EXPECTED BENEFITS**

The LCR supports a chinook salmon run and has been declared by NMFS to provide “critical habitat” for Central Valley steelhead. Informal consultation under the federal Endangered Species Act has begun and there are a number of initiatives underway to improve conditions for anadromous fish in the LCR. There is, however, little quantitative data on salmonid population dynamics or habitat conditions in the LCR available to inform these efforts. This project will begin the process of providing this information.

## **TASKS**

### **Task 1: Stakeholder and Committee Coordination**

The Fishery Foundation of California (the Cooperator) will work closely with the Calaveras River Salmonid Technical Sub-committee (Salmonid Sub-committee) and the Calaveras River Steering Committee (CRSC) to help form and facilitate a stakeholder group for the LCR. The CRTAC is composed of the Stockton East Water District (SEWD), Contra Costa County Water District (CCWD), California Department of Water Resources (CDWR), California Department of Fish and Game (CDFG), CH2M Hill, S.P. Cramer and Associates (for SEWD), the Fishery Foundation of California (FFC), Stillwater Sciences (SWS), the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (USFWS). The CRSC is a broad-based group of non-governmental organizations that seeks to promote ecosystem restoration and other stakeholder activities in the Calaveras River watershed. The CRSC consists of the New Hogan Lake Conservancy, Woodbridge Rivers Company, Delta Flyfishers, and the Foothill Conservancy.

The Cooperator will help ensure that at least five stakeholder meetings take place during the first year of the project.

### **Task 2: Quality Assurance Program Plan**

The Cooperator will prepare a Quality Assurance Program Plan and Monitoring Plan (QAPP/Monitoring Plan) to describe the objectives, hypotheses, sampling design, parameters, and analytical techniques to be used in completing the tasks described in this work plan, as well as the data quality and assurance measures that will be employed. A draft QAPP/Monitoring Plan will be submitted to AFRP for comment and approval before data collection will begin.

### **Task 3: Synthesize Available Data and Information**

### *Subtask 3.1: Describe Calaveras River Steelhead and Chinook Salmon Life History*

The Cooperator will review available literature and survey data and interview local experts to develop a description of (1) the timing and spatial patterns of chinook salmon and steelhead migration, spawning activity and juvenile and smolt outmigration, and (2) historical and current population abundance and important habitat areas.

### *Subtask 3.2: Assess Hydrologic Conditions in the River*

In coordination with SEWD, the Corps of Engineers and the Department of Water Resources, the Cooperator will assess the timing, magnitude, and duration of hydrograph components under regulated and unimpaired conditions. Data sources for this analysis will include:

#### Gauge Data

- USACE gauge, New Hogan Dam (period of record 1966 to present)
- USACE gauge, Mormon Slough at Bellota (period of record 1997 to present)
- USGS gauge, Jenny Lind, gauge number 11309500 (period of record 1908 to 1966)
- USGS gauge, Calaveras Near Stockton, gauge number 11310900 (period of record 1944 to 1950)

#### Unimpaired Flow Calculations

- Calculation of daily, unimpaired flow at New Hogan Dam developed by the Army Corps of Engineers for the period 1966 to present.

### *Subtask 3.3: Compile and Review Available Water Temperature Data*

The Cooperator will compile all available water temperature data for New Hogan Lake and the Lower Calaveras River. The water temperature data will be compared to known temperature thresholds and tolerances for various life history stages of chinook salmon and steelhead.

### *Subtask 3.4: Develop Initial Habitat Maps*

Using aerial photographs taken by California Department of Water Resources in November 1998 (1:2,000-scale), the Cooperator will develop coarse-level habitat maps of the LCR that identify potentially important habitat areas for chinook salmon and steelhead spawning and rearing. Using field data and aerial photos, an analysis will be performed to estimate the total area (i.e., mean bankfull width multiplied by channel length) occupied by each of the three channels constituting the Lower Calaveras River.

#### **Task 4: Conduct Reconnaissance-level Field Surveys and Refine Habitat Map**

The Cooperator will conduct reconnaissance-level field surveys (by boat, on foot, and helicopter, as necessary) along the entire extent of the study area to verify and refine habitat maps developed in Subtask 3.4. This task will also allow site selection for subsequent studies and refinement of the hypotheses that will be tested. These surveys will focus on refining habitat maps and, if necessary, may include assessment of residual pool filling, pebble counts, permeability measurements and other measures, as detailed in the QAPP/Monitoring Plan. The survey will be conducted over a 5-day period using 2–3 field crew personnel.

