Work Plan for Fiscal Year 2004

I. Program Title. Identification of the Instream Flow Requirements for Anadromous Fish in the Streams Within the Central Valley of California - CVPIA Section 3406(b)(1)(B)

II. Responsible Entities.

	Agency	Staff Name	Role
Lead	USFWS	Mark Gard	Fish and Wildlife Biologist

III. Program Objectives for FY 2004.

The program objectives are enumerated below. The source documents for these objectives are noted and their relationship, if any, to the CALFED Program Ecosystem Restoration Program Implementation Plan is explained below. The program objectives have been cross-referenced against the actions the program will undertake in Fiscal Year (FY) 04 in Section VI below.

A. Provide scientific information to be used in developing recommendations for instream flow needs for Central Valley rivers, by developing improved hypotheses regarding the relationship between flows and the amount of physical habitat for indicator species of ecosystem health in Central Valley rivers.

IV. Status of the Program.

Although this will be the third year of funding for this project, this project is a continuation of work conducted under a seven-year program to identify the instream flow requirements for anadromous fish in the streams within the Central Valley of California. Accomplishments of the previous seven-year program include final reports on instream flow needs for spawning in the Merced and American Rivers. We are nearing the halfway point in achieving the current goals of this project (completing instream flow studies for the Sacramento, American and Yuba River and Butte Creek).

V. FY 2003 Accomplishments. For the Sacramento River, we issued the final report on fall, late-fall and winter-run chinook salmon and steelhead spawning between Keswick Dam and Battle Creek. We completed hydraulic modeling of juvenile rearing and macroinvertebrate habitat between Keswick Dam and Battle Creek, and expect to complete modeling of fall-run chinook salmon spawning habitat between Battle Creek and Deer Creek by the end of FY03. We completed development of chinook salmon juvenile rearing habitat suitability criteria (HSC). Development of macroinvertebrate HSC is dependent on the availability of funding for processing macroinvertebrate samples. We expect to complete final reports on juvenile rearing and macroinvertebrate flow-habitat relationships in FY04.

For Butte Creek, we have completed a peer review of a final report on flow-habitat relationships for spring-run chinook salmon spawning and hope to issue the final report by the end of FY03.

For the Lower American River, we issued a final report comparing PHABSIM and 2-D modeling of steelhead and fall-run chinook salmon spawning.

For the Yuba River, we continued collection of hydraulic modeling and HSC data for spring-run and fall-run chinook salmon and steelhead spawning, and expect to complete data collection except for steelhead HSC data by the end of FY03.

VI. Tasks, Costs, Schedules and Deliverables

A. Narrative Explanation of Tasks

For FY04, Task 1 will address steelhead spawning and chinook salmon and steelhead rearing in the Yuba River; Tasks 2, 3 and 4 will address chinook salmon and steelhead rearing in the Yuba River; and Tasks 5 and 6 will address chinook salmon spawning in the Yuba River and the Sacramento River between Battle Creek and Deer Creek, and juvenile chinook salmon rearing and stranding in the Sacramento River between Keswick Dam and Battle Creek. The details of this work may change in response to discussions with resource agency personnel. All tasks are inseparable. All tasks cross-reference to Program Objective A.

1. Habitat Suitability Criteria Development - Data collection for spawning HSC will consist of locating redds in shallow and deep water and measuring depth, velocity and substrate size. Data will be collected in all spawning sites discussed in Tasks 3-5, as well as in other areas, to obtain at least 150 observations of redds. All active redds (those not covered with periphyton growth) within a given mesohabitat unit will be measured. Dominant substrate particles will be assigned a size range (e.g., 1-2") at three locations: 1) in front of the pit; 2) on the sides of the pit; and 3) in the tailspill. Redds will be located in deep water using underwater video. Depth and water velocity will be measured over the redds using an Acoustic Doppler Current Profiler (ADCP). Location of redds (both in shallow and deep water) will be recorded with a Global Positioning System (GPS) unit to prevent redundant sampling. Additionally, the location of redds in our study sites will be determined using a total station[1]. We will also use depth, velocity and substrate data predicted by the 2-D model at randomly-selected locations without redds for application of a method to adjust HSC for habitat availability. Additionally, a procedure will be applied to adjust spawning depth habitat utilization curves for habitat availability.

[1] This data will be used in biological validation of the 2-D model.

Data collection for juvenile rearing HSC will consist of locating juveniles by snorkeling in shallow water and SCUBA diving in deep water, and measuring depth, velocity, adjacent velocity and cover. Depth, velocity and adjacent velocity[2] will be measured for deep water using the ADCP. Location of juveniles in our study sites will be determined using a total station[1]. We will also collect depth, velocity, adjacent velocity and cover data at randomly-selected locations without juveniles for application of a method to adjust HSC for habitat availability.

2. Habitat Mapping - For streams where juvenile salmonid rearing and macroinvertebrate habitat will be simulated, the entire reach of the stream to be addressed in the study will be mesohabitat mapped. The mapping will be done either using aerial photos or on the ground with an electronic distance meter and GPS unit to determine the total length of each mesohabitat type (run, riffle, pool, glide) and the location of each mesohabitat unit.

3. Field Reconnaissance and Study Site Selection - At least six to eight study sites will be selected for each stream and life stage for modeling of habitat. Spawning sites will be located in areas with heavy spawning use. Sites for juvenile salmonid rearing and macroinvertebrates will be stratified by mesohabitat type.

