Elk habitat use and the impact of the construction and energization of a 500-KV ac powerline on the North Boulder Winter Range, Montana
by Jodie Ellen Canfield

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Fish and Wildlife Management
Montana State University

Abstract:
Elk habitat use, activity patterns, and winter distribution, before and after energization of a 500-kV AC powerline which crosses critical winter range in southwestern Montana, was studied during the mild winters of 1983 and 1984. Methods included 24 hour continuous radio-monitoring, track and pellet group counts, and direct ground and aerial observations. Habitat use by the elk herd, which apparently was at or above carrying capacity, was influenced by weather parameters, distribution of available forage (as influenced by snow conditions and cattle grazing), and population density. The powerline crosses a bunchgrass range at about the level where timber begins, and elk typically crossed the powerline corridor twice a day while traveling between bedding and feeding areas. Powerlihe construction in the spring of 1983 displaced radioed elk prior to spring migration. ' Four of 11 elk with functional radios did not return to the study area to winter in 1984 after the powerline was energized. The physical presence of the powerline did not alter elk distribution or activity patterns, however, noise generated from corona discharge off the conductors during precipitation caused elk to hesitate and show excitability before crossing a "noisy corridor" , and may alter basic elk daily activity patterns during storms. It is not expected that elk will further acclimate to precipitation noise levels because the rate of animal exposure is low on the relatively arid North Boulder range, and the corridor itself is not an attractive forage source. The level of impact from corona noise may change with more severe winter conditions if elk are forced by deep snow to congregate on lower elevations entirely below the powerline corridor. The number of hunters declined from historical figures in the area after powerline access roads were built. Hunter distribution also changed, however, total harvest remained the same. Placement of future extra high voltage (EHV) lines should consider not only the effect of the physical presence of the corridor and towers on wildlife, but also the potential impacts of electro-magnetic fields and corona discharge. It is recommended that future EHV lines are not placed across concentrated big game use areas.

ELK HABITAT USE AND THE IMPACT OF THE CONSTRUCTION AND ENERGIZATION OF A 500-KV AC POWERLINE ON THE NORTH BOULDER WINTER RANGE, MONTANA

by

Jodie Ellen Canfield

A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Fish and Wildlife Management

MONTANA STATE UNIVERSITY
Bozeman, Montana

November 1984

APPROVAL

of a thesis submitted by

Jodie E. Canfield

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

Nov 19, 1984
Date

Harold D. Pratt
Chairperson, Graduate Committee

Approved for the Major Department

30 November 1984
Date

Robert S. Moore
Head, Major Department

Approved for the College of Graduate Studies

12-10-84
Date

M. B. Malone
Graduate Dean

STATEMENT OF PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements of a master's degree at Montana State University, I agree that the Library shall make it available to borrowers under rules of the Library. Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgement of source is made.

Permission for extensive quotation from or reproduction of this thesis may be granted by my major professor, or in his/her absence, by the Director of Libraries when, in the opinion of either, the proposed use of the material in this thesis is for scholarly purposes. Any copying or use of the material in this thesis for financial gain shall not be allowed without my written permission.

Signature Jodie Canfield

Date November 30, 1984

ACKNOWLEDGEMENT

I wish to express my sincere appreciation to the following people for their valuable contributions to this study: Dr. H. D. Picton, Montana State University, major advisor, who invested time and energy in all phases of the study; Dr. R. J. Mackie and Dr. R. E. Moore, MSU, for review of the manuscript; Mr. D. Burkhalter, MSU computing services, for conducting the computerized statistical analyses and for assistance with TELDAY; Mike Paterni and Tina Crump, Deerlodge National Forest, for their tremendous contributions to the fieldwork; Mike Frisina, MDFWP area manager, for conducting the trapping operations and providing background information; Mr. Jack Lee and others of the Bonneville Power Administration for providing constructive criticism, technical publications, and weather and noise data; The Gallatin Flying Service for their expertise in aviation and locating elk; the many volunteers from the Deerlodge National Forest and Montana State University who made the 24 hour monitoring sessions and pellet group counts a success; Ron Spoon for field assistance, encouragement, and patience; my family for their support throughout my academic endeavors; and my dog Mac for his constant companionship in the field.

TABLE OF CONTENTS

TABLE OF CONTENTS--Continued

LIST OF TABLES

LIST OF TABLES--Continued

LIST OF FIGURES

LIST OF FIGURES--Continued

LIST OF FIGURES--Continued

LIST OF FIGURES--Continued

LIST OF FIGURES--Continued

LIST OF FIGURES--Continued

LIST OF FIGURES--Continued

ABSTRACT

Elk habitat use, activity patterns, and winter distribution, before and after energization of a 500-kV AC powerline which crosses critical winter range in southwestern Montana, was studied during the mild winters of 1983 and 1984. Methods included 24 hour continuous radiomonitoring, track and pellet group counts, and direct ground and aerial observations. Habitat use by the elk herd, which apparently was at or above carrying capacity, was influenced by weather parameters, distribution of available forage (as influenced by snow conditions and cattle grazing), and population density. The powerline crosses a bunchgrass range at about the level where timber begins, and elk typically crossed the powerline corridor twice a day while traveling between bedding and feeding areas. Powerline construction in the spring of 1983 displaced radioed elk prior to spring migration. Four of 11 elk with functional radios did not return to the study area to winter in 1984 after the powerline was energized. The physical presence of the powerline did not alter elk distribution or activity patterns, however, noise generated from corona discharge off the conductors during precipitation caused elk to hesitate and show excitablity before crossing a "noisy corridor", and may alter basic elk daily activity patterns during storms. It is not expected that elk will further acclimate to precipitation noise levels because the rate of animal exposure is low on the relatively arid North Boulder range, and the corridor itself is not an attractive forage source. The level of impact from corona noise may change with more severe winter conditions if elk are forced by deep snow to congregate on lower elevations entirely below the powerline corridor. The number of hunters declined from historical figures in the area after powerline access roads were built. Hunter distribution also changed, however, total harvest remained the same. Placement of future extra high voltage (EHV) lines should consider not only the effect of the physical presence of the corridor and towers on wildlife, but also the potential impacts of electro-magnetic fields and corona discharge. It is recommended that future EHV lines are not placed across concentrated big game use areas.