#### **Task 5: Salmonid Ecology and Fish Community Assessment**

The Cooperator will assess fish community species composition and distribution and refine the understanding of temporal and spatial patterns of chinook salmon and steelhead use of the LCR. The goal of this task is to obtain quantitative data on salmonid distribution, abundance, habitat use, length, weight and condition factor as well as information on the abundance and distribution of potential predators and competitors. The objectives of these surveys are to: (1) assess distribution and density of juvenile chinook and steelhead, (2) assess the timing and relative abundance of upstream migrating adults, (3) assess chinook salmon and steelhead spawning distribution and timing, and (4) assess the timing of juvenile outmigration. For these studies the project area will be divided into study reaches based on the validated habitat map developed in Task 4. However, based on previous work in the project area four reaches have been tentatively defined as follows:

Reach 1–New Hogan Dam to Cosgrove Cr;

Reach 2–Cosgrove Creek to Jenny Lind Bridge (i.e. Calaveras River canyon reach)

Reach 3–Jenny Lind Br to Bellota Weir; and

Reach 4–Bellota Weir to Tidewater.

Due to potential difficulties accessing and working in the Calaveras River canyon this reach may be sampled using different or modified methods and site selection criteria than the other reaches due to the constraints of working in steep, bouldery, channel morphology.

At least two sites will be surveyed in each reach. The anticipated level of effort for the surveys is two days per reach.

*Snorkel Surveys.* Snorkel surveys will be conducted on a biweekly basis from January through September to determine juvenile salmonid qualitative abundance and distribution throughout the LCR. Methods for direct observation developed by the Cooperator on the Stanislaus River will be described in the QAPP (Task 2) and employed during the Calaveras surveys. Should elevated turbidity, or other conditions, make direct observation impossible, alternative methods, (such as electro fishing or beach seining) will be employed. The anticipated level of effort is two people for two days for each survey.

*Beach Seining.* Seine surveys will be conducted on a biweekly basis from January through September to verify the data collected during snorkel surveys on juvenile distribution, density, size, and growth rates. Beach seining will be conducted at the 8–10 sites established during the reconnaissance surveys. The anticipated level of effort is 2-3 people seining for two days to sample all sites in the project area.

*Redd Surveys.* Reconnaissance-level redd surveys will be conducted biweekly from October through February to qualitatively document chinook salmon and steelhead spawning distribution in the upper and lower stretches of the Calaveras River. The anticipated level of effort is two people for two days for each survey.

*Ladder Monitoring.* Adult passage at the Bellota Weir Fish Ladder will be monitored on a biweekly basis during adult migration periods to document run timing and assess the ability of adult salmonids to pass through the ladder successfully (October through February).

*Fyke Netting.* At least two fyke nets will be deployed at locations deemed appropriate after reviewing the results of the reconnaissance survey. The fyke nets will be used to help assess juvenile salmonid movements within the system. In coordination with SEWD, it is anticipated that one fyke net will be deployed at the mouth of the SEWD diversion just upstream of the Bellota Weir. Nets will be deployed in anticipation of significant hydrologic events that may initiate juvenile movement or migration and will be fished regularly while deployed.

**Task 6: Monitor Water Temperature**

The Cooperator will monitor 6-8 digital recording thermographs deployed along the entire length of the river (from New Hogan Dam to Stockton). Thermograph placement will be determined during reconnaissance surveys.

**Task 7: Conduct Preliminary Population Modeling**

The Cooperator will use population models to explore linkages between factors studied in previous tasks and possible population-level effects on chinook salmon and steelhead. The analysis will attempt to determine which factors are most likely to limit salmonid populations and to develop a preliminary adaptive management plan for a range of further studies and possible restoration actions addressing these potential limiting factors.

**Task 8: Prepare Draft and Final Report**

The Cooperator will produce a draft report for public review and comment and a final report within 30 days thereafter.

**DELIVERABLES**

The deliverables schedule will start upon receipt of a signed agreement and is also contingent upon acquisition of necessary permits for sampling activities.

