

MOVEMENTS OF THE ROOSEVELT ELK

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Abstract. Eighty-five Roosevelt elk were tagged and home ranges determined for two herds in Prairie Creek Redwoods State Park, California. The size of the home range was 506 and 845 acres, with daily movements of 0.31 and 1.40 miles per day. Physical barriers limited the home range in one herd and natural features set the boundary for the home range in the other herd. Young elk and bulls were most prone to explore new territory. Bulls divided or combined separate herds of elk during the rutting season, but all the animals returned to their original home range after the rut. The bulls dominating the major portion of the rutting season resided within the herd's home range. Size of the home range appeared to be more associated with available forage than any other factor.

INTRODUCTION

Roosevelt elk (*Cervus canadensis roosevelti*) were tagged in Prairie Creek Redwoods State Park, California to trace extent of movements, discover factors limiting home range, and determine the degree of interchange between herds. The Boyes Prairie Herd and Gold Bluff Beach Herd (Beach Herd), each numbering about 40 animals, were selected for study because of their unwariness and acceptance of human intrusion.

The Park is characterized by steep hills and permanent streams draining canyon bottoms. Tall bluffs (Gold Bluffs) occur along the coast, rising 100 to 250 ft. They are bordered on the west by a long, sandy beach approximately 100 to 200 yards wide. The principle grasslands are Boyes Prairie, comprising about 170 acres, and a strip of grassland between Gold Bluffs and the ocean of about 75 acres.

The field work was conducted from April, 1964 to March, 1965.

Financial assistance was provided by the California Division of Beaches and Parks, for which I am grateful. I am indebted to the following persons for their help during the study: Dr. Raymond F. Dasmann, Dr. Richard E. Genelly, Dr. Stan W. Harris, Mr. Glen Jones, Mr. Joseph D. Hood, Mr. Dimitri Bader, Mr. Richard Hafenfeld, Mr. James A. Harper, Mr. Marschall C. Stevens, and Mr. James D. Yoakum.

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² Editor's Note: This paper was not presented at the 1973 Annual Meeting. It is an additional paper to the Transactions since its contents were deemed of significant value to the California-Nevada area.