INTRODUCTION

Rocky Mountain elk (Cervus elaphus nelsoni) and the hunting opportunities they create are a source of recreational wealth and economic benefit (Boyd 1978). As a species, elk provide the most days of hunter recreation in the state of Montana (Aderhold 1984). Rich coal deposits in Eastern Montana also generate economic benefits and provide energy for the needs of a growing human population.

The "Colstrip Project" was designed to use these coal resources in order to meet anticipated demands for electrical energy in the Pacific Northwest. The final phase of the project was to build a 500-kV AC electrical transmission line. The Montana Power Company built the line from Colstrip to Townsend, Montana, and from there the Bonneville Power Administration (BPA) continued the line west to integrate Colstrip power into the BPA transmission grid (Colstrip EIS 1979). The BPA portion of the line in Montana skirts the Elkhorn Mountains between Townsend and Boulder, continues up the North Boulder River drainage, and crosses the eastern foothills of the Continental Divide west of Basin.

The foothills, rising up from the North Boulder River, constitute the only major elk wintering area in hunting district 318 (Egan 1967). Mule deer (Odocoileus hemionus) and moose (Alces alces shirasi) also winter in the area.

The Colstrip EIS (1979) states that the impacts of the extra high voltage (EVH) transmission line on deer and elk range would be long-term, high, and direct in terms of cover removal, forage disturbances due to road and tower construction, increased stress on animals due to human activities and access roads, and potential fragmentation of habitat.

Other phenomena associated with EHV lines include electrical fields, magnetic fields, and corona discharge which results in foul weather audible noise and ozone production. Sheppard (1983) suggested that there are significant biological interactions with electric fields in the "high voltage transmission line" environment. However, it was beyond the scope of this study to investigate these aspects as they relate to elk in a field situation.

Responses of big game to EHV powerlines and the use of associated corridors were evaluated by Goodwin (1975) and Griffith (1977). Relative to these studies, the current study is unique in that it provided the

opportunity to gather data both before and after energization of the line, during the years of greatest habitat disruption, and at altitudes above 1500 m.

Elk winter range in the N. Boulder drainage is limited by excessive snow accumulations to the north, west, and south, and by human settlement to the east. The amount and quality of winter range is, in turn, limiting to the elk population (Chrest and Herbert 1980, Chrest and Childress 1976). Therefore, any reduction in habitat or changes in patterns of elk use associated with the transmission line, will directly affect the future populations.

There is potential for impacts of the powerline to be masked or compounded by climatic conditions, availability of forage and cover, and man's activities. It is recognized that future changes in land management on this winter range, in terms of timber harvest, cattle grazing, or recreational uses, may potentiate or ameliorate powerline effects.

Because elk are large mobile animals, it can be expected they will respond to change in their environment by adjusting behavior in regard to distribution, movement, and use of specific habitats (Mackie pers. comm. 1984).

The general objective of this ongoing study is to evaluate factors influencing elk habitat use and movements

on the North Boulder River winter range before and after energization of the powerline. The specific objectives are to (1) evaluate elk habitat selection and movement patterns on winter range in relation to climatic variables, forage availability, animal activity, the transmission line, and human activities and (2) determine if elk avoid or show distinct behavioral responses to any activity or phenomena associated with construction and operation of the powerline.

The original proposal recommended 3 years of baseline data collection and an additional 3 years to study the impacts of powerline construction and energization. Delays in funding precluded fieldwork until the winter of 1982-1983. By that time, the transmission line towers and access roads had been completed. Clearing of the corridor was completed and the lines strung in spring and summer 1983. The line was energized in October 1983, thus the second field season (1983-1984) represents the post-energization period. My field studies were conducted from late December 1982 to June of 1983 and from mid- December 1983 to late March of 1984. The overall study will continue through the spring 1985.

This study was funded by the Bonneville Power Administration (U.S. Department of Energy), and by the United States Forest Service. Mike Frisina, Montana Department of Fish, Wildlife, and Parks (MDFWP), provided assistance in capturing and marking elk.

STUDY AREA DESCRIPTION

Location and Access

The study area is in the North Boulder River drainage of southwest Montana, approximately 26 km (16 mi) north of Butte. The area includes approximately 52 km^2 (20 mi^2), of the Deerlodge National forest and a small portion of private holdings. Boundaries are Basin Creek on the east, Little Cottonwood Creek on the west, the North Boulder River on the south, and the 2100 m (7,000 ft) contour line on the north.

Vehicular access is provided by three principal gravel roads: the Red Rock Creek road extending north off Interstate 15 near the eastern study area boundary; the Boulder River road following the valley floor from I-15 west to headwaters along the Continental Divide; and the Saratoga road running north from the river bottom along the western margin of the study area (Figure 1). In addition, there is a variety of jeep trails, logging and mining roads, and newly built BPA powerline access roads which penetrate every drainage in the area, but which are closed to motorized vehicles between December 1 and May