Coastal coho salmon research in the West Fork Smith River: Patterns of coho salmon size and survival within a complex watershed

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Effective habitat restoration planning requires the ability to anticipate fish population responses to altered habitats. The EPA has conducted network-scale research to document habitat-specific growth and survival of juvenile salmonids in a complex watershed. These findings have provided critical insights that can now better inform and help prioritize rehabilitation activities. Using habitat-specific growth, survival and movement data from passive integrated transponder (PIT)-tagged coho salmon (*Oncorhynchus kisutch*), we illustrate the potential benefits of spatially-explicit habitat restoration scenarios in an Oregon, USA coastal basin. Use of in-stream antenna arrays, remote scanning of PIT-tagged fish, and multiple recapture efforts allowed us to document seasonal movement, growth and survival throughout a 67 km^2 basin over 4 years. We evaluated network patterns of juvenile coho salmon abundance, size, and survival rates. We found that under present conditions, survival and growth are greater in tributary habitats compared to downstream mainstem habitats. Intermittent tributaries are particularly important as seasonal refuges and provide valuable spawning and foraging habitats. Mainstem habitats currently support low densities of juvenile coho salmon due to warm water temperatures in the summer and lack of cover during high flows during winter. With successful habitat restoration, slight decreases in summer temperature and slight increases in available winter refuge habitat in the mainstem could substantially increase juvenile coho salmon survival and production. Thus, under potential restoration scenarios, the greatest benefits per unit of habitat quality improvement are likely to be observed in the mainstem. These findings highlight the value of habitat-specific demographic data to restoration planning, and the usefulness of individual-based approaches for fish population monitoring at whole-basin scales.