

DISTRIBUTION, MOVEMENTS, HABITAT USAGE, FOOD HABITS, AND
ASSOCIATED BEHAVIOR OF REINTRODUCED ELK IN THEODORE
ROOSEVELT NATIONAL PARK

Lynn R. Irby
Clayton B. Marlow
Harold D. Picton
Mark G. Sullivan

Biology and Animal and Range Science Departments
Montana State University
Bozeman

Objectives

1. Determination of daily and seasonal movements of elk (Cervus elaphus).
2. Identification of vegetation and physiographic characteristics of habitats and/or habitat complexes used for feeding, cover, mating, and calving.
3. Determination of seasonal and yearlong range.
4. Identification of actual or potential damage to park resources (including structures, vegetation, and other animals) that could be attributed to introduction of elk.
5. Description of daily and seasonal activity and behavior patterns of elk.
6. Description of elk population changes during the study, and prediction of elk carrying capacity for each unit of Theodore Roosevelt National Park (TRNP).

Methods

Observation - Completely randomized selection of elk for observation has proven difficult, especially in summer when activity is largely nocturnal or crepuscular and heavy use of hardwood draws occurs. The strategy of choosing a radio collared animal as a "target" then observing the first elk group encountered while searching for the target appears to be adequate. The difficulty in locating and maintaining visual contact with elk in summer has forced us to deviate from a standardized observation length and number of animals, but correlation analysis indicates that summing sequential data from several animals into 2-h blocks reduces autocorrelation to nonsignificant levels.

Radiotelemetry - Three approaches have been utilized. A hand-held antenna is employed in locating elk for observation and in determining seasonal home ranges for radio collared animals. Night movements and use areas have been investigated using antennas mounted on 5-m towers. The use of two

tower-receiver systems (the maximum number available due to limited equipment and personnel) does not allow precise triangulation but does allow us to make general assessments of night movements and use areas. Aerial relocation has been used on three occasions to obtain fixes on radio collared elk that left TRNP.

Vegetation measurement - Permanent transects of 20 m (woodland vegetation types) or 30 m (open types) were established and marked using metal stakes. Measurements in wooded types include ground coverage by species (Daubenmire plots) at 1-m intervals, counts of shrub stems in 1-m² plots at 3-m intervals, and counts of trees and saplings in a 60-m² strip. Use of forage <2 m in height is assessed visually by species (0-20% = light; 20-50% = moderate; >50% = heavy) in each stratum. Open vegetation types are assessed using microplots for ground stratum plants and a line-intercept for shrubs.

Fecal analysis - Feces and plant reference materials collected in TRNP will be sent to the Food Habits Laboratory, Washington State University, where microhistological techniques will be used to obtain frequency of occurrence of plant items in the feces.

Results

(1) Determination of daily and seasonal movements of elk.

Elk seasonal movements in summer, autumn, and early winter were monitored via relocation of radiocollared animals and sightings of uncollared animals on 10-15 days per month during June - November 1985. After release, a minimum of three elk left TRNP. Remaining animals concentrated in the southeast corner of the Park during summer and early autumn but most moved to the central park area in September (Figure 1). Elk were dispersed in small groups in summer but coalesced into a single large group by early autumn.

Daily movements were investigated using diurnal observation and nocturnal radio relocation. Daily movement (linear distance between early morning and dusk locations) varied from < 1 - 5 km. Night movements showed a similar pattern. Home ranges, based on diurnal relocations, for radio collared animals averaged 4,400 ha in summer and 8,700 ha in autumn (Table 1).

Observations will be continued in spring and summer 1986 and supplemented with a trail survey of pellet groups in summer 1986 to determine yearlong distribution in the South Unit of TRNP after the first year of elk presence.

(2) Identification of elk habitat use in TRNP.