Deliverables	Oct-Dec 01	Jan-Mar 02	Apr-Jun 02	Jul-Sept31 02
Quarterly Progress Reports	Due Dec 31, 01	Due Mar 30, 02	Due Jun 30, 02	
Raw data (Habitat, Temp, Salmonid Data, etc.)				To be completed Sept 31, 02
Refined Habitat Map				To be completed Sept 31, 02

Draft and Final Report				To be completed Sept 31, 02
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## BUDGET (Year 1)

Project Phase and Task	Direct Labor Hours and Salary	Benefits (@25%)	General Admin. and fee (@10% gross)	Service Contracts	Material and Acquisition Contracts	Misc Costs	Total
Task 1	120 <b>\$4,800</b>	\$1,200	\$2,570	\$20,910	0	0	\$29,480
Task 2	60 <b>\$2,400</b>	\$600	\$577	\$3,373	0	0	\$6,950
Task 3							
task 3.1	0	0	\$608	\$5,473	0	0	\$6,081
task 3.2	0	0	\$763	\$6,868	0	0	\$7,631
task 3.3	0	0	\$475	\$4,275	0	0	\$4,750
task 3.4	0	0	\$751	\$6,761	0	0	\$7,512
Task 4	120 <b>\$3200</b>	\$800	\$1,580	\$7,750	\$3,240	0	\$16,570
Task 5							
5.1	445 <b>\$14,500</b>	\$3,625	\$2,736	\$10,310	\$2,563	0	\$33,734
5.2	581 <b>\$16,940</b>	\$4,235	\$3,365	\$16,692	0	0	\$41,232
5.3	127 <b>\$2,740</b>	\$685	\$666	\$3,917	0	0	\$8,008
5.4	97 <b>\$2,600</b>	\$650	\$481	\$2,205	0	0	\$5,936
Task 6	80 <b>\$2,400</b>	\$600	\$452	\$2,117	0	0	\$5,569
Task 7	0	0	\$1,521	\$13,687	0	0	\$15,208
Task 8	40 <b>\$1,600</b>	\$400	\$1,453	\$12,927	0	0	\$16,380
<b>Total</b>	1,670 <b>\$51,180</b>	<b>\$12,795</b>	<b>\$17,998</b>	<b>\$117,265</b>	<b>\$5,803</b>	<b>0</b>	<b>205,041</b>

## Year 2

### Task 9: Mechanistic Field Research

Develop targeted studies to assess factors identified in Task 7 as likely to limit population abundance. Until tasks 1-7 have been completed, it is not possible to identify which studies will be conducted.

**Task 10: Data Synthesis (Modeling)**

Develop a refined model of limiting factors and estimate total carrying capacity of habitat, given the range of possible restoration actions.

**Task 11: Identification of Actions to Increase Chinook Salmon and Steelhead Abundance**

Synthesize information collected and analyses conducted in tasks 3-10 above. Based on this synthesis, Identify a range of actions to increase chinook salmon and steelhead abundance in the Calaveras River. Produce one draft and one final report describing the methods, results, and conclusions used in and produced in tasks 2-10.

**DELIVERABLES (Year 2)**

	Oct-Dec 02	Jan-Mar 03	Apr-Jun 03	Jul-Sept31 03
Quarterly Progress Reports	Due Dec 31, 02	Due Mar 30, 03	Due Jun 30, 03	
Raw Data (Mech Studies, Task 9)				To be completed Sept 31, 03
L.F. Modeling Raw Data				To be completed Sept 31, 03
Draft and Final Report				To be completed Sept 31, 03

**BUDGET (Year 2)**

Project Phase and Task	Direct Labor Hours and Salary	Benefits (@25%)	General Admin. and fee (@10% gross)	Service Contracts	Material and Acquisition Contracts	Misc Costs	Total
Task 9	160 <b>\$6,400</b>	\$1,600	\$4,968	\$40,703	\$0	\$974	\$54,645
Task 10		\$0	\$2,087	\$20,867	\$0	\$0	\$22,954
Task 11		\$0	\$2,912	\$29,124	\$0	\$0	\$32,037
<b>Total</b>	160 <b>\$6,400</b>	<b>\$1,600</b>	<b>\$9,967</b>	<b>\$90,694</b>	<b>\$0</b>	<b>\$974</b>	<b>\$109,636</b>