

ADULT SALMON AND STEELHEAD PASSAGE AT LOWER GRANITE DAM WITH A MODIFIED TRANSITION POOL AND IN RELATION TO LADDER TEMPERATURE

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ABSTRACT

Previous passage studies of salmonids at Lower Granite Dam indicated slowed passage at the transition between the tailrace and ladder (the transition pool). In 2001 and 2002, we conducted an experiment to determine if a prototype weir modification improved adult salmon and steelhead passage times through the transition pool. Treatment conditions increased head (1 ft) difference at the two downstream weirs, thereby creating faster water velocities. Passage time through the transition pool was significantly lower in spring-summer Chinook salmon during treatment periods, and this effect resulted primarily from a two-fold increase in the proportion of salmon passing through the transition pool on the first attempt during treatment conditions. These results were used to develop new design criteria and modifications of the Lower Granite Dam fishway.

In 2006, the junction pool walls in the fish ladder were narrowed (from 38 ft to 20 ft) and new weir crest panels were added onto the bottom eleven weirs to provide improved head differentials and increased flows through the submerged orifices. In 2008, we measured water elevations in the fish ladder to calculate head differentials and estimate submerged orifice velocities. Target head differentials of 0.25 ft (velocity 4 ft/s) were met during tailwater elevations of 632-634 feet.

In 2006 and 2008, we monitored passage times and behavior of radio-tagged adult Chinook salmon and steelhead in the modified transition pool. Spring-summer Chinook salmon transition pool passage times in 2006 were significantly lower compared to those in 2003 and 2004 (unmodified years). Transition pool passages times in 2008 were also lower than 2003 and 2004, however, these differences were not statistically significant. A higher percentage of fish passed straight through the transition pool in 2006 and 2008 compared to 2003 and 2004. We also tested to see if there was a significant difference between the passage time of fish at Little Goose and Lower Granite dam each year to ask whether relatively "fast" fish at Little Goose Dam were also fast at Lower Granite Dam before and after the modification. The median difference in transition pool passage times between the two dams in 2006 were significantly lower than in 2003, and 2004 and 2008 passage times were significantly lower than in 2003.

In 2008, we also monitored water temperatures in the fish ladder at Lower Granite Dam to examine whether high temperature differences were associated with longer passage times. Eight temperature loggers were distributed from the bottom to the top of the fish ladder and recorded

hourly temperatures. Preliminary analyses suggest that water temperatures during 2008 were cool compared to previous years and ladder temperature differences were modest. Future analyses will examine the relationship between ladder temperatures and passage behavior.