

Influence of Weather and Body Condition on Elk Reproductive Performance in Northern Utah

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Abstract: We observed significant between-year variation in elk (*Cervus elaphus*) calf production on the Desert Land and Livestock ranch 1988-98. Managed for mature bull harvest, this herd experienced low breeding season hunter density and high breeding season bull:cow ratios (>0.5). Following the 1988 drought, cow:calf ratios alternated between low (0.4) and high (0.7) values from one year to the next; mirroring the concurrent wet year - dry year rainfall pattern. Reproductive tracts and carcasses revealed that female elk generally bred at age 2.5, but did not reach maximum body weight until 5.5 years. Between-year variability in mean harvest weights of sexually mature cows (>1.5 years) correlated positively with April-October precipitation ($r^2 = 0.40$). Mean annual harvest weights of mature cows then correlated positively with mature cow pregnancy rates ($r^2 = 0.54$), correlated negatively with mean conception dates ($r^2 = 0.76$) and correlated positively with following-year calf production ($r^2 = 0.38$). Mature cow pregnancy rates declined in years of below-average summer precipitation ($p < 0.06$). Mean conception dates were significantly earlier in above-average than below-average rainfall years ($p < 0.05$). In dry years, age-specific pregnancy rates declined greatly in cow elk ages 3.5, 4.5 and > 12.5 . We suggest 3-4 year old cows (sub-adults in terms of weight) were unable to simultaneously lactate, gain body size and maintain body condition in dry years, therefore failed to conceive. Conversely, during the alternating wet summers these non-lactating younger and older cohorts apparently gained adequate body condition and conceived. Annual production ratios correlated negatively with prior-year production ($r^2 = 0.74$) as well as prior-year mature cow harvest weight. A multiple regression model using these two variables explained 87% of the observed variation in annual calf production ($r^2 = 0.87$, $p = 0.0001$). This analysis suggests that elk reproductive performance may be influenced and predicted by weather, body condition and reproductive status.