Observations of elk (80-100 h per season) indicate hardwood draws provide important summer cover and juniper breaks cold weather cover. Agropyron smithii - Stipa viridula grasslands and hardwood draws dominated by Flaximus pennsylvanica were important feeding areas in summer. Mating activities this year were concentrated on upland grassland and adjacent breaks. Most calving evidently occurred in hardwood draws. Availability of surface water had an

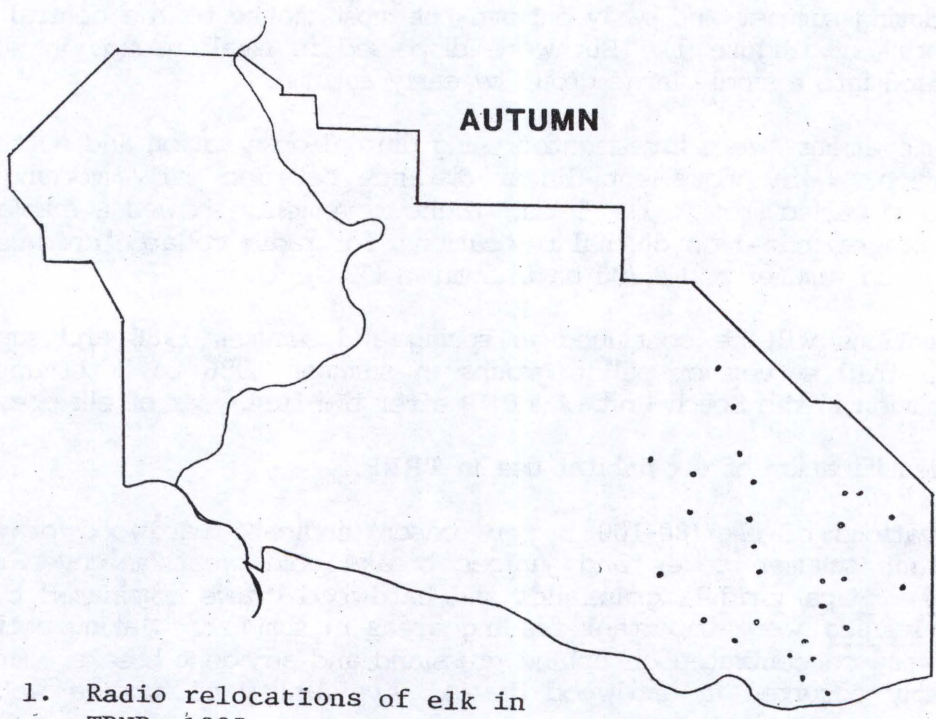
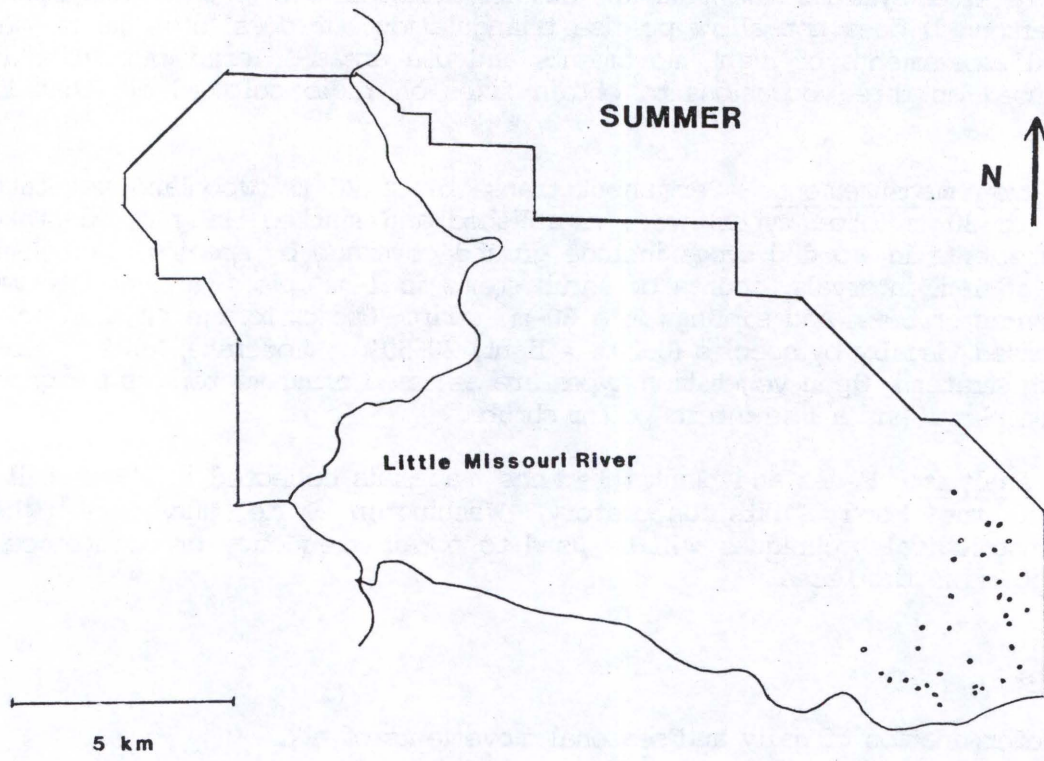