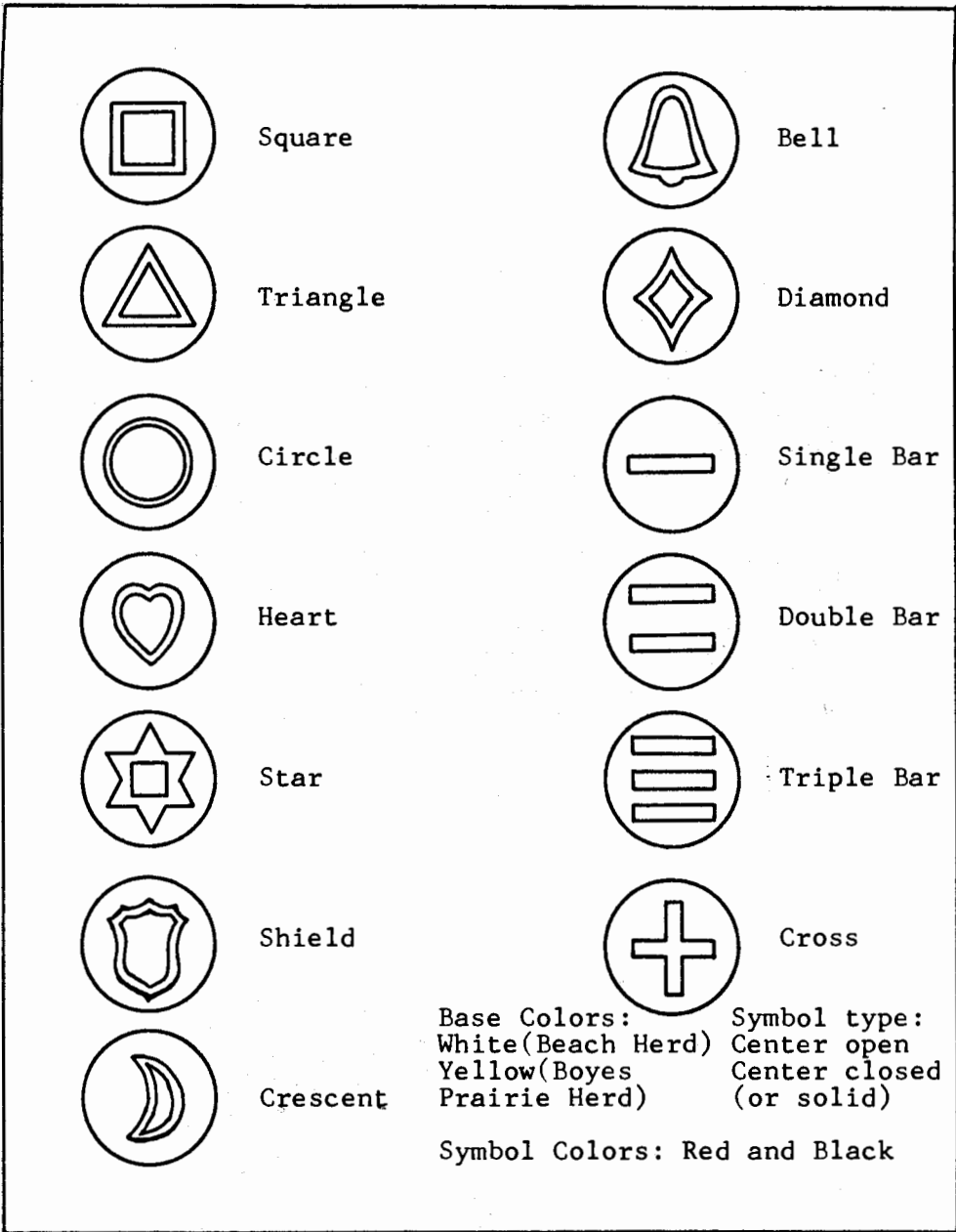


Figure 1. Coded elk tag symbols used during the study.

Figure 2. A coded ear tag being applied to a female elk. The blindfold helped to reduce stress during immobilization.



Figure 4. The Gold Bluff Beach Herd during the rutting season. Gold Bluffs may be seen to the right.



METHODS AND MATERIALS

The California Fish and Game Commission granted a permit to capture elk with the use of drugs. The Cap-Chur Gun was used to inject the drug succinylcholine chloride (muscle relaxant) for immobilizing elk. Immobilization occurred with a lowering of the head, trembling of legs and short lunges, culminating in collapse of the animal.

An inconspicuous marking system was desired because the elk were frequently viewed by the public. A round cattle tag, one and three-eighths inches in diameter, was selected for the marking device. Johnson's (1951) color-symbol code was modified to designate individual animals (Figure 1). By varying base color, symbol color, and symbol, every animal could be identified. A 25-power spotting scope was used to identify individual elk up to 100 yards away.

Blindfolding elk helped to reduce stress caused by the immobilizing and tagging operations (Figure 2). An antiseptic cattle cream (Bag Balm) was applied to the needle before firing and to the puncture wound to prevent infection.

Drug dosages were estimated according to four age classes: calf (birth to 11 months), yearling (11 months to 2 years), 2 year old (2 to 2 1/2 years), and adult (2 1/2 years or older). Results from a particular dosage within an age class were consistent because of the low magnitude of weight differences. Once an effective dosage for each age class was determined, dosages were altered as drug tolerance increased or decreased with the season (Table 1). However, variables such as an occasional larger or smaller elk and animals in poor condition had to be taken into consideration.

A total of 85 elk were tagged during the study, including all of the Boyes Prairie Herd and Beach Herd. Also, it was possible to tag all the bulls that associated with either of these herds during the rutting season.

RESULTS

Home range has been defined as ". . . that area transversed by the individual in its normal activities of food gathering, mating, and caring of young (Burt 1943)." In general, one portion of the home range is used more frequently than the remainder. Such an area can be considered the "center" of the home range, but it may not be in the geographic center. The home ranges of the Boyes Prairie and Beach herds were linear in form, with well defined "centers".

