

Fish Passage Monitoring at the Cherry Creek Hidrostral Pump Facility 2006 Summary

Washington Trout (WT), in partnership with the Snoqualmie Tribe, King County Drainage District #7, WDFW and NOAA Fisheries, has undertaken a three-year monitoring study of the renovated pump facility on lower Cherry Creek (King County, WA). A primary purpose of the study is to assess the effectiveness of newly installed Hidrostral (screw impeller) pumps in safely transporting fish from the Cherry Valley floodplain to mainstem Cherry Creek.

In May 2006, WT measured survival, injury and mortality rates in juvenile hatchery salmonids introduced into a single, unscreened Hidrostral pump discharging into Cherry Creek (Figs 1, 2). Separate trials were run with steelhead smolts (mean fork length 210 mm), coho smolts (mean 123 mm) and young-of-year coho (mean 57 mm) at low and high pump speeds (650 and 870 rpm, respectively).

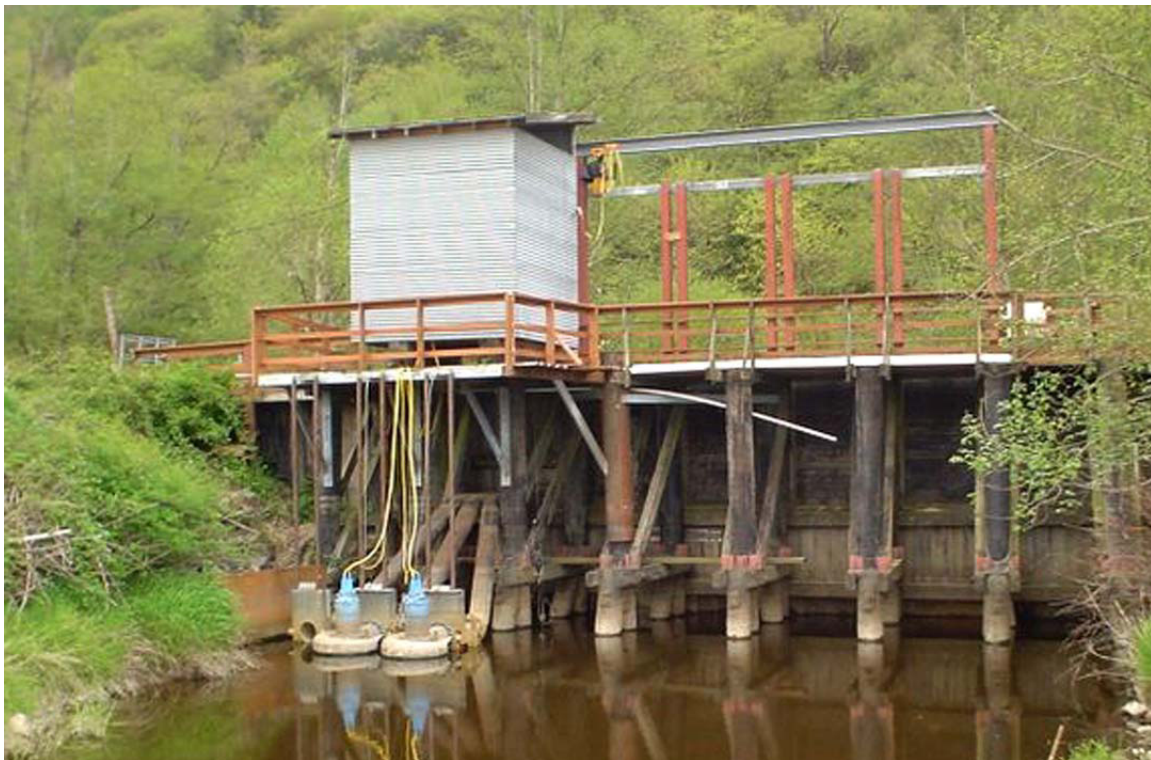


Figure 1. Cherry Creek pump facility viewed from the floodplain. New Hidrostral pumps are at lower left.



Figure 2. Pump facility outfall and fish collection net viewed from Cherry Creek.

Fish survival immediately after pumping ranged from 53% to 98% in the 23 pump trials performed. Fish mortality assessed immediately after pump passage (Fig. 3) was less than 5% on average in all groups, although higher mortality rates were associated with the higher pump speed. Fish injury, including bruising, abrasion, laceration, and loss of equilibrium (Fig. 4), ranged from 4 to 37%, with the higher rates associated with larger fish (Fig. 5).



Figure 3. Laceration injuries in young-of-year coho salmon killed by passage through Hidrostral pump.



Figure 4. Typical bruising injuries in juvenile steelhead (left) and coho (right) that survived pump passage.