4. Hydraulic Data Collection - Data will be collected on water surface elevations, bed topography, cover and substrate distribution for input into a 2-dimensional hydraulic and habitat model. Water surface elevations will be taken at three flows spanning at least an order of magnitude. Bed topography data will be collected using a total station. For streams which are not wadeable, data will be collected across portions of the river deeper than three feet with the ADCP and underwater video camera system. An independent dataset of 50 random points will be collected for each site, to validate the physical predictions of the model. The bed elevation, horizontal location, depth, velocity, substrate and cover of each validation point will be determined. Velocities collected by the ADCP, as discussed above, will also be used to validate the physical predictions of the model.Modeling of Spawning and Rearing Habitat in Study Streams - Data collected in Task 4 will be used in a 2-dimensional hydraulic model (River2D) to predict the velocities and depths present in the study sites over a range of flows of at least one order of magnitude.

A PHABSIM transect at the bottom of the site will be calibrated to provide the water surface elevations at the bottom of the site used by River2D. A second PHABSIM transect at the top of the site will be calibrated to provide the water surface elevations used to calibrate the River2D model. The River2D model will be calibrated by adjusting bed roughnesses so that the water surface elevations generated by River2D at the top of the site match the water surface elevations predicted by the PHABSIM transect at the top of the site. The River2D model will be run at the flow at which the validation

[2] Adjacent velocity is defined as the fastest velocity within two feet (perpendicular to the direction of flow) of the location of the velocity measurement.

dataset was collected, with the output used in GIS to determine the difference between simulated and measured velocities, depths, bed elevations, substrate and cover.

The depths and velocities simulated by the River2D model, along with the substrate and cover distribution in the site and Habitat Suitability Criteria developed in Task 1 will be used to predict the amount of spawning and rearing habitat present over a range of discharges of at least one order of magnitude.

For biological validation of the habitat simulation models, the locations of redds and juveniles from Task 1 will be used to test the hypothesis that the compound suitability predicted by the River2D model is higher at locations where redds or juveniles are present versus locations where redds or juveniles are absent. This hypothesis will be statistically tested with a Mann-Whitney test.

5. Peer Review. Each draft report will be provided to at least two to three experts outside of the Sacramento Field Office to review the technical adequacy of the report. The report will be revised in response to the reviews and a response-to-comments document will be enclosed with the report.

6. Program Management. Overall project management and administration includes overseeing project coordination meetings, managing project finances (budgets, contracts, etc.), and preparing project progress reports.

Additional Funding Needs.
No additional funding is needed.

B. Schedule and Deliverables

#	Task	Dates		Deliverable
		Start	Complete	
1	Habitat Suitability Criteria Development	10/01/03	09/30/04	Annual Report
2	Habitat Mapping	10/01/03	09/30/04	Annual Report
3	Field Reconnaissance and Study Site Selection	10/01/03	09/30/04	Annual Report
4	Hydraulic Data Collection	10/01/03	09/30/04	Annual Report
5	Modeling of Spawning and Rearing Habitat in Study Streams	10/01/03	09/30/04	Annual Report
6	Peer Review	10/01/03	09/30/04	Annual Report
7	Program Management	10/01/03	09/30/04	Annual Report

C. Summary of Program Costs and Funding Sources

#	Task	Total Cost	Funding Sources
			RF
1	Habitat Suitability Criteria Development	$75,380	$75,380
2	Habitat Mapping	$10,554	$10,554
3	Field Reconnaissance and Study Site Selection	$10,554	$10,554
4	Hydraulic Data Collection	$134,926	$134,926
5	Modeling of Spawning and Rearing Habitat in Study Streams	$158,296	$158,296
6	Peer Review	$82,917	$82,917
7	Program Management	$7,538	$7,538
	Total Program Budget	**$480,165**	**$480,165**

D. CVPIA Program Budget

#	Task	FTE	Direct Salary and Benefits Costs	Administrative Costs	Total Costs
	Habitat Suitability Criteria Development	0.50	$61,812	$13,568	$75,380
2	Habitat Mapping	0.07	$8,654	$1,900	$10,554
3	Field Reconnaissance and Study Site Selection	0.07	$8,654	$1,900	$10,554
4	Hydraulic Data Collection (FWS)	0.86	$106,316	$23,336	$129,652
4.1	Hydraulic Data Collection (BOR)	0.02	$5,274		$5,274
5	Modeling of Spawning and Rearing Habitat in Study Streams	1.05	$129,804	$28,492	$158,296
6	Peer Review	0.55	$67,993	$14,924	$82,917
7	Program Management	0.05	$6,181	$1,357	$7,538
	Total by Category	**3.15**	**$394,688**	**$85,477**	**$480.165**

CVPIA Program Budget - Additional Funding Needs.

Explanatory Notes: The 3.15 FTE represents 90% of Mark Gard's time, 75% of Ed Ballard's time, 100% of Bill Pelle's time and 50% of Rick William's time. The remainder of Mark Gard's time will be charged to Clear Creek Restoration Monitoring, while the remainder of Ed Ballard's time will be charged to the Clear Creek IFIM Study (both items funded by Section b(12)). Direct salary and benefits costs are based on the Sacramento Field Office's $84.91/biologist hour rate. Administrative costs consist of 4.5% of the total costs overhead for contract costs and 18% of the

total costs overhead for all other direct costs. Contract costs consist of a contract to USBR for Differential GPS work (Task 4).

VII. Future Years Commitments/Actions.

$500,000 per year for