

EVALUATION OF CENTRAL VALLEY SPRING-RUN CHINOOK SALMON PASSAGE THROUGH LOWER BUTTE CREEK USING HYDRAULIC MODELING TECHNIQUES

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ABSTRACT

River2D was used to develop a hydraulic model of an upstream passage impediment for adult spring-run Chinook salmon (*Oncorhynchus tshawytscha*) on Butte Creek, Tehama County, California. Topographic data were collected using a total station, survey-grade RTK GPS, and terrestrial LIDAR. Stage-discharge relationships were developed at the upstream and downstream ends of the site to use as boundary conditions and to calibrate the 2D model. A pressure transducer was installed at the downstream boundary of the site to provide a time series of flow and water temperatures. Parameters of the hydraulic model were examined to assess upstream passage including minimum thalweg depth along the least width-limiting pathway, velocity, and water surface elevation above and below a jump, and flow partitioning between a split in the main flow paths through the site. The results of the River2D model were used to identify flow levels that met the minimum depth and width thresholds needed for adult spring-run Chinook salmon (SRCS) to migrate upstream through the study reach. A minimum passage depth criterion of 0.27 meters was used for adult SCRS. Site-specific passage width criteria were derived from the literature for the study site and ranged from 0.3 to 0.9 meters (m). Model results indicated that a flow of 3.40 cubic meters per second (cms) met the depth criterion and the lower bound of the width criterion. A flow level of 6.8 cms met the depth criterion and the upper bound of the width criterion. Data from the VAKI Riverwatcher fish passage counting device installed just upstream of the study site were related to the stage/passage limiting width and water temperature monitoring data. The monitoring data and results of the predictive modeling will be used by the California Department of Fish and Wildlife to recommend flow criteria that protect migrating adult spring-run Chinook salmon.

key words: passage; stranding; spring-run Chinook; River2D; VAKI Riverwatcher

Published in:

RIVER RESEARCH AND APPLICATIONS
River Res. Applic. (2016)
Published online in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/rra.3098