U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
2800 Cottage Way, Rm. W-2605
Sacramento, California 95825

October 4, 1999

To: Attached list

From: Erin Sauls, Sacramento Fish and Wildlife Office

Subject: Monitoring Of Restoration Projects In Clear Creek Annual Report

Attached for your information is a copy of the first annual report for the U.S. Fish and Wildlife Service's Clear Creek Restoration Project Investigations. During the past year, we completed field work on chinook salmon juvenile rearing and spawning habitat modeling sites on Clear Creek below Saeltzer Dam within the restoration area. Restoration activities are scheduled to take place in summer 2001 after which time data will again be collected at each of the modeling sites. These data will be used to evaluate wether the restoration activities are successful at increasing the quality and quantity of chinook salmon rearing and spawning habitat in Clear Creek.

If you have any comments or questions about the attached report or our investigations, please feel free to contact me at (916) 414-6729.

Attachments (2)

Distribution list: Andy Hamilton, FWS,SFWO
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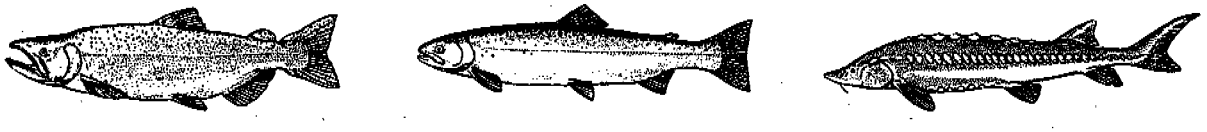
MONITORING OF RESTORATION PROJECTS IN CLEAR CREEK, CALIFORNIA

Annual Progress Report
Fiscal Year 1999

U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Room W-2605
2800 Cottage Way
Sacramento, CA 95825

Prepared by staff of
The Energy, Power and Instream Flow Assessments Branch



PREFACE

The following is the first annual progress report prepared as part of the Clear Creek Restoration Project Monitoring Investigations, a two year effort which began April 1999. Title 34, Section 3406(b)(12) of the Central Valley Project Improvement Act, P.L. 102-575, authorizes funding for channel restoration of Clear Creek to provide spawning, incubation, and rearing habitat for salmon and steelhead. The purpose of this investigation is to evaluate the success of these restoration activities.

The fieldwork described herein was conducted by Ed Ballard, Mark Gard, Rick Williams, Erin Sauls and John Kelly.

To those who are interested, comments and information regarding this program and the habitat resources of Central Valley rivers are welcomed. Written comments or information can be submitted to:

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Introduction

The decline of spring and fall-run chinook salmon and steelhead trout in Clear Creek over the last decade is attributed to many factors including habitat degradation. The existing habitat appears inadequate for either spawning or rearing. The Central Valley Project Improvement Act (CVPIA), section 3406(b)(12), authorizes funding for channel restoration of Clear Creek to provide spawning, incubation, and rearing habitat for salmon and steelhead. In response to this authorization, in 1998 the USWFS developed the Lower Clear Creek Flood Plain Restoration Project to increase spawning success on the section of Clear Creek below Saeltzer Dam. Part of this study proposal included the use of the Service's Instream Flow Incremental Methodology to compare total weighted usable area of salmonid habitat before and after channel restoration utilizing 2-D modeling. The Clear Creek Study is a two year effort to be completed in two phases (pre-restoration and post-restoration) by 2001, depending on the schedule of restoration construction.

Field Reconnaissance and Study Site Selection

During FY99, four study sites were selected within the two mile restoration area on lower Clear Creek. Each of these sites were evaluated based on morphological and channel characteristics which facilitate the development of reliable hydraulic models, and on their overall representation of the mesohabitat types present within the entire restoration site. A side channel site was included within the study area because all of the side channel habitat currently present in Clear Creek will be eliminated during restoration activities.

Transect Placement (study site setup)

Chinook salmon spawning and rearing habitat

Study sites were established in April 1999. Two transects were placed in each site, one at the top of the site and one at the bottom.

