

Influence of Annual Survival on Population Viability of Northern Bobwhite

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Abstract: Northern bobwhite (*Colinus virginianus*) populations have experienced range-wide declines. Population models have identified survival as an important variable influencing population change in bobwhites. However, demographic thresholds of annual survival necessary for population persistence are relatively unknown. We evaluated the influence of annual survival on bobwhite population persistence using Population Viability Analysis (PVA). Our goal was to identify biological reference points from which survival estimates could be evaluated. We developed a stochastic population model in Program VORTEX 9.94 and modeled population viability to 100 years over a range of annual survival rates (0.05–0.30) and inter-annual variability ($S \pm 0.02$ and $S \pm 0.07$; $S \pm SD$). We defined extinction as occurring when only individuals of 1 sex remained in the population. Our simulations indicated that probability of extinction decreased with increasing annual survival from 1.00 (0.05 annual survival) to 0.00 (0.23 annual survival). Mean time to extinction ranged from 5.3 ± 0.04 years ($\bar{x} \pm SE$) to 72.5 ± 2.7 years for 0.05 and 0.21 annual survival, respectively. Our analysis and prior research indicate that mean long-term annual survival rates ≥ 0.20 are necessary for >90% probability of population persistence to 100 years. Annual survival rates below this demographic threshold may be reflective of declining populations and/or possible methodological bias.

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