Observer Error Structure in Bull Trout Redd Counts in Montana Streams: Implications for Inference on True Redd Numbers

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Despite the widespread use of redd counts to monitor trends in salmonid populations,

few studies have evaluated the uncertainties in observed counts. We assessed variability in migratory bull trout (*Salvelinus confluentus*) redd counts among experienced observers in Lion and Goat creeks, tributaries to the Swan River, Montana. We documented substantially lower observer variability in bull trout redd counts than previous studies. Observer counts ranged from 78 percent of our best estimates of true redd numbers in Lion Creek and from 90 to 130 percent Creek. Observers made both errors of omission and errors of false identification, and we modeled this combination using a binomial probability of detection and a Poisson count distribution of false identifications. Redd detection probabilities were high (mean = 83%) and exhibited no significant variation among observers (SD = 8%). We applied this error structure to annual redd counts in the Swan River basin (1982-2004) to correct for observer error and thus derived more accurate estimates of redd numbers and associated confidence intervals. Our results indicate that bias in redd counts may be reduced, if experienced observers are used to conduct annual redd counts. Future studies should assess both sources of observer error to increase the validity of using redd counts to infer true redd numbers in different basins. This information will help fisheries biologists to more precisely monitor population trends, identify recovery and extinction thresholds for conservation and recovery programs, ascertain and predict how management actions influence distribution and abundance, and examine effects of recovery and restoration activities.