The bottom transect will be modeled with PHABSIM to provide water surface elevations as an input to the 2-D model. Calibration of the 2-D model will be done using data from the upstream transect. This calibration is accomplished by adjusting the bed roughness until the water surface elevation at the top of the site matches the water surface elevation predicted by PHABSIM. The upstream boundary will also be used to determine the distribution of flow across the upstream boundary as an input to the 2-D model. The 2-D model uses as inputs the bed topography, cover, and substrate of a site, and the water surface elevation at the bottom of the site, to predict the amount of habitat present in the site. The 2-D model it is more efficient for modeling juvenile

habitat than PHABSIM, since it allows for intensive sampling on the stream margins, where most juvenile habitat is located, and less-intensive sampling in the middle of the river, which tends to have velocities which are too high for juvenile salmon. The 2-D model also has the potential to predict velocities more accurately than PHABSIM, because it uses the bed topography of the entire site, along with conservation of mass and momentum equations to change the distribution of flow across the river at different flows, rather than assuming (as PHABSIM does) that the Manning's *n* value at a given location does not change with flow.

Transect pins (headpin and tailpins) were marked on each river bank above the 500 cfs level using rebar driven into the ground and/or lag bolts placed in tree trunks. Survey flagging and spray paint were used to mark the locations of each pin.

Hydraulic and Structural Data Collection

Chinook salmon spawning and rearing habitat

Hydraulic and structural data collection began in April and was completed in July. Vertical benchmarks were established at each site to serve as the reference elevation to which all elevations (streambed and water surface) were tied. In addition, horizontal benchmarks were established at each site to serve as reference locations to which all horizontal locations (northings and eastings) were tied. Fluvial geomorphologists for the restoration project established total station control points and staff gage locations previous to the start of our IFIM work. Our vertical and horizontal benchmarks were tied into these points.

The data collected on the top and bottom transect include: 1) water surface elevations (WSELs), measured to the nearest .01 foot at three different stream discharges (except on Site 1) using standard surveying techniques (differential leveling); 2) wetted streambed elevations determined by subtracting the measured depth from the surveyed WSEL at a measured flow; 3) dry ground elevations to points above bankfull discharge surveyed to the nearest 0.1 foot; 4) mean water column velocities measured at a high-to-mid range flow at the points where bed elevations were taken; and 5) substrate and cover classification at these same locations and also where dry ground elevations were surveyed. Data collected between the transects include: 1) bed elevation; 2) northing and easting (horizontal location); 3) cover; and 4) substrate. These parameters are collected at enough points to characterize the bed topography, substrate and cover of the entire site.

For site 1, water surface elevations were collected at two different flow levels and a gage reading will be used to calculate the water surface elevation at a third flow level. WSELs were collected at three flow levels at Site 4 and at four levels at Sites 2 and 3. Data collection in this area was difficult at times because some areas were too deep at certain flows to get measurements and yet

the creek is too small to allow for the use of a jet boat. Discharge measurements have been collected at all sites under at least two different flow levels, while wading with a wading rod equipped with a Price AA velocity meter. At sites 2 and 3 discharge measurements were collected at four different flow levels.

To validate the velocities predicted by the 2-D model for shallow areas within a site, depth, velocity, substrate and cover measurements were collected along the right and left banks by wading with a wading rod equipped with a Price AA velocity meter. The horizontal locations and bed elevations were determined by taking a total station shot on a prism held at each point exactly where the velocity and depth were measured. A minimum of 25 representative points were measured along the length of each side of the creek per site.

Hydraulic and structural data will be collected in the same manner after the restoration activities which are scheduled for the summer of 2001.

Hydraulic Model Construction and Calibration

All data for the spawning and juvenile habitat has been compiled and checked. PHABSIM data decks, hydraulic calibration and final 2-D modeling files for the pre-restoration work will be completed for all sites by March 2000. After post-restoration data collection in fall 2001, 2-D modeling files will be developed again and a final report evaluating the success of restoration activities in providing more spawning and rearing habitat for salmon will be completed by May 2002.

Habitat Suitability Criteria (HSC) Development

Habitat Suitability Criteria data will not be collected during this study. HSC previously developed on Clear Creek or other streams, will be used to predict the amount of spawning and rearing habitat present over a range of discharges in the restoration site prior to and after restoration actions.