EVALUATION OF HABITAT AND FLOW RELATIONSHIPS FOR SPRING CHINOOK SALMON SPAWNING AND INCUBATION IN THE MIDDLE FORK WILLAMETTE AND MCKENZIE RIVERS, OREGON

Troy Brandt[1*], Peter Gruendike[1], and Jarvis Caldwell[2]

[1]River Design Group
311 SW Jefferson Ave, Corvallis, OR, 97330
*tbrandt@riverdesigngroup.com (541-738-2920)

[2]HDR, Inc
2379 Gateway Oaks, Suite 200, Sacramento, CA 95833
jarvis.caldwell@hdrinc.com (916-679-8875)

River Design Group and HDR, Inc are working with the U.S. Army Corps of Engineers, Portland District (CENWP) to complete an instream flow study to evaluate available spawning and incubation habitat for ESA listed spring Chinook salmon on three tributaries of the upper Willamette River. Study reaches include approximately 3.5 miles of the Middle Fork Willamette River below Dexter Dam, 4.5 miles of the South Fork McKenzie River below Cougar Dam, and 19 miles of the McKenzie River above Leaburg Dam.

The need for the instream flow study was identified in the 2008 Biological Opinion (BiOp) prepared by the National Marine Fisheries Service (NMFS) on the continued operation of the CENWP's Willamette Valley Project (WVP). The BiOp describes target streamflows to be released into Willamette River tributaries below WVP dams (NMFS 2008). Development of these prescribed streamflow targets was determined based on limited local information. Results from the instream flow study will be used to assess how flow volume relates to the availability of Chinook salmon spawning and incubation habitat and allow for the comparison of results to the BiOp targets.

The instream flow study was conducted in the Physical Habitat Simulation System (PHABSIM) framework and utilized the System for Environmental Flow Analysis (SEFA) for hydraulic and habitat modeling. The PHABSIM method incorporates hydrology, stream morphology, and microhabitat preferences to evaluate the relationship between streamflow and habitat availability. Components of the PHABSIM method include a calibrated one-dimensional hydraulic model, Habitat Suitability Criteria (HSC) curves for Chinook salmon spawning and incubation life stages, and a habitat model that relates flow volume to available habitat or, Area Weighted Suitability (AWS).

A total of thirty transects divided among the study reaches were evaluated at three different flows to determine the relationship between flow and available spawning habitat. Transects with known spawning activity were specifically selected to most accurately characterize river conditions. Physical measurements collected at each transect included depth, velocity, substrate composition, and cover. Stage versus discharge relationships were developed

to calibrate the hydraulic model and measured velocities were used to calibrate velocity predictions for extrapolation of unmeasured flows.

Final results of the habitat modeling are expected in Spring 2015 and will be used to assist CENWP in meeting BiOp goals and objectives.