Work Plan for Fiscal Year 2002

October 24, 2001

I. Program Title. Identification of the Instream Flow Requirements for CVPIA Section 3406(b)(1)(B)

II. Responsible Entities.

	Agency	Staff Name	Role
Lead	USFWS	Gary Taylor	Program Manager
	USFWS	Mark Gard	Fish and Wildlife Biologist
	USFWS	Ed Ballard	Fishery Biologist
	USFWS	Rick Williams	Small Craft Operator

III. Program Objectives for FY 2002.

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. The program objectives have been cross-referenced against the actions the program will undertake in Fiscal Year (FY) 02 in Section VI below.

A Develop 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 first 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.

V. FY 2001 Accomplishments.

For the Sacramento River, we have completed hydraulic modeling of spawning areas for fall, late-fall and winter-run chinook salmon and steelhead between Keswick Dam and Battle Creek and are well along in modeling juvenile rearing and macroinvertebrate habitat between Keswick Dam and Battle Creek. We have completed development of fall-run, late-fall and winter-run chinook salmon spawning habitat suitability criteria (HSC) and expect to complete development of chinook salmon juvenile rearing and macroinvertebrate HSC by the end of FY01. We have completed most of the data collection for modeling fall-run chinook salmon spawning habitat between Battle Creek and Deer Creek. We expect to complete a final report on spawning, juvenile rearing and macroinvertebrate flow-habitat relationships in FY02.

For Butte Creek, we have completed the field data collection for 2-D modeling sites for spring-run chinook salmon spawning and have completed data collection for spring-run chinook salmon HSC. We expect to complete a final report on flow-habitat relationships for spring-run chinook salmon spawning in FY02.

For the Lower American River, in 1996, we placed PHABSIM transects in areas which had received heavy use by spawning fall-run chinook salmon, to produce flow-habitat relationships for fall-run chinook salmon and steelhead spawning. In 1997, we collected fall-run chinook salmon spawning habitat use data and developed Type II criteria. We used the resulting criteria with our previous PHABSIM transects to produce revised flow-habitat relationships for fall-run chinook salmon. In 1998, we placed PHABSIM transects and 2-D modeling sites in areas which had received heavy use by spawning fall-run chinook salmon, to evaluate how the January 1997 floods had changed flow-habitat relationships for fall-run chinook salmon and steelhead spawning and to compare the results of PHABSIM and 2-D modeling. We have completed the PHABSIM transect portion of this work and plan to complete the 2-D modeling portion of this work by the end of FY01.

VI. Tasks, Costs, Schedules and Deliverables.

A. Narrative Explanation of Tasks.

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 of the spawning sites discussed in Tasks 3-5, as well as in other areas, to get at least 150 observations of redds. All of the active redds (those not covered with periphyton growth) within a given mesohabitat unit will be measured. Data for shallow redds will be collected from an area adjacent to the redd which is judged to have a similar depth and velocity as was present at the redd location prior to redd construction. Substrate will be visually assessed for the dominant particle size range (i.e., range of 1-2") at three locations: 1) in front of the pit; 2) on the sides of the pit; and 3) in the tailspill. Location of redds in deep water will be accomplished by boat using underwater video. When searching for redds in deep water using underwater video, a series of parallel runs with the boat upstream within a mesohabitat unit will be performed. After locating a redd in deep water, substrate size will be measured using underwater video directly over the redds. Depth and water velocity will be measured over the redds using an Acoustic Doppler Current Profiler (ADCP) . The location of all redds (both in shallow and deep water) will be recorded with a Global Positioning System (GPS) unit, so that we can ensure that redds were not measured twice. In addition, the location of all redds in our study sites will be mapped in with a total station[1]. We will also collect depth,

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

velocity and substrate data on locations without redds in our sites for application of a method to adjust HSC for availability. In addition, a procedure will be applied to adjust spawning depth habitat utilization curves for availability.

1.1 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 will be measured for deep water using the ADCP. Data will be collected in all of the rearing sites discussed in Tasks 3-5, as well as in other areas, to get at least 150 observations of redds. Equal effort will be spent in different mesohabitat types. The location of all juveniles in our study sites will be mapped in with a total station[1]. We will also collect depth, velocity, adjacent velocity and cover data on locations without juveniles in our sites for application of a method to adjust HSC for 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 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. Spawning sites will be located in areas with heavy spawning use. Sites for juvenile salmonid rearing and macroinvertebrates will be selected based on 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 at a low flow by a series of lines across the channel and extending far enough onto the floodplain to include the entire area which would be inundated at the highest flow to be simulated. Each line will include a point at each change in bed slope, substrate or cover. The lines will be spaced close enough so that bed slope, substrate and cover uniformly change between the lines. The bed elevation and horizontal location of each point will be determined using a total station, and the substrate and cover of each point will be recorded. For streams which are not wadeable, data will be collected along lines across portions of the river deeper than three feet with the ADCP and underwater video camera system. The total station will be used to record the initial and final locations of each line. A level will be used to measure the water surface elevation of each line, so that depths can be converted into bed elevations. An independent dataset of 50 random points will be collected for each site, to validate the physical predictions of the model. The bed elevation and horizontal location of each validation point will be determined using a total station, the depth and velocity at each validation point will be measured, and the substrate and cover at each point will be recorded. Velocities collected by the ADCP on the lines discussed above will also be used to validate the physical predictions of the model.

5 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[2]. The topographic data will first be processed using the R2D_Bed software, where breaklines are added to produce a smooth bed topography. The resulting dataset will then be converted into a computational mesh using the R2D_Mesh software, with mesh elements sized to reduce the error in bed elevations resulting from the mesh-generating process to 0.1 feet where possible, given the computational constraints on the number of nodes. The resulting mesh is used in River2D to simulate depths and velocities at the flows to be simulated.

