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# COUNTING BEARS, P'S AND Q'S: AN EFFICIENT SAMPLE DESIGN FOR A SPATIAL CAPTURE RECAPTURE HAIR SNAG STUDY OF GRIZZLY BEARS

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Accurate assessment of abundance can be expensive and managers often seek to minimize costs. Because spatial capture recapture (SCR) methods explicitly account for variation in trap effort in space and time and permit the use of covariates to explain abundance, substantial flexibility in design and thus reduction in costs may be possible. Estimates of grizzly bear (*Ursus arctos*) densities and abundances in 4 management units in Alberta were very low (superpopulation  $n = 47-133$ ) in the latest studies occurring from 2004-2008. Since these first provincial population estimates were obtained, management, landscape, and habitat conditions have changed. Managers would like updated abundance information but also seek to reduce the costs of acquiring these data. We assessed 1) the behavior of SCR models across several general sample designs and 2) whether we could eliminate sampling in helicopter-access-only areas in the Yellowhead management unit while maintaining accurate estimates. We used a combination of retrospective subsampling of existing data from a 2004 sampling effort and simulations to evaluate several designs. Placing sampling arrays in areas with high densities of bears decreased variance, while the fine-scale configuration of traps did not greatly influence estimates. Simulations of designs for Alberta with more intensive sampling of only the areas accessible by road and no sampling of more expensive helicopter-access-only areas provided robust estimates with little loss in precision. We will describe the framework and assumptions of SCR models with covariates for abundance in comparison with traditional capture recapture models.