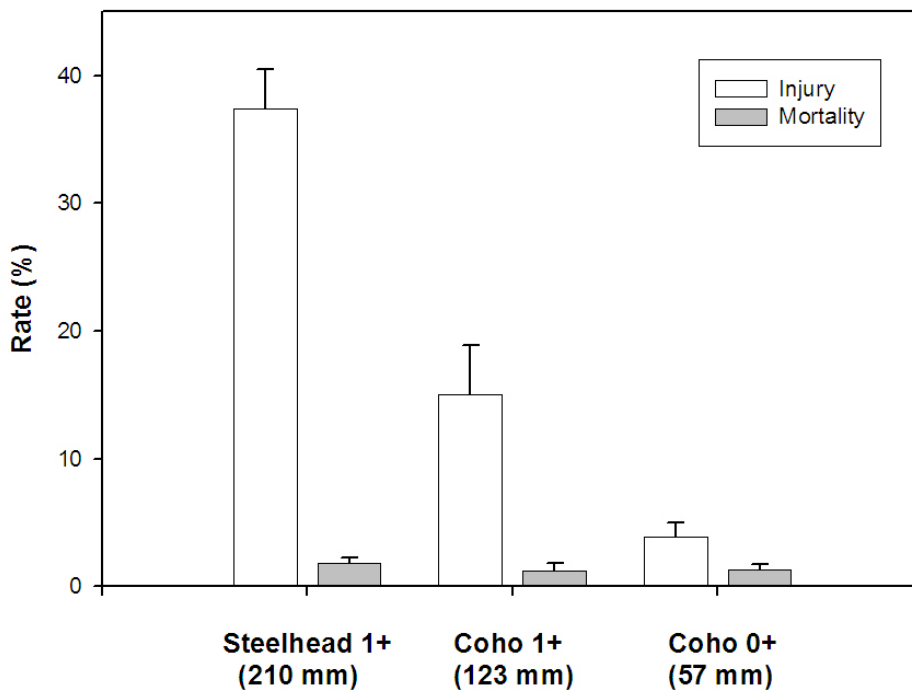


Figure 5. Salmonid injury and mortality rates immediately after Hidrostral pump passage. Data from low and high pump RPM trials ($N = 7-9$ trials of 40–60 fish each) are pooled. Average rates are shown with S.E.M. error bars.

The monitoring plan included an investigation of delayed mortality (i.e. fish death stemming from pump-related injury but occurring hours or days after pump passage). Delayed mortality was evaluated in each trial by holding and examining pumped survivors, and an unpumped control population, for 96 hours. For many trials, the delayed mortality rate of unpumped fish was near zero, substantially less than that of pumped fish (Fig. 6). But for a number of other daily trials, both surviving pumped fish and the paired control population showed very high and nearly identical mortality rates within a few days of pumping (Fig. 7). This anomalous result confounded the delayed mortality assessment, and raised the possibility of significant temporal fluctuation in water quality in the Cherry Valley floodplain tributary where fish were held.

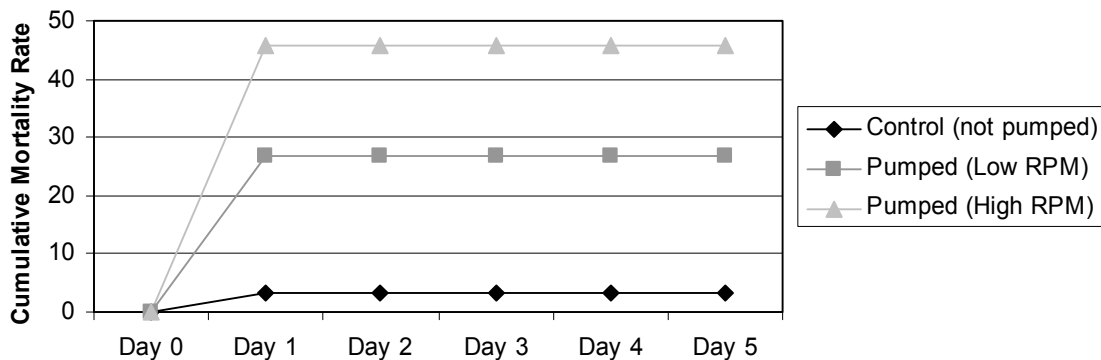


Figure 6. Typical delayed mortality pattern illustrated by three groups of steelhead smolts ($N = 30-50$) examined for several days after pump passage on May 24, 2006 (Day 0).



Figure 7. Anomalous, intermittent delayed mortality pattern: steelhead smolts—both pumped survivors and unpumped control fish—that showed 100% mortality within 96 hours of being held in the Cherry Valley floodplain tributary on May 18, 2006.

Preliminary water quality testing performed by King County in May 2006 indicated low dissolved oxygen levels at several sites within the floodplain tributary. Important next steps, which WT will take in 2007–2008, are (1) to obtain a better understanding of this water quality problem through additional monitoring, and (2) to collect defensible delayed mortality data associated with Hidrostral pump passage.

A major goal of this project is to communicate results to resource managers in the Snohomish basin and throughout Washington State. The Hidrostral pump technology is relatively new, and its use in fish-passage facilities in Washington is currently limited. There are, however, numerous opportunities for agricultural production districts to retrofit existing “macerating” pump facilities with more fish-friendly pumps to improve fish passage. A formal report of this study will be made available from WT to help inform management decisions.