Gold Bluff Beach Herd

The home range of the Beach Herd extended along 6 miles of Gold Bluff Beach, the slopes of Gold Bluffs, and the Ossagon Creek Headlands (Figure 3). This elongated home range covered about 845 acres. The Beach Herd used the area around Home Creek most frequently, accounting for 25% of all observations. Home Creek was considered the "center" of the home range. The south end of the home range was least used, probably because of the lack of suitable forage.

Daily movements of the Beach Herd were extensive. Herd movements between two consecutive days were recorded on eight occasions. The longest distance traveled was 3.0 miles, with the average 1.4 miles.

Physical barriers limited elk movements within the home range. The Pacific Ocean was a barrier to the west and steep-faced cliffs of Gold Bluffs retarded movement to the east (Figure 4). The sloping portions of the bluffs were not barriers, but observations indicated that the elk preferred the habitat of the beach.

A small herd of 6 to 10 animals was seen six times, always within 1/2 mile of Butler Creek and never with the Beach herd. This herd was easily frightened and generally retreated up the Butler Creek drainage.

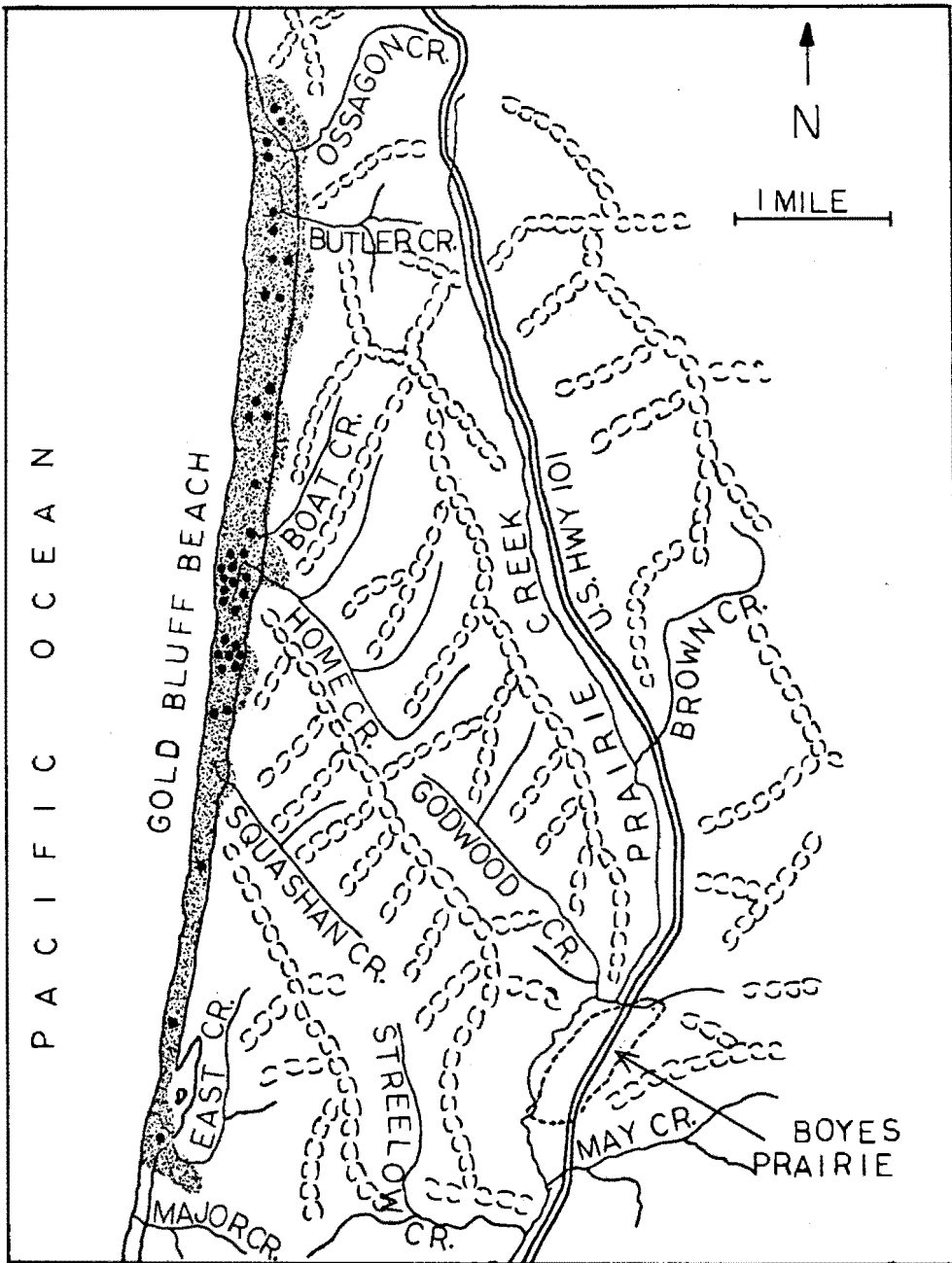


Figure 3. Home range and observations of the Gold Bluff Beach Herd. Black dots are locations of actual sightings and stippled areas indicate extent of known herd movements.

