

ELK MOVEMENTS, HABITAT USE, AND POPULATION DYNAMICS IN  
THEODORE ROOSEVELT NATIONAL PARK

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Objectives

- 1) Description of daily and seasonal movements of elk (Cervus elaphus);
- 2) Identification of seasonally important habitat types and physiographic character of areas used for feeding, cover, mating, and calving;
- 3) Identification of damage to Park resources or property of adjoining landowners by elk;
- 4) Description of interactions between elk and other ungulates and identification of interactions that could detrimentally affect specific ungulate species;
- 5) Determination of human impacts on elk behavior and distribution in the Park; and
- 6) Description of elk age structure, productivity, and survivorship during 1987-88 and development of population goals that are consistent with Park management goals.

Methods

Habitat use patterns, movements, and population structure have been described through direct observation. A radiocollared animal is selected as a "target" and located using a radio receiver and hand held directional antenna. Activities, movement distances, and habitat types occupied by the target animal and its associates are noted at 5-minute intervals for 1 to 4-hour periods. This procedure sacrifices independence of individual observations (with minimal significant autocorrelation in 1-hour blocks tested during 1985 for the first phase of this study) to increase efficiency of data collection and reduce disturbance of elk. Locations of other ungulate species are noted while searching for elk and when seen during observation of elk groups.

Incidental information on elk distribution is collected from site investigations of elk sightings by tourists and residents of areas adjacent to Theodore Roosevelt National Park. Additional information will be available from a trail survey to be conducted in summer 1988. The trail survey will consist of counts of elk fecal pellet groups on randomly selected trail segments throughout the Park and in areas adjacent to the Park boundary.

Vegetation measurements (canopy coverage, species composition, and vegetation utilization in 3 height strata and production estimates for specific browse species) will be made in summer 1988 on plots established in 1982-86. Emphasis will be placed on detecting changes that could be attributed to elk by comparing plots in areas used by elk with those in areas in which elk use is absent or minimal.

Habitat use patterns and food habits information collected in this study and studies by Sullivan (thesis in preparation) and Norland et al. (1985) will be used to identify overlaps in forage and habitat use among ungulate species in the Park. Estimates of plant productivity by species/genus by habitat type taken from the literature and our work in the Park will be incorporated with ungulate food habits and habitat use information to produce an approximation of optimum population levels for elk, mule deer (Odocoileus hemionus), white-tailed deer (O. virginianus), bison (Bison bison), and feral horses.

## Results and Discussion

### 1) Movements and distribution

Five adult female and 3 male elk carried functioning radios early in 1987. One radiocollared male left the Park in late winter/spring 1987 and the transmitter on another male worked only intermittently. The remaining animals provided the bulk of information on movement.

Daily movements differed among sexes with female-calf groups frequently moving < 1 km and male groups 3 or more km between locations on consecutive days. Differences were most marked in early summer.

Females, yearlings, and calves were organized in small (1-10 animals) groups in June but coalesced into 1 large group by late July. Cow-calf groups were dispersed in the southeastern quarter of the Park in early summer but tended to concentrate in one area along the southern boundary later in summer (Figure 1).

Males were organized into 3 small groups in early summer and occupied areas to the north and west of 1986 locations (Figure 1). Single bulls occasionally associated with the large cow-calf group in mid summer. The radiocollared bull that left the Park in late winter 1987, evidently accompanied by an unmarked bull, was never relocated, but reports of 2 bulls, 1 wearing a radiocollar, were received throughout summer and fall

