Effectiveness of Flow Management and Rainbow Trout Harvest on Long-Term Viability of Native Yellowstone Cutthroat Trout in the South Fork Snake River

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The South Fork Snake River supports one of the last remaining large-river populations of Yellowstone cutthroat trout (YCT, *Onchorynchus clarkia bouvierii*). Rainbow (*O. mykiss*) and rainbow x cutthroat hybrid trout (collectively, RHT) established a self-sustaining population in the upper South Fork in the mid-1980s. In 2003, density of each species was 1400 fish per mile. In 2004, U.S. Bureau of Reclamation began delivering a spring "freshet" from Palisades Dam, and Idaho Department of Fish and Game removed harvest limits on RHT. We evaluated current and future effectiveness of these management actions with a stochastic simulation model parameterized with observed data. Total RHT + YCT recruitment is positively correlated with winter flow, and RHT recruitment is negatively correlated with maximum freshet flow. There is little temporal overlap in spawning, and hybridization alone does not explain the observed RHT invasion rate. Nonetheless, continued removal of RHT from spawning tributaries is necessary to prevent long-term loss of YCT. A model of juvenile competition between the two species based on experimental results of Seiler and Keeley explains observed invasion rates. Current densities of 1700 YCT/mi and 925 RHT/mi indicate reversal in population trends since 2004, and our analysis suggests that this is due primarily to harvest of RHT, which increased from 7 percent in 2003 to 20 percent in 2005. About 15 percent exploitation on RHT is required to prevent YCT extinction. We considered a likely future scenario to include mean winter flow of 1600 cfs (72% of 1987-2007 mean but necessary to enable the freshet operation), maximum freshet flow averaging 20,000 cfs, and RHT harvest at 20. A percent assuming environmental variance as observed since 1987, the 25-yr population projection is about 1100 fish/mi of each species. Increased percentage of YCT requires higher RHT harvest and/or higher maximum flows, and increased abundance requires higher winter flows.