

FACTORS AFFECTING SPATIAL AND TEMPORAL DYNAMICS OF AN UNGULATE ASSEMBLAGE IN THE BLACK HILLS, SOUTH DAKOTA

Barbara J. Keller

Dr. Joshua Millspaugh, Dissertation Supervisor

ABSTRACT

Our goal was to gain empirical data on the spatial and temporal selection of resources by the ungulate assemblage in Custer State Park (CSP), South Dakota. To achieve this goal, we developed a spatially-explicit model to predict forage production throughout the park, evaluated factors affecting bison (*Bison bison*) and pronghorn (*Antilocapra americana*) spatial selection of resources, and evaluated diet selection and overlap, as well as habitat overlap among the ungulate assemblage. We incorporated this information into a linear optimization model which estimated optimal stocking densities for CSP. We observed considerable individual heterogeneity in the mechanisms affecting bison and pronghorn resource selection. In general, we found that forage biomass was most important to bison and pronghorn resource selection in CSP, but only when placed in the context of unique seasonal stressors, such as water and human disturbance. Diet composition of each species followed *a priori* expectations based on the physiology and natural history of the species. Annual dietary overlap was high between bison and elk (*Cervus elaphus*; 0.63), elk and white-tailed deer (*Odocoileus virginianus*; 0.60), pronghorn and mule deer (*O. hemionus*; 0.61), and white-tailed deer and mule deer (0.55). Dietary overlap was highest during the summer and lowest during the winter, whereas habitat overlap among all species was highest during winter and lowest during the summer. Female bison and pronghorn, both sexes of bison and elk, and white-tailed deer and elk used habitat in a similar manner during most seasons. In general, tradeoffs existed between maximizing bison and elk, elk and white-tailed deer, and pronghorn and mule deer populations. The model we produced will be most useful to examine theoretical relationships related to stocking densities and forage production, rather than a strictly applied estimate of ungulate carrying capacities.