

Using expanded McNary Passage Estimates to estimate Release-to-McNary Survival Indices for PIT-Tagged Releases into the Yakima Basin

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Developing passage-time and travel-time indices at McNary Dam from releases on the Yakima River requires the estimation of McNary detection rates¹ for the stock. The Yakima-Klickitat Fisheries Project uses tallies of detections at dams downriver of McNary and tallies of joint detections at both McNary and the downriver dams to estimate the detection rates. Daily detection-rate estimates are pooled over contiguous days having relatively homogeneous detection-rates. A release's daily-passage estimate is the release's daily McNary detection tally divided by the respective stratum's detection-rate estimate.

These expanded passage estimates are also used to obtain survival-index estimates from release to McNary. McNary daily detection tallies are totaled over contiguous days within the stratum; each stratum's detection total is expanded (divided) by the stratum's detection-rate estimate; the resulting expanded totals are pooled over strata; and this pooled total is divided by the number released to obtain the survival-index estimate²:

$$\text{Release - to - McNary Survival Index} = \frac{\sum_{\text{strata}} \frac{\text{McNary Stratum's Detection Tally}}{\text{McNary Stratum's Detection Rate}}}{\text{Number Released}}$$

wherein

$$\text{McNary's Stratum Detection Rate} = \frac{\text{Stratum's Joint Number of McNary and Downriver Dam Detections}}{\text{Stratum's Total Number of Downriver Dam Detections}}$$

The strata are established by a stepwise logistic analysis of variation procedure that results in significant detection-rate differences among strata relative to the variation among daily detection rates within the strata. The procedural methods of estimation and the assumptions and biases associated with the estimation procedures are discussed.

¹ McNary detection rate is the proportion of PIT-tagged fish passing McNary that are detected within the juvenile bypass system.

² The survival-index estimate given is actually adjusted for detected fish that are removed (transported or sampled and not returned to the river) at McNary