

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

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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 elk make heavy use of wooded vegetation types. The strategy of choosing a radiocollared animal as a target and observing the first elk group encountered while searching for the target has proven to be an effective alternative. Elk movements and use of wooded vegetation types have also forced us to deviate from a standardized observation period. Preliminary analyses indicate that neither of these deviations from an optimal experimental design have introduced major biases in our data.

Radiotelemetry - Three animals (2 males and 1 female) were captured and fitted with radio transmitters in late spring 1986 to bring the sample of functional radiocollars up to 4. A handheld antenna was employed to locate elk for

observation (habitat use, activity, seasonal home ranges, etc.). Nocturnal movements and habitat use were investigated using 3 antennas mounted on 5-m towers.

Vegetation measurement - Eighteen permanent vegetation transects established in wooded vegetation types in 1985 were measured in 1986 to determine changes attributable to elk. Additional transects were established in woodland and open vegetation types. Woodland transects extend 20-m and open transects 30-m. All transects are marked with 2 metal stakes, and their locations have been identified on maps and in detailed written descriptions. Measurements in woodland types include ground coverage by species (Daubenmire plots) at 1-m intervals, counts of shrub stems by species and height class in 1-m plots at 3-m intervals, and counts of trees and saplings by species in a 20x3-m plot. Herbivore use of plant species was estimated (0-20% = light, 20-50% = moderate, and >50% = heavy). Open vegetation types were assessed using a microplots for measurement of herbaceous plants and a line-intercept for shrubs.

Fecal analysis - Feces and plant reference materials collected in TRNP have been sent to the Wildlife Habitat Laboratory, Washington State University, where microhistological techniques will be used to identify major seasonal food items for elk, feral horses, mule deer (Odocoileus hemionus), and white-tailed deer (O. virginianus).

Results

1. Determination of daily and seasonal movements of elk.

Elk movements in 1986 have been described based on relocations of radiocollared animals and sightings of unmarked animals on 11-19 days per month during March - September 1986. Elk use in the TRNP in 1986 was concentrated in the eastern half of the South Unit (Figure 1). Greatest movements occurred in late spring - early summer when cows dispersed prior to calving. Elk were scattered and in small groups during mid summer but coalesced into a single large group by early autumn. Several elk (1-6) were reported outside TRNP during 1986, and ~ 5 evidently were outside the park as late as December (R. Fox, pers. commun.).

Diurnal movements (linear distance between early morning and dusk locations) varied from <1-5 km. Precise location of animals by triangulation using the 3-tower system available was not possible due to errors in bearing induced by topography and/or distance from towers to radiocollared animals, but we were able to determine general areas of night use and to make estimates of night movement. Nocturnal movements appeared to be comparable to those made during the day. Movements between feeding locations and cover rarely exceeded 2 km in day or night monitoring.

2. Identification of elk habitat use in TRNP.

A survey of pellet groups on trails in TRNP (Figure 2) was conducted in August. Pellet group distribution closely matched our estimates of distribution obtained

