Genetic pedigree analysis of spring Chinook salmon reintroduced above Foster Dam on the South Santiam River

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Upper Willamette River spring Chinook salmon (*Oncorhynchus tshawytscha*) are listed as threatened under the United States' Endangered Species Act. On the South Santiam River, a tributary of the Willamette River, recovery of spring Chinook is limited by Foster Dam, which, along with Green Peter Dam, blocks access to ~85% of the population's historical spawning habitat. In the 1990s, the Oregon Department of Fish and Wildlife initiated reintroductions of Chinook salmon above Foster Dam. In this study, we used genetic parentage analysis to evaluate the contribution of salmon reintroductions to subsequent adult recruitment to the South Santiam River at Foster Dam. The parentage of salmon sampled as carcasses below Foster Dam was also examined to estimate the contribution of the reintroduction program to below-dam recruitment. Our analyses considered seven years (2007-2013) of reintroductions and multiple cohorts.

Respectively, 74% and 66% of salmon reintroduced above the dam during 2012 and 2013 were identified as progeny of reintroduced parents (2007-2009). Reintroduced salmon also produced up to 15% of adult recruits to the river below the dam. Overall, adult offspring recruitment met or marginally exceeded replacement of previous generations. The number of adult progeny returning per adult reintroduced above the dam during 2007 and 2008 (cohort replacement rate) was 0.96 and 1.16, respectively.

The fitness of reintroduced salmon was highly variable (range: 0-38 adult progeny) and in some years (2007 and 2008, but not 2009) was positively associated with date of reintroduction above the dam. In all years but 2007, females achieved higher fitness compared to males. Moreover, parental pairs involving a hatchery origin individual achieved lower fitness than pairs comprised of unmarked presumed natural origin salmon, though this finding was based on a limited number of observations of the latter.

Taken together, our results suggest that reintroductions are a promising method of increasing natural production within this threatened population. Continued monitoring of salmon reintroductions is needed to evaluate how recent modifications to the program, including reintroductions of wild salmon only above the dam, will impact efficacy.