Environmental Variation and Demography of A Yellowstone Elk Population[TWS]

Robert A. Garrott, L. Lee Eberhardt, and Patrick J. White
Fish and Wildlife Management Program, Montana State University,
310 Lewis Hall, Bozeman, MT 59717

We conducted an intensive 7-year radio-telemetry study (1991-1998) of variations in vital rates of a nonmigratory population of elk in the upper Madison River drainage of Yellowstone National Park, Wyoming. Adult survival rates derived from 185 animal years of monitoring documented consistently high annual survival rates for animals 1-11 years of age (0.97), a pronounced onset of senescence beginning at age 12, and no animals surviving beyond age 15. The major cause of mortality was starvation in senescent animals with logistic regression indicating poorer survival in years with higher winter snowpack. Using fecal progestagen concentrations, we estimated late gestation pregnancy rates ranging from 0.83 to 0.96 annually. Logistic regression detected no significant annual differences in pregnancy rates (n=137 animal years) with a rate of 0.92 estimated for animals ≥2 years. A comparison of simulation-based parturition calf-cow ratio estimates and calf-cow ratios observed at the onset of winter suggested that 40-50 percent of the calves born each year were lost during the first 6 months of life. Overwinter calf survival, as indexed by changes in calf-cow ratios, was highly variable, with regression models revealing a strong correlation between annual variation in winter snowpack and calf recruitment. All documented overwinter calf mortality was attributed to starvation with the most severe winter conditions resulting in the virtual elimination of the juvenile cohort. Data collected in the study were synthesized into a population projection model by combining stochastic Monte Carlo simulations and the bootstrapping technique and suggested a considerable degree of stability in the system, in spite of substantial variability in final population sizes.