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 initial bed roughnesses used by River2D will be based on the observed substrate sizes and cover types. A multiplier will be applied to the resulting bed roughnesses, with the value of the multiplier adjusted 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[3]. The River2D model will be run at the flow at which the validation dataset was collected, with the output used in GIS to determine the difference between simulated and measured velocities, depths, bed elevations, substrate and cover. If significant differences are found, the bed topography will be adjusted to correct the observed errors, and the models will be rerun. The final report will include these differences, how well the model predicts observations before modification of the bed topography, and implications of interpretation based on potential bed topography adjustments.

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

[2] Discharges will be modeled under steady-state conditions. It is not expected that the study areas will include any areas with supercritical flow.

[3] This will be the primary technique used to calibrate the River2D model.

present versus locations where redds or juveniles are absent. This hypothesis will be statistically tested with a Mann-Whitney test.

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

For FY02, Tasks 1 and 3 will address chinook salmon spawning in the Yuba River; Task 4 will address chinook salmon spawning in the Yuba River, juvenile chinook salmon stranding in the Sacramento River between Keswick Dam and Battle Creek, and chinook salmon spawning in the Sacramento River between Battle Creek and Deer Creek; and Task 5 will address chinook salmon spawning in Butte Creek 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.

Additional Funding Needs.

No funding is needed in FY02 in addition to the $350,000 for the above activities.

B Schedule and Deliverables.

#	Task	Dates		Deliverable
		Start	Complete	
1	Habitat Suitability Criteria Development	10/01/01	09/30/02	Annual Report
2	Habitat Mapping	N/A	N/A	N/A
3	Field Reconnaissance and Study Site Selection	10/01/01	09/30/02	Annual Report
4	Hydraulic Data Collection	10/01/01	09/30/02	Annual Report
5	Modeling of Spawning and Rearing Habitat in Study Streams	10/01/01	09/30/02	Annual Report
6	Program Management	10/01/01	09/30/02	Annual Report

Explanatory Notes:

Schedule and Deliverables - Additional Funding Needs.

#	Task	Dates		Deliverable
		Start	Complete	
	Not Applicable			

Explanatory Notes:

C Summary of Program Costs and Funding Sources.

#	Task	Total Cost	Funding Sources
			RF
1	Habitat Suitability Criteria Development	$ 28,728	$ 28,728
2	Habitat Mapping	$ 0	$ 0
3	Field Reconnaissance and Study Site Selection	$ 4,788	$ 4,788
4	Hydraulic Data Collection	$ 154,014	$ 154,014
5	Modeling of Spawning and Rearing Habitat in Study Streams	$ 158,480	$ 158,480
6	Program Management	$ 3,990	$ 3,990
Total Program Budget		$ 350,000	$ 350,000

Explanatory Notes:

Program Costs and Funding Sources - Additional Funding Needs.

#	Task	Total Cost	Funding Sources

			RF	W&RR	Prop 204			
	Not applicable	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Program Budget		$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0

Explanatory Notes:

D CVPIA Program Budget.

#	Task	FTE	Direct Salary and Benefits Costs	Administrative Costs	Total Costs
1	Habitat Suitability Criteria Development	0.27	$ 22,092	$ 6,636	$ 28,728
2	Habitat Mapping	0.00	$ 0	$ 0	$ 0
3	Field Reconnaissance and Study Site	0.04	$ 3,682	$ 1,106	$ 4,788
4	Hydraulic Data Collection	1.45	$ 118,437	$ 35,577	$154,014
5	Modeling of Spawning and Rearing	1.49	$ 121,871	$ 36,609	$158,480
6	Program Management	0.04	$ 3,068	$ 922	$ 3,990
		0.00	$ 0	$ 0	$ 0
	Total by Category	3.30	$ 269,150	$ 80,850	$350,000

Explanatory Notes: Administrative costs include travel, training, supplies, equipment and administrative charges

CVPIA Program Budget - Additional Funding Needs.

#	Task	FTE	Direct Salary and Benefits Costs	Contracts Costs	Miscellaneous Costs	Administrative Costs	Total Costs
	Not Applicable	0.0	$ 0	$ 0	$ 0	$ 0	$ 0
	Total by	0.0	$ 0	$ 0	$ 0	$ 0	$ 0

Explanatory Notes:

E Quarterly Obligation/Expenditures.

#	Task	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1	Habitat Suitability Criteria Development	$ 7,182	$ 7,182	$ 7,182	$ 7,182
2	Habitat Mapping	$ 1,197	$ 1,197	$ 1,197	$ 1,197
3	Field Reconnaissance and Study Site Selection	$ 1,197	$ 1,197	$ 1,197	$ 1,197
4	Hydraulic Data Collection	$ 38,504	$ 38,504	$ 38,504	$ 38,504
5	Modeling of Spawning and Rearing Habitat in Study Streams	$ 39,620	$ 39,620	$ 39,620	$ 39,620
6	Program Management	$ 998	$ 998	$ 998	$ 998
Total CVPIA Budget by Quarter		$88,697	$ 88,697	$88,697	$88,697

Explanatory Notes:

Quarterly Obligation/Expenditures - Additional Funding Needs.

#	Task	Quarter 1	Quarter 2	Quarter 3	Quarter 4
	Not Applicable	$ 0	$ 0	$ 0	$ 0
Total CVPIA Budget by Quarter		**$ 0**	**$ 0**	**$ 0**	**$ 0**

Explanatory Notes:

I Future Years Commitments/Actions.

$350,000 per year for FY03 to FY07