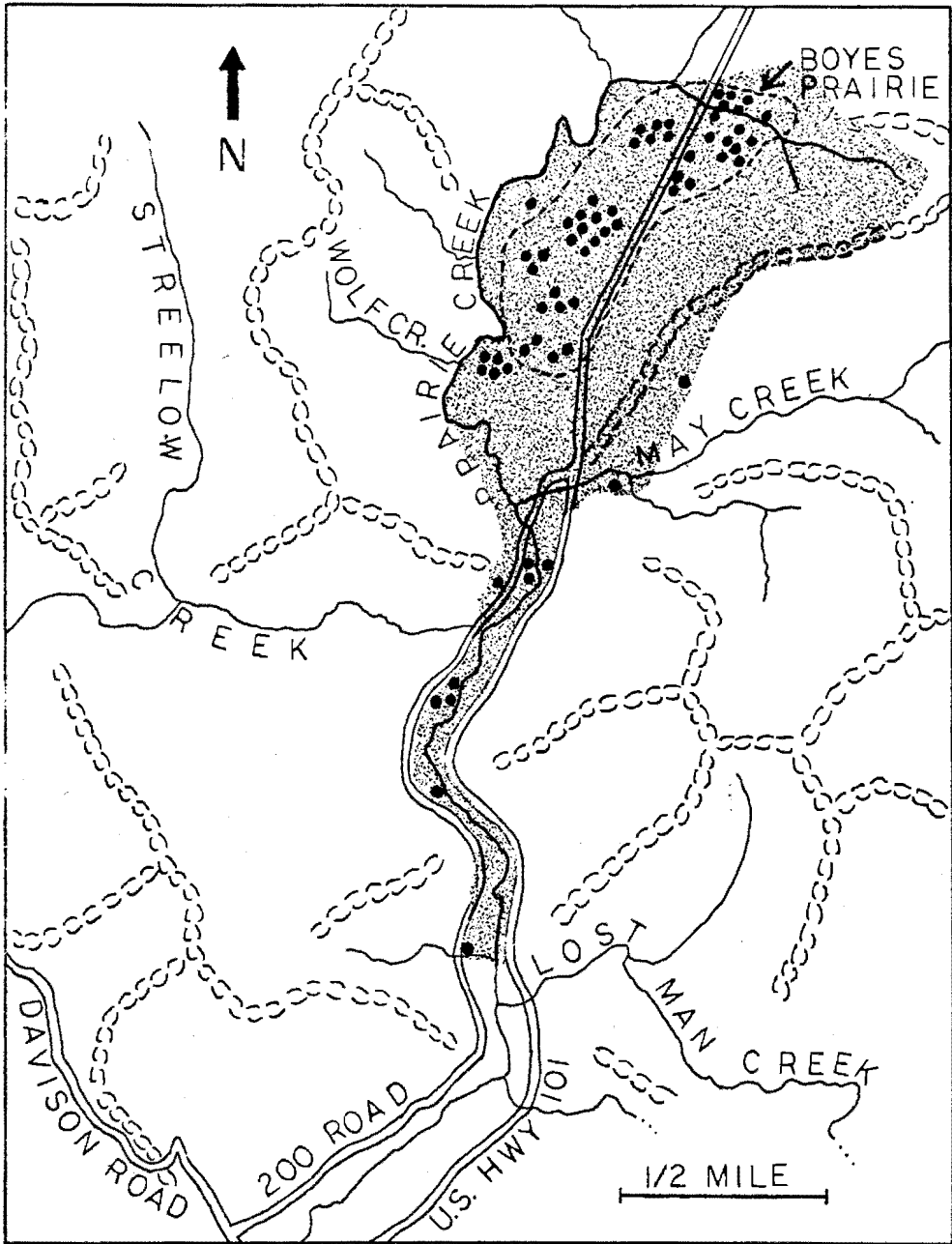


Figure 5. Home range and observations of the Boyes Prairie Herd. Black dots are locations of actual sightings and stippled areas indicate extent of known herd movements.

Table 1. Effective dosages of succinylcholine chloride for the immobilization of Roosevelt elk in the Prairie Creek Redwoods State Park region, California.

	Number of animals	Dosage in mg/animal	Reaction time in minutes	
			Injection to collapse	Collapse to recovery
<u>April 1964</u>		SPRING		
Calf ^{a/}	2	8.0-14.0(11.0) ^{b/}	4.0-10.0(7.0)	10.0-31.0(20.5)
<u>May 1964</u>				
Yearling	4	14.0-16.5(15.5)	4.0- 8.5(5.5)	15.0-33.0(25.2)
<u>June 1964</u>				
Yearling	10	16.5-20.0(18.9)	3.0-10.5(7.8)	9.0-28.5(18.0)
2 Yr. ♂ ^{c/}	3	20.0-21.0(20.5)	7.0-10.5(8.8)	22.0-28.5(25.2)
2 Yr. ♀	4	17.5-19.5(18.5)	7.5-11.5(9.6)	12.5-20.0(17.1)
Adult ♀	4	19.5-23.5(22.5)	6.0- 9.0(6.8)	30.0-31.5(30.8)
<u>September 1964</u>		FALL		
Yearling	1	20.0	5.5	36.0
Adult ♀	4	18.0-20.0(19.5)	7.0-16.0(12.1)	21.5-29.5(26.2)
Adult ♂	7	18.0-21.0(19.2)	5.0-11.0(8.4)	17.0-43.0(28.1)
<u>October 1964</u>				
Yearling	2	18.0-19.5(18.7)	4.0-5.5(4.7)	31.0