Fig. 1. Radio relocations of elk in TRNP, 1985.

Table 1. Summer (mid-June - mid-September) and autumn (mid-September - mid-November) home ranges (ha) for three radiocollared elk in TRNP.

Elk	Sex	Summer		Autumn	
		Relocations	Size	Relocations	Size
1	Male	a		27	8700
2	Female	27	4400	27	8700
3	Female	24	4100	27	8700

^a Occupied area 5 km south of Park boundary.

important influence on summer distribution.

(3) Determination of diets.

Observation of feeding elk indicated ground stratum plants were the dominant summer-autumn food items. Shrubs and low trees were important in summer. Fecal pellets were collected during autumn and early winter. This material, along with fecal collections in late winter, spring, and summer 1986, will be analyzed to determine the contribution of specific plant items to seasonal diets.

(4) Identification of damage to Park resources.

Two sets (high elk use and low/no use) of permanent vegetation transects were established in hardwood draws and Juniper (Juniperus scopulorum) woodland. Additional transects will be established in cottonwood (Populus deltoides) and sagebrush (Artemisia tridentata) types. Transects established in 1985 and those established in 1983 for a bison (Bison bison) study in TRNP will be monitored during summer 1986 for changes attributable to elk use.

Observations of interactions between elk and other ungulates in the Park indicate elk are dominant to mule deer (Odocoileus hemionus) and subordinate to horses and bison. Displacements of one species by another have been no more than local and temporary. Too few data are available to assess longterm effects of elk reintroduction on distribution or population structure in the ungulate complex in TRNP. Fecal samples from horses and deer (O. hemionus and O. virginianus) are being collected to obtain an index of dietary overlap with elk.

(5) Determination of daily and seasonal activity.

Activity (feeding, resting, social, interspecific interactions, other) of all elk visible was noted at 5-min intervals during 1-6 h observation periods in summer and autumn 1985. Diurnal feeding was more pronounced on cool than on warm days. Social interactions peaked during the September rut. Late winter, spring, and early summer activity data will be collected in 1986.

Data collected in summer 1985 (99 observation hours on 34 days including 13,452 activity notes) indicated that 80-100 h of activity observation per season is a feasible goal. Elk associations are sufficiently fluid that use of radio collared animals to locate elk for observation allowed us to sample a reasonable percentage of the herd with minimal biases towards specific individuals or age/sex classes.

(6) Description of elk population changes and carrying capacity.

Population classifications during the rut indicated that few, if any, animals released in 1985 died during the first 6 months in the Park. Survival of calves to autumn was good, and cow-calf ratios were characteristic of a healthy herd (Table 2).

Estimates of elk carrying capacity will be made after diet has been determined from fecal analysis and supplemental vegetation work is completed in 1986.

Table 2. Population structure of elk in Theodore Roosevelt National Park, March and September 1985.

Date	Males	Females	Calves	Unknown
March (Transplant)	7	38	1	1
September In Park	8	37	16	
Outside Park	1	1	1	