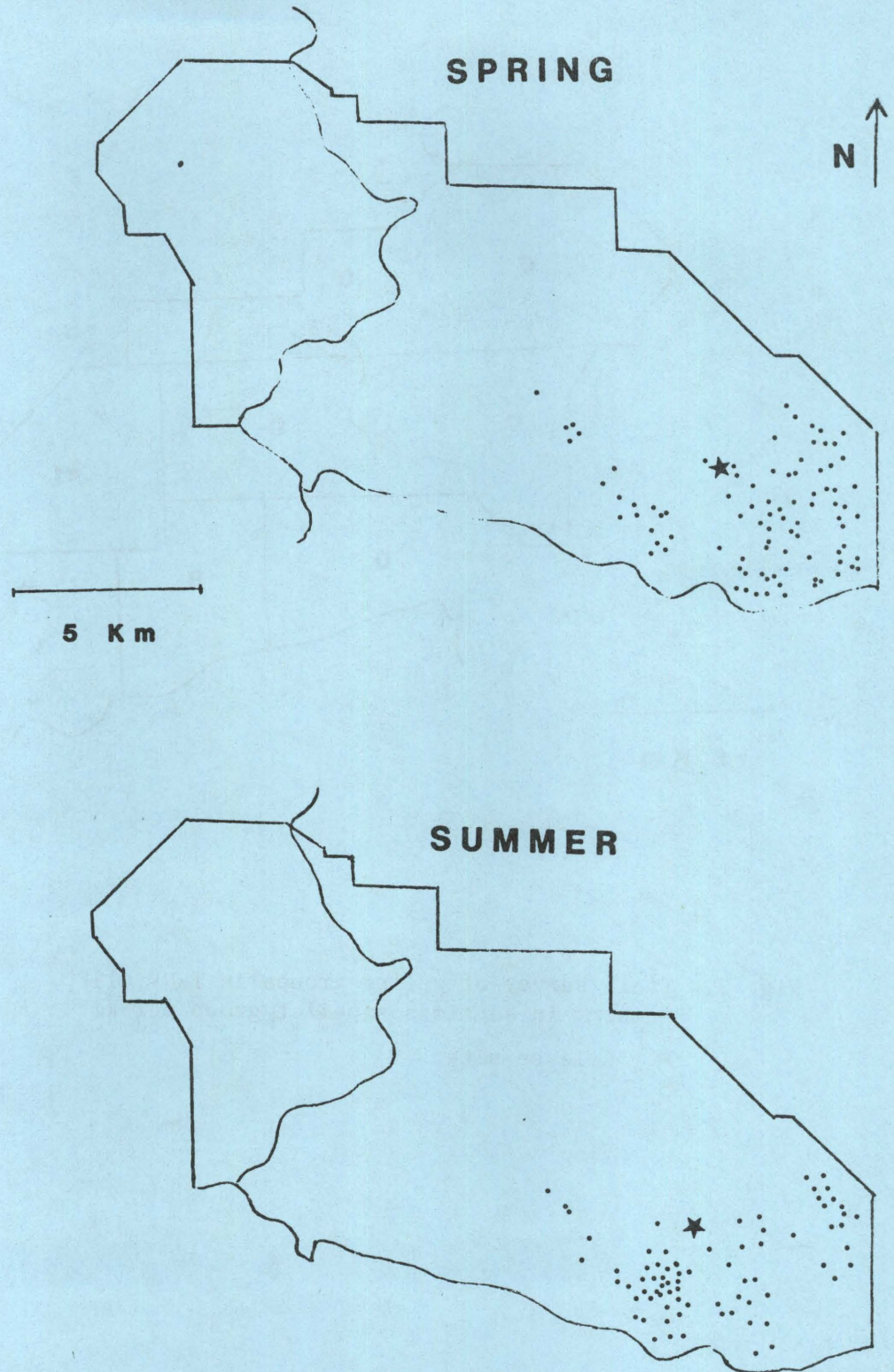


Fig. 1. Radio relocations of elk in TRNP, 1986.
Spring = March 15 - June 15
Summer = June 15 - Sept. 15
★ = Release site