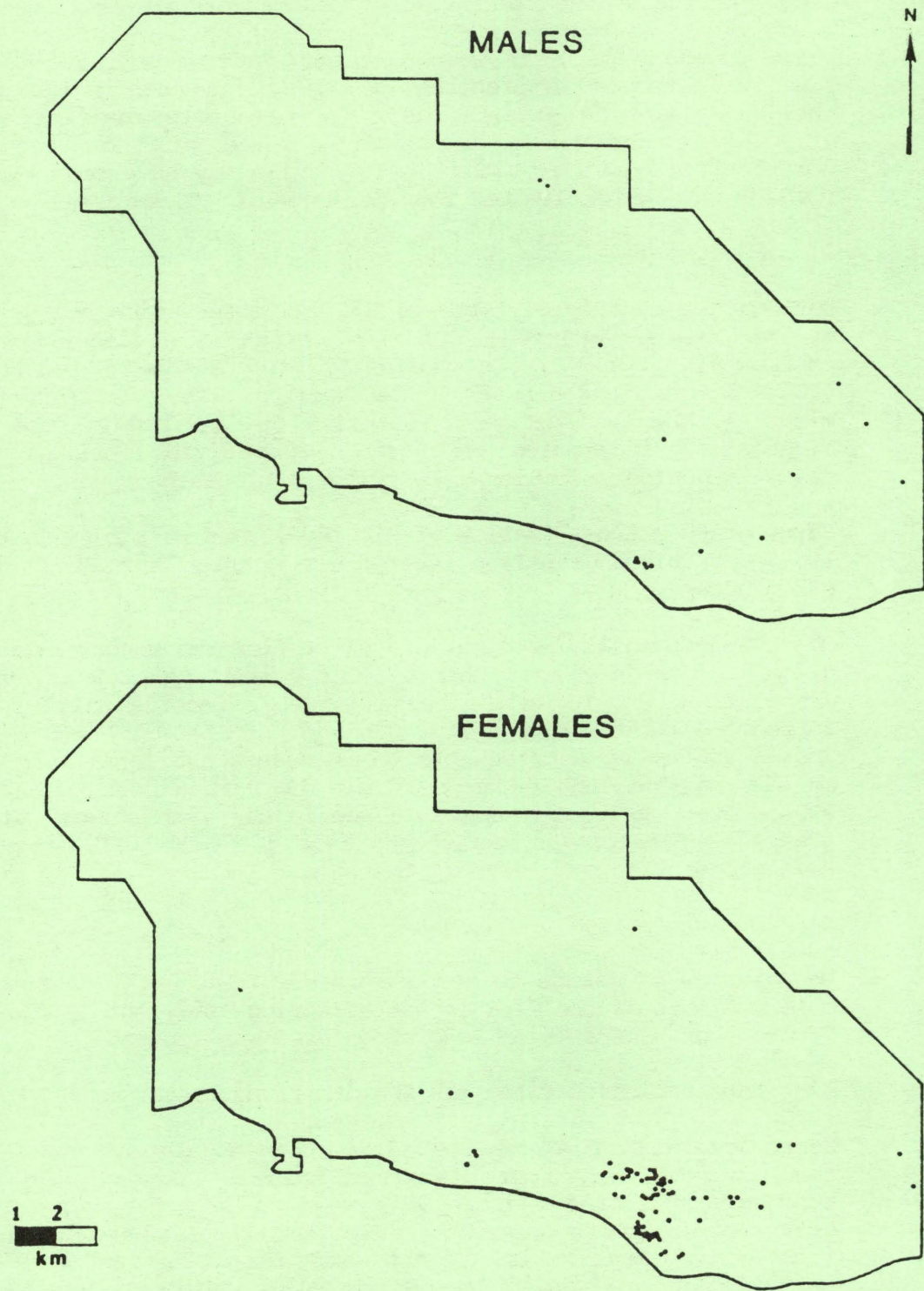


Fig. 1. Radio relocations of elk in Theodore Roosevelt National Park for summer 1987.

at distances of 160-475 km from the Park. Male groups joined female groups in the southeastern quarter of the Park in August.

Daily movement patterns were similar to those observed in summer 1986 (Sullivan, thesis in preparation). The increase in the proportion of the Park used was expected as elk became more familiar with the area into which they were introduced. Use of the northeastern and northcentral portion of the Park by bulls may have been encouraged by a road closure which limited tourist access to these areas.

