

A COMPARISON OF THE HEALTH, PERFORMANCE, AND WELFARE OF JUVENILE CHINOOK SALMON *Oncorhynchus tshawytscha* RAISED IN A PILOT PARTIAL WATER REUSE SYSTEM VERSUS A FLOW-THROUGH RACEWAY

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The Chelan County Public Utility District installed a pilot partial water reuse system at the Eastbank Hatchery in Wenatchee, Washington in 2008, as a potential alternative to the existing traditional flow-through raceways. To assess the suitability of water reuse technology for raising anadromous salmonids for stocking into the Columbia River basin, The Conservation Fund's Freshwater Institute was requested to evaluate the performance, health, and welfare of juvenile Chinook salmon *Oncorhynchus tshawytscha* reared in the partial water reuse environment relative to those from the same spawn reared in a comparison raceway. The hypothesis to be examined was that fish reared in the pilot system would have comparable growth, survival, and health to fish raised in a raceway environment.

This observational study in June, 2008 at the time of ponding, and involved repeated assessments of reuse and raceway cohorts over a 21-week period before all fish were moved off-site in November. Fish were sampled on three occasions and screened for subclinical infections by important bacterial and viral fish pathogens. During the same assessment events, fish from each cohort were sampled and fixed in formalin for histological evaluation of multiple tissues, including gill, heart, liver, spleen, and kidney. To assess fin erosion, at 4- and 21-weeks post-ponding the dorsal and caudal fins of fish sampled from each cohort were measured and standardized to fork length to compare fin indices. During final sampling at 21-weeks a sample of fish from each cohort was bled via caudal venipuncture for evaluation of blood gas (pO_2 , pCO_2 , O_2 saturation, etc.) and chemistry (sodium, chloride, glucose, etc.) parameters.

No listed bacterial or viral fish pathogens were isolated from either cohort during the three sampling events. By 21-weeks post-ponding, length and weight were comparable between the reuse and raceway cohorts (114.07mm and 110.72mm, and 16.98g and 17.39g, respectively), and survival was excellent in both groups (99.3% and 99.0%, respectively). Condition factor was higher in raceway fish (1.28 vs. 1.14 in reuse fish), and length coefficient of variation was higher in raceway fish. Fin indices were lower in reuse fish, although fin erosion was not grossly apparent on either cohort. Histological evaluation revealed a higher prevalence of liver lesions in raceway fish; however, the most noticeable histological difference between the two cohorts was epithelial hypertrophy of the gills in reuse fish. Blood chemistry and gas measurements revealed differences consistent with the histological findings. Overall, by study's end both cohorts were generally comparable in performance, health, and welfare indices, suggesting that partial water reuse technology for rearing juvenile anadromous salmonids can be employed without negatively affecting fish quality.