

Bayesian estimation of population-specific Snake River Adult Escapement based on PIT tag data and window counts

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Population-specific escapement estimates are a critical part of efforts to accurately assess recovery and responses to management action in Pacific salmonid ESUs. However, accurate and unbiased escapement estimates are notoriously difficult to obtain. We will present a method for generating population-specific escapement estimates based on a mark-recapture PIT tag study of adult steelhead passing Lower Granite dam (LGD). The Integrated Status and Effectiveness Project (ISEMP) along with regional partners, maintains PIT tag arrays in 5 watersheds above LGD that provide continuous data on recapture events throughout the season. In order to model the probabilities of tagged fish returning to each of 5 upstream watersheds as a function of date of LGD passage, we implemented a Bayesian hierarchical formulation of a model for population occupancy that allowed for imperfect detection. We subsequently estimated the total daily wild adult passage at LGD based on both window counts and counts from the ladder trap using a multivariate autoregressive state-space model. Finally, we merged the posteriors of both exercises to generate probabilistic estimates of population specific adult escapement. Standard escapement survey methods (e.g. redd counts) require intensive, distributed field-sampling effort and are subject to substantial observer error. Our mark-recapture study design largely avoids these issues, yet affords accurate population-specific escapement estimates over a large geographic range.