## 2) Habitat use

During June - early September 1987, 126 observation hours (>21,000 elk-minutes) were completed. Of the habitat types identified by Norland (Marlow et al. 1984), elk apparently selected the Introduced Grass type (33% of total elk-minutes), the Rolling Scoria Complex (21% of elk-minutes), and the Agropyron smithii - Stipa viridula type (16% of elk-minutes). Midday inactive periods were divided between the hardwood draw and Juniper scopulorum - Oryzopsis mircantha types.

Physiographic types (Marlow et al. 1984) used most heavily during summer 1987 were Upland Grassland (40% of elk-minutes) and Scoria Hills (32% of elk-minutes).

Observations in 1987 indicated a shift from the concentration in Juniper draws for midday rest observed in summer 1986 (Sullivan, thesis in preparation) and marked increase in use of scoria hills and areas with introduced grasses (primarily Agropyron cristatum) for feeding. The increases may be attributable to increased availability of these types as elk expanded their range within the Park and/or to an abundance of sweetclover (Melilotus spp.) in scoria hills and areas with introduced grasses. Sweetclover was abundant in 1987, and elk frequently fed in sweetclover stands throughout the summer.

## 3) Identification of damages

No evidence of damage to resources within the Park was noted. Elk were observed outside the Park in winter/spring 1987, but little or no damage to crops or haystacks on adjoining farms was reported.

## 4) Interactions between elk and other ungulates

Overt interactions between elk and other ungulates were rare. Elk did tend to move away from bison and horses. Single mule deer adopted submissive postures (Geist 1981) when in proximity to elk, but larger groups of deer were observed feeding through elk herds with no hindrance from elk. Mule deer, bison, and feral horses were observed in physiographic classes favored by elk. White-tailed deer were seen almost exclusively in habitats not utilized by elk in summer 1987.

#### 5) Human impacts

All elk groups used isolated areas of the Park more frequently than areas which were easily accessible to tourists. Bull groups in the northcentral portion of the Park left the area ~ 1 week after the Loop Road was reopened. This coincided with movement of bulls to join cow groups, however, and may be related to the beginning of the rut rather than human disturbance. Elk disturbed by tourists and researchers consistently ran >0.5 km into dense tree cover. Elk that detected us during observation periods remained alert and eventually moved away. After nearly 3 years in the Park, elk show little sign of habituation to humans. Elk were, however, frequently observed feeding in open areas within 200 m of heavily traveled roads along the Park boundary. If vehicles stopped within ~0.5 km, the animals would move away from the road.

#### 6) Population dynamics and management goals

Twenty-nine calves produced in May 1987 survived to the end of summer, a 14% increase over 1986. At least 2 animals (2 males) left the Park in 1987 and 1 female, injured in winter 1987, is assumed to have died. Counts in late August - early September 1987 indicate a minimum of 107 elk in the Park (Table 1), an increase of 32% from counts in August 1986.

The high calf production (73% of females 2 years and older evidently produced calves that survived through summer), high calf survival to 1 year (an apparent 100% survival of calves produced in 1986), and the rapid development of antlers in males (most 3-year-olds produced antlers with 5-6 points) indicate a healthy productive herd which has not encountered problems with forage quality or quantity.

#### Conclusions

During the 3 years since introduction, the elk population in Theodore Roosevelt National Park has increased in numbers, range, and, to a lesser extent, observability by visitors in the Park. Problems with elk condition/health, overuse of vegetation, competition with other ungulates, and damage to adjoining farms have not developed. Data we collect and the model of optimum population levels that will be constructed during this project should help Park staff avoid many potential problems and manage those that do occur.

#### Literature Cited

Geist, V. 1981. Behavior: adaptive strategies in mule deer. Pp. 157-223 in Wallmo, O. C., ed. Mule and black-tailed deer of North America. Univ. NE. Press, Lincoln.

Table 1. Minimum number of elk in Theodore Roosevelt National Park determined from counts in August - September 1987.

Age/sex class	Minimum number
Adult females (5 collared)	40
Yearling females	13
Adult males (2 collared)	13
Yearling males	12
Calves	29
Total	107

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