Adult ♀	29	19.0-21.0(19.6)	3.0-20.0(8.7)	7.0-51.5(28.4)
Adult ♂	6	18.0-20.75(19.6)	5.0-17.0(9.8)	26.5-46.0(34.1)
<u>November 1964</u>				
Yearling	1	18.0	13.0	36.0
Adult ♀	3	18.25-19.25(18.75)	9.5-30.0*(19.0)	4.0*-28.5(20.6)
<u>December 1964</u>		WINTER		
Adult ♀	4	17.25-18.25(17.6)	6.5-12.5(11.2)	26.5-39.0(33.6)
Adult ♂	1	17.25	6.5	42.0**
<u>January 1965</u>				
Adult ♂	1	16.5	15.0	45.0
<u>February 1965</u>				
Calf	3	7.0-7.5(7.3)	9.0-15.0(13.0)	10.0-37.0(22.8)

^{a/} A calf of the year after May 1 is considered a Yearling.

^{b/} Parenthesis indicates averages.

^{c/} A 2 year old after September 1 is considered an Adult.

* - subcutaneous injection

** - given artificial respiration

Boyes Prairie Herd

The home range of the Boyes Prairie Herd covered the entire Boyes Prairie and south to Lost Man Creek (Figure 5). The southern half of the home range followed the flood plain of Prairie Creek. The "center" of the home range was Boyes Prairie and accounted for 75% of the observations. The areas north and west of Boyes Prairie had been used in the past (Harn 1958; Dasmann, pers. comm.), but the herd did not use these areas during this study.

