Detection Probability Functions of Rare Species: the Northern Goshawk

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Extended Abstract: Over the past decade, industry and government have spent large amounts of time and money conducting broadcast surveys for northern goshawks (*Accipiter gentilis*) within North America to detect breeding individuals and locate their nests. The northern goshawk subspecies *A. g. laingi* is red-listed in British Columbia (B.C. Species and Ecosystems Explorer 2004) and is designated as Threatened in Canada (COSEWIC 2004). Detecting breeding individuals and locating their nests serves as the foundation for answering several research questions about northern goshawk habitat selection and population trends; however, the probability of detecting northern goshawks using broadcast surveys was unknown within coastal British Columbia where this subspecies occurs.

To test the effectiveness of using broadcast surveys in coastal British Columbia, we conducted broadcast experiments at occupied northern goshawk nest sites on Vancouver Island during the 1998 (n = 8) and 1999 (n = 11) breeding seasons (see McClaren et al. 2003 for complete details). We compared an untested call, the male food-delivery call, to standard vocalizations within each breeding phase. Northern goshawks were detected in 52% (n = 88) of all broadcast survey trials. Compared to standard vocalizations, the male food-delivery call did not improve detection rates throughout the breeding season. Detection rates were lowest (40%) during courtship and highest (75%) during the fledgling-dependency phase. The distance we detected northern goshawks from nests with male food-delivery and alarm calls increased between courtship and nestling phases to the fledgling-dependency phase when the majority of detections shifted from adults to fledglings. The alarm and juvenile begging calls remain the most effective for detecting northern goshawks on Vancouver Island during the nestling and fledgling-dependency periods, respectively. The effectiveness of broadcast surveys during the courtship phase requires further testing.

To increase the effectiveness of broadcast surveys for detecting breeding northern goshawks, a minimum of two broadcast surveys (one in the nestling phase, one in the fledgling-dependency phase) should be conducted per breeding season for a minimum of two breeding seasons. Although detection rates were lower with alarm calls than with juvenile begging calls, the likelihood of locating nests was greater because detections generally occurred closer to nests. As well, spending five minutes (six calls plus a one minute detection period) at each broadcast

station maximized (90%) the chance of detecting northern goshawks while minimizing the time spent at each station. The distance northern goshawks were detected from nests suggests that broadcast stations and transect lines should be spaced 200 m apart during the nestling phase and 400 m apart during the fledgling-dependency phase.

Regional detection probabilities should be combined with the area surveyed to calculate an area occupied estimate that can be monitored annually (McLeod and Andersen 1998). Population monitoring programs that fail to incorporate detection probability functions may bias population abundance or nest area occupancy estimates. Lower detection rates for northern goshawks breeding in coastal forests compared to interior forests may result from interference of broadcast call projection by dense coastal vegetation and rugged terrain, and similarly, from reduced abilities of surveyors to detect northern goshawks in these habitats.

References

British Columbia (B.C.) Species and Ecosystems Explorer. 2004. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Water, Land and Air Protection, Victoria, British Columbia. Available from http://srmapps.gov.bc.ca/apps/eswp/ (accessed December 2004).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2004. Canadian Species at Risk, May 2004. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario. Available from http://www.cosewic.gc.ca/eng/sct0/sar_2004_05_e.cfm

McClaren, E.L., P.L. Kennedy, and P. L. Chapman. 2003. Efficacy of male goshawk food-delivery calls in broadcast surveys on Vancouver Island. Journal of Raptor Research **37**:198–208.

McLeod, M., and D.E. Andersen. 1998. Red-shouldered hawk broadcast surveys: factors affecting detection of responses and population trends. Journal of Wildlife Management **62**:1385–1397.