United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Rm. W-2605
Sacramento, California 95825

September 29, 2000

Memorandum

To: Gary Taylor
Andy Hamilton, CVPIA
Scott Spaulding, SSJEFWO

From: Mark Gard, Sacramento Fish and Wildlife Office

Subject: Monitoring of Restoration Projects in the Merced River Annual Report

Attached for your information is a copy of the first annual report for the U.S. Fish and Wildlife Service's Merced River Restoration Project Investigations. In the past year, we completed most of the field work on fall-run chinook salmon juvenile rearing and spawning habitat modeling sites on the Merced River. After restoration activities have been completed, data will again be collected on modeling sites in the restoration area. These data will be used to evaluate whether the restoration activities are successful at increasing the quality and quantity of fall-run chinook salmon rearing and spawning habitat in the Merced River.

If you have any comments or questions about the attached report or our investigations, please feel free to contact me at (916) 414-6588.

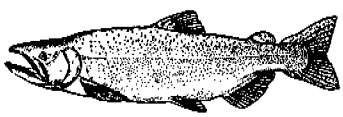
Attachment

MONITORING OF RESTORATION PROJECTS IN THE MERCED RIVER, CALIFORNIA

Annual Progress Report
Fiscal Year 2000

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 Merced River Restoration Project Monitoring Investigations, a two year effort which began August 2000. Funding has been provided under the Anadromous Fish Restoration Program of the Central Valley Project Improvement Act, P.L. 102-575, for channel restoration of the Merced River to provide spawning, incubation, and rearing habitat for fall-run chinook salmon. 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, Erin Sauls, John Kelly, Jerry Big Eagle and Rich DeHaven.

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:

Mark Gard, Senior Fish and Wildlife Biologist
Energy, Power and Instream Flow Assessments Branch
U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Room W-2605
2800 Cottage Way
Sacramento, CA 95825

Introduction

The decline of fall-run chinook salmon in the Merced River over the last decade is attributed to many factors including habitat degradation. The existing habitat appears inadequate for either spawning or rearing. Funding has been provided under the Anadromous Fish Restoration Program of the Central Valley Project Improvement Act, P.L. 102-575, for channel restoration of the Merced River to provide spawning, incubation, and rearing habitat for fall-run chinook salmon. The study described herein involves 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 Merced River Study is a two year effort to be completed in two phases (pre-restoration and post-restoration) by 2002, depending on the schedule of restoration construction.

Field Reconnaissance and Study Site Selection

During FY2000, four study sites were selected within the two and a half mile Robinson Restoration area on the Merced River. 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.

Transect Placement (study site setup)

Chinook salmon spawning and rearing habitat

Study sites were established in August 2000. 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 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 2500 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 August 2000 and is expected to be completed in October 2000. 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.

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.

Thus far, water surface elevations have been collected at a low flow level at all four sites. Discharge measurements were collected at all sites under at the same flow level as for the water surface elevations, while wading with a wading rod equipped with a Marsh-McBirney^{R} Model 2000 velocity meter. Velocities, bed elevations and substrate and cover have been measured on the transects and bed elevation, cover and substrate data have been collected between the transects on all four sites. Substrate and cover were determined visually at all locations.

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 Marsh-McBirney^{R} Model 2000 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. To date, validation velocities have been collected at three of the four sites.

Hydraulic and structural data will be collected in the same manner after the restoration activities which are scheduled for the summer of 2002.

Hydraulic Model Construction and Calibration

All data for the spawning and juvenile habitat will be compiled and checked, and PHABSIM data decks, hydraulic calibration and final 2-D modeling files for the pre-restoration work will be completed for all sites by March 2001. After post-restoration data collection in fall 2002, 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 2003.

Habitat Suitability Criteria (HSC) Development

Habitat Suitability Criteria data will not be collected during this study. HSC previously developed on the Merced River 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.