Harn (1958) reported the home range as Boyes Prairie and surrounding forest area, encompassing about 540 acres. In this study, the home range was of the same magnitude, 506 acres. However, the herd had not been previously reported south of May Creek (Jones, pers. comm.), meaning an extension of the home range into a new area.

The longest distance traveled for the Boyes Prairie Herd in 12 records of daily movements was 0.75 miles, with the average 0.31 miles. Since Boyes Prairie and the flood plain of Prairie Creek was abundant in forage, it is reasonable to expect a relative small home range and less extensive daily movements.

No physical barriers prevented the herd from moving into the adjacent areas. Even U. S. Highway 101 did not retard elk movements and the herd frequently crossed this highway while foraging on Boyes Prairie. The southern half of the home range overlapped with the home range of other elk. The extent of this overlap was not determined.

Individual Movements

Young elk and adult bulls were more prone to explore new territory. For instance, a 2-year-old cow permanently left the Boyes Prairie Herd to join another herd outside the home range. A yearling female suddenly showed up in the Boyes Prairie Herd in November. The yearling was later observed with another yearling female and calf from the Boyes Prairie Herd, but they were three-eighths of a mile south of the Boyes Prairie Herd's Home Range. The yearling female disappeared after this observation, although the other two elk were soon seen in the Boyes Prairie Herd.

There was a case of a calf switching herds. In November, a strange calf suddenly appeared in the Beach Herd. The calf was readily recognized by the presence of 3 inch velvet spikes. The velvet spikes had swollen tips, indicating that they were actively growing. The calf was seen 19 days later with the Butler Creek Herd. He apparently stayed with this herd for 4 or 5 days, then rejoined the Beach Herd. The calf disappeared after this observation. It is quite possible that abnormal hormone levels, indicated by the presence of antlers, were causing the peculiar behavior.

Movements During the Rutting Season

The rut affected directly or indirectly all elk. The larger cow herds, such as the Boyes Prairie Herd and Beach Herd, were divided into smaller herds, each with a single bull dominating the herd. Although bulls kept cows closely bunched up during the rut, they did not appreciably affect movements of the entire herd. The result was that cow herds covered the same parts of the home range, but more slowly.

Sometimes bulls divided and combined separate herds of elk, as indicated by mixed herds of tagged and untagged animals. However, elk from the Boyes Prairie Herd and Beach Herd returned to their respective herds after the rutting season.

During the rut a great deal of movement of yearling males took place. These elk formed separate groups or herds after being excluded from cow herds by bulls. However, during this period, no yearling male was seen outside its herd's home range.

DISCUSSION

Roosevelt elk are both migratory and non-migratory (Schwartz and Mitchell 1945). On the lower slopes of Pacific Coast Ranges elk are non-migratory (Graf 1955). Along the Oregon coast, the size of the home range for cow herds has been reported 640 to 1,280 acres

(Graf 1955). In this study, the home ranges were 506 or 845 acres. Graf (1955) stated that the home range conformed with the topography occupied by herd, frequently with boundaries set by natural features such as a stream or ridge. This was also the case in Prairie Creek Redwoods State Park.

The overlapping of home ranges was confined to the least used portions of the home range. "Sign Posts" were not evident at the extreme edges of the home range, but this activity was seen on several occasions in the "centers" of the home range.

New animals temporarily associated with the two herds under study. The period of time varied from a few days to several months. None of these new animals became permanent members of the herd. These cases of interchange were infrequent and did not affect the movements of the herd. As previously suggested (Harn 1958), the Boyes Prairie Herd and Gold Bluff Beach Herd were distinct herds of elk and they can be managed as separate units.

Bulls that dominated the cow herds during the major portion of the rut, were found to reside within their respective herd's home range. However, during the rut new bulls entered the home range. The location of these bulls after the rut could not be determined.

The greater mobility of the Beach Herd was probably due to the limited forage and more linear form of the home range.

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