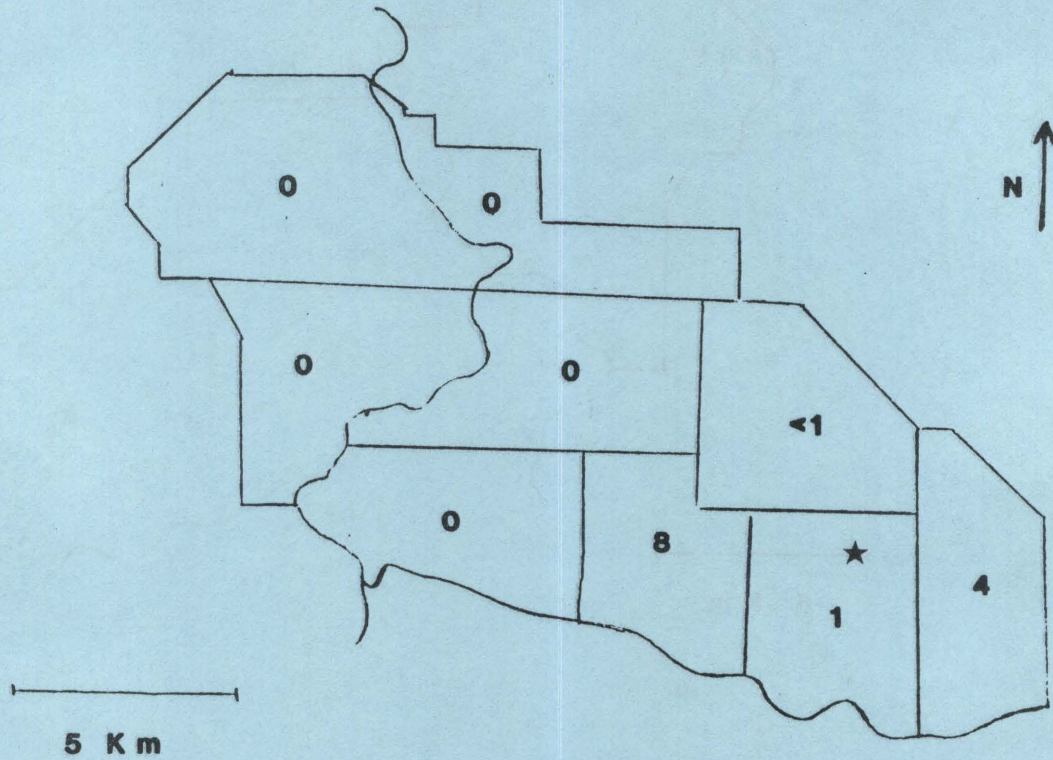


Fig. 2. Trail survey of pellet groups in TRNP, 1986.
Numbers in sections = pellet group per km.

★ = Release site

by observation of elk indicating that our observations sampled all major use areas in TRNP.

Elk observations (80-130 hours/season in spring and summer 1986) indicate a shift in habitat use between 1985 and 1986. Juniper (Juniperus scopulorum) woodlands replaced hardwood draws as the most heavily used wooded habitat. Agropyron smithii and Stipa viridula grasslands were the most heavily used open vegetation types in spring and summer. Areas dominated by introduced grasses received heavy use in late spring. Most calving occurred in juniper woodlands.

3. Determination of diets.

Observations of feeding elk indicated ground stratum plants were the dominant spring-summer food items. Observed use of shrubs and trees increased through summer. Fecal material from elk, deer, and horses was collected to complete our seasonal samples. Results will be obtained from the Wildlife Habitats Laboratory by spring 1987.

4. Identification of damage to park resources.

Two sets (high and low elk use) of woodland vegetation transects measured in 1985 and 1986 indicated that changes between 1985 and 1986 were not attributable to elk. The difference between plant growth in dry (1985) and wet (1986) years masked any effects of herbivores on the vegetation. Future measurements of these transects and those established in 1986 should provide more definitive information.

Observations of interactions between elk and other ungulates in TRNP indicate a linear dominance hierarchy (bison > horses > elk > deer). Observed displacements of one species by another have been local and temporary. Information on distribution, productivity, and habitat use patterns of other ungulate species in TRNP relative to elk (obtained during elk activity observations, ground searches, and road transects) will be analyzed in 1987. Seasonal dietary overlap will be calculated when fecal samples have been analyzed. No damage to Park structures has been noted.

5. Determination of daily and seasonal activity.

Activity (feeding, resting, moving, intraspecific and interspecific interactions) of all elk visible was noted at 5-min intervals during 1-6 h observation periods in spring and summer 1986 (total observation hours = 210). Diurnal feeding was more pronounced on cool than on warm days. Social interactions peaked during the September rut. Supplementary data on winter activity patterns will be collected in 1987.

6. Description of elk population changes.

A near-complete count and classification of the population in March 1986 indicated that winter mortality was negligible (Table 1). Calving occurred in early June. The late August cow-calf ratio (60:100) was higher than that recorded in early September 1985 (45:100) and indicative of a highly productive herd.

Table 1. Population structure of elk introduced into Theodore Roosevelt National Park.

Census period	Males (>1 yr)	Females (>1 yr)	Calves	Total
March 1985 (Transplant)	8	36	3	47
September 1985				
In TRNP	8	37	16	61
Outside TRNP	1	1	1	3
Total	$\overline{9}$	$\overline{38}$	$\overline{17}$	$\overline{64}$
March 1986				
In TRNP	8	37	16	61
Outside TRNP		1		1
Total	$\overline{8}$	$\overline{38}$	$\overline{16}$	$\overline{62}$
August 1986				
In TRNP	15	41	25	81
Outside TRNP ^a		1		1
Total	$\overline{15}$	$\overline{42}$	$\overline{25}$	$\overline{82}$

^a Five to six elk were reported outside TRNP during autumn and could have been outside the Park during August.