

Productivity and survival rate trends in the freshwater spawning and rearing stage of Snake River chinook salmon (*Oncorhynchus tshawytscha*)

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Abstract: Stream-type chinook salmon (*Oncorhynchus tshawytscha*) populations in the Snake River (northwest United States) have declined dramatically since completion of the federal hydrosystem. Identifying the life stage that is limiting the survival of these stocks is crucial for evaluating the potential of management actions to recover these stocks. We tested the hypothesis that a decrease in productivity and survival rate in the freshwater spawning and rearing (FSR) life stage since completion of the hydropower system could explain the decline observed over the life cycle. The decline of chinook populations following completion of the hydrosystem was not accompanied by major survival changes in the FSR life stage. FSR productivity showed no significant decline, and the FSR survival rate decline was small relative to the overall decline. However, significant survival declines did occur in the smolt-to-adult stage coincident primarily with hydrosystem completion, combined with poorer climate conditions and possibly hatchery effects. Potential improvements in survival that occur only at the FSR life stage are unlikely to offset these impacts and increase survival to a level that ensures the recovery of Snake River stream-type chinook.