EVALUATING TRIBUTARY RESTORATION POTENTIAL FOR PACIFIC SALMON RECOVERY

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Abstract. Although habitat restoration can play a key role in the conservation of imperiled species, for animals that demonstrate long migrations and complex life histories, reliance on physical restoration of isolated habitat patches comes with considerable uncertainty. Nevertheless, within freshwater ecosystems, stream restoration has become a major conservation focus, with millions of dollars spent annually on efforts aimed at recovering degraded habitat and imperiled riverine species. Within this context, we addressed fundamental uncertainties of the focus on tributary restoration for recovery of salmon: (1) Is there potential for improving habitat in tributaries? (2) What magnitude of early survival improvement can be expected based on stream restoration? and (3) Will incremental increases in early survival be sufficient to ensure viability overall? We combined simple mechanistic habitat models, population viability measures, and categorical filters to quantify ''restoration potential,'' expressed as increased total life-cycle survival in response to restored tributary condition, across 32 populations composing five major population groups (MPG).
A wide gap remains between how much survival improvement is needed vs. what is likely to occur; restoration potential meets the necessary minimum increase needed for only four populations within one MPG. The remaining populations (84%, 4 MPG) still fall far below the survival increase needed for future viability. In addition, across all populations and groups, a 171% increase (on average) in total life-cycle survival is needed; only ;106% appears possible. A recovery strategy for these salmon that relies largely on tributary restoration to mitigate for known mortality imposed at other life stages (e.g., migration through hydropower dams) is risky with a low probability of success. We demonstrate an approach for completing an a priori evaluation of restoration potential linked to population viability, such that habitat restoration efforts can be biologically prioritized and scarce resources can be allocated to efforts with the greatest potential and the least amount of risk, in terms of meeting conservation and recovery goals.