

ELK FOOD HABITS AND RANGE INTERACTIONS WITH  
OTHER HERBIVORES IN WIND CAVE NATIONAL PARK

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Elk (*Cervus elaphus nelsoni*) have been the most numerous ungulate in Wind Cave National Park (WCNP), South Dakota, in recent years. If population numbers for elk and other herbivores increased substantially, a marked effect on available forage may occur. Information on movement, on herd organization, and on areas of intensive use has been obtained previously (Varland 1976). Additional information is necessary for rational management of elk in the Park. Wind Cave National Park is an 11,355 ha park in the southern Black Hills. The vegetation is ecotonal between the coniferous forest of the Black Hills and mixed grass prairie of the Great Plains. The Park is surrounded by a woven-wire fence 1.2 to 2.4 m high. Field work was conducted from 6 June 1976 through 12 August 1977. A summary of data gathered during 1976 was reported earlier (Wydeven 1977).

Study Objectives

- A. Determine food habits of elk and pattern of range use.
- B. Determine principal forage species and select methods for evaluating forage trends.
- C. Investigate competition for forage among herbivores, chiefly bison, antelope and prairie dogs.
- D. Evaluate health of the elk population and measure its productivity.

Methods

Two elk were killed each month from July 1976 to July 1977, and six additional elk that died from other causes were obtained during the period. Post-mortem examinations were performed and standard body measurements made of these elk. Rumen samples were obtained from these 30 animals as well as 21 others killed by hunters in adjacent areas. Rumen analysis was done using a modified point-analysis method described by Heady and Torell (1959).

Examinations of vegetation at feeding sites were conducted according to procedures given by Cole (1956). Grasses were tabulated as one-instance-of-use per bunch for short grasses, per stalk for midgrasses and per shoot for tall grasses.

Vegetation analysis was conducted using 2 x 5 dm quadrats for herbaceous cover, 1.22 x 1.22 m quadrats for shrubs, and the point-centered quarter method for trees. Two types of analyses were performed: 1) quantitative determination of available forage at each site where an elk was killed, and 2) quantitative determination of forage at major range and woodland sites at 3-month intervals. Both analyses were done by stratified random sampling, using 48 plots at kill sites and 60 plots at range sites seasonally.

Observations were made of ungulates to determine habitat relationships and spatial distributions. Additionally, browse surveys (Cole 1963) were made and information was gathered on calving sites.

### Results and Discussion

Seasonal range-site analysis was conducted in fall, winter, spring, and summer in each of 8 vegetation types (Table 1). Clayey and silty sites were characteristically flat prairie with an absence of shrubs and small amounts of forbs. Shallow and stoney hills sites were sloping prairie with scattered shrubs and moderate amounts of forbs. Overflow sites had dense stands of snowberries (Symphoricarpos occidentalis) but also grass and forbs. Woodland sites varied from pure stands of ponderosa pine to ponderosa pine with occasional Rocky Mountain juniper (Juniperus scopulorum).

Rumen samples were obtained from 16 adult males, 9 adult females, a 2-year-old male, a yearling male, a yearling female, a calf male, and a calf female. Average weight of the adult males was 332 kg (277-406 kg) and average weight of 6 adult females was 226 kg (208-241 kg). Weights of other animals were as follows: 2-year-old male, 226 kg; yearling male, 172 kg; yearling female, 180 kg; and calf female 78 kg (estimated). Two calves (less than 1 week old) captured, tagged, and released in late spring, had weights of 18 kg (male) and 19 kg (female).

That elk fed mainly on forbs in fall and winter and on graminoids in spring and summer (Table 2) was determined from rumen analysis. A total of 92 feeding-site examinations with 32,469 instances-of-use were made. Late summer and fall food habits were reported previously (Wydeven 1977). Forb use was high in winter, especially on Louisiana sagewort (Artemisia ludoviciana). Forty-five percent of the instances-of-use for feeding-site examinations in April and early May was on threadleaf sedge (Carex filifolia). During late spring and summer, high use was made of graminoids. Big bluestem (Andropogon gerardii) comprised 83 percent of instances-of-use for late May through early August. This high use of grass was not detected with rumen analysis. Substantial use of browse occurred only during the summer when elk chiefly fed on leaves of lead plant amorpha (Amorpha canescens).

Between 24 June 1976 and 10 August 1977, 43,978 sightings of ungulates were recorded. These consisted of 4,457 sightings of elk, 32,772 of bison (Bison bison), 4,921 of pronghorn (Antilocapra americana) and 1,828 of mule deer (Odocoileus hemionus). Elk were seen frequently in all seasons on shallow, stoney hills and forest sites. Bison chiefly used silty, overflow, and clayey

sites. Pronghorn often used silty and stoney hills sites in winter and spring but in summer made more extensive use of silty sites. Mule deer utilized shallow, overflow, and forest sites, with more extensive use of shallow sites in winter. Bison and pronghorn increased their use of prairie dog (Cynomys ludovicianus) towns in summer.

Vegetation was analyzed at the kill sites of 25 elk. These analyses will be used to determine whether elk select for certain plants.

Elk examined post-mortem were in fairly good condition. Ectoparasites of 25 elk consisted of Dermacentor albipictus on 12 elk, Dermacentor andersoni on 1 elk, and Neolipoptena ferrisi on 2 elk. Endoparasites of 20 elk consisted of coccidium in 2 animals, Fascioloides magna in 1 elk, a Trichuroid in 1 elk and Cephenemyia trompe in 1 elk. The summer calf:cow ratio for two of the three herds in the Park was 76:100; in the fall of 1976 this ratio was 64:100.

Browse surveys were conducted in the spring at three locations in the Park. All areas had low utilization by ungulates and true mountainmahogany (Cercocarpus montanus) had vigorous growth.

#### Recommendations and/or Conclusions

Information in this report should be considered as preliminary. Further analysis of data collected in 1977 is needed before definite conclusions can be drawn. Further analysis of the data should be made to determine ungulate selection of key forage species and range sites including burned areas and prairie dog towns. Evaluations of habitat selection and food habits should enable the assessment of competition between elk and other herbivores.

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Table 1. Major Range and Woodland Sites, Wind Cave National Park, South Dakota, and the Vegetation Types Associated with Them. Forage Weights are Dried Weights Available 19 July to 6 August, 1977.

Range or Woodland Site	Percent of WCNP	Vegetation Type	Forage (kg/ha)
Silty	27	Western Wheatgrass - Needleandthread Prairie	863
Shallow	36	Little Bluestem Prairie	934
Stoney Hills	10	Big Bluestem - Leadplant Amorpha Prairie	1,278
Overflow	5	Green Needlegrass - Snowberry Bottomland	1,556
Clayey	3	Western Wheatgrass - Green Needlegrass Prairie	890
Ponderosa Pine 1 & 2	13	Ponderosa Pine Forest	150
Ponderosa Pine 3	4	Ponderosa Pine - Juniper Woodland	326

Table 2. Mean Percent Occurrence and Range of Forage Classes in the Rumens of Elk from Wind Cave National Park, South Dakota. Tr = trace.

Forage Class	Summer N=8	Fall N=6	Winter N=12	Spring N=4
Forbs	37 (3-78)	61 (54-70)	54 (18-82)	29 (19-44)
Graminoids	51 (17-94)	34 (20-44)	45 (12-80)	65 (35-80)
Browse	12 (1-20)	5 (tr-10)	Tr (tr-2)	2 (0-22)
Succulents	Tr	0	1 (0-4)	Tr (0-1)