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Research Article

Estimating occupancy to monitor northern goshawk in the central Rocky Mountains[‡]

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Accipiter gentilis; aspen; lodgepole pine; management indicator species; northern goshawk; ponderosa pine monitoring

Abstract

Designing monitoring programs to evaluate trends in low-density wildlife species at regional scales is challenging given difficulties detecting uncommon organisms distributed in potential habitats over large spatial extents. The northern goshawk (*Accipiter gentilis*) has been petitioned for listing under the Endangered Species Act and the review of the petition indicated a need for information on population trend. To evaluate trends in goshawk populations, the U.S. Forest Service developed the Northern Goshawk Bioregional Monitoring Design to estimate goshawk occupancy over broad spatial extents. We adapted and implemented this design to approximately 30,600 km² of 88,128 km² of National Forest System lands in the Forest Service Rocky Mountain Region, including portions of Colorado, Wyoming, and South Dakota. We developed a stratified random design to monitor goshawk occupancy in sampling units, defined by primary and secondary habitat quality as well as accessibility. To define habitat quality, we examined a time series for 58 previously located nesting territories. Using logistic regression, we found that the dominant conifer species and status of aspen in postfledging zones best characterized high-quality goshawk nesting habitat. We applied model results to stratify 4,445 sampling units based on habitat quality and further stratified sampling units based on accessibility into easy and difficult access categories. We conducted field sampling during the goshawk breeding season in the summer of 2006 to estimate detection probabilities and occupancy rates. Within our sampling frame, we sampled 51 sampling units

and estimated goshawk occupancy (\hat{P}) of 0.329 (95% CI: 0.213–0.445). Occupancy within primary strata (high quality) sampling units was 0.811 (SE = 0.113), whereas occupancy in secondary strata (lower quality) sampling units was 0.124 (SE = 0.067). Future implementation of this monitoring program can achieve 0.8 power to detect 30–40% declines in \hat{P} with 140 sampling units. Our implementation of a stratified sampling design to monitor occupancy of goshawks at a region-wide scale reduced the number of sampling units in each administrative unit and focused our efforts on those areas most likely to have goshawks. © 2011 The Wildlife Society.

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