



Use of clearcuts by elk in the Little Belt Mountains, Montana
by Thomas Alfred Day

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE in Fish and Wildlife Management
Montana State University
© Copyright by Thomas Alfred Day (1973)

Abstract:

A study was conducted during two summers and one fall in the southeastern Little Belt Mountains of central Montana to obtain data pertaining to use by elk of clearcuts located in extensive stands of lodgepole pine. Secondary objectives were to record data on movements and summer distributions of two separate elk herds that winter on the south slopes and to note areas used by cattle. Ground vegetation of the lodgepole pine understory and of four groups of clearcuts; 2-4, 7-10, 11-15, and 16, 17, and 20 years of age, was evaluated from measurements within randomly spaced 2X5 dm. plots. Coverage values for grasses, forbs, and shrubs were greatest in the 7-10, 2-4, and 16, 17, and 20 year age groups, respectively. Elk used clearcuts only when they were located within or near traditional summer range areas. Data of observations of elk and pellet group counts in 40 intensively studied clearcut blocks indicated the most suitable conditions for elk were present when the block was located the greatest distance from human disturbance, closest to extensive stands of timber cover, adequately treated for disposal of slash, and of younger age (2-10 years). The size of opening appeared to be a negligible factor of influence. Elk were observed using 26 of the 40 clearcuts. Ninety-two percent of 1816 observations of elk using these 26 clearcuts were made in four of them. Apparently all conditions must be suitable for a block to receive appreciable elk use. Elk wintering on one area of the south slopes moved along two major routes to summer range where they concentrated activities in three main areas which they shared with elk from a larger herd that wintered on the north slopes. Elk wintering on another area of the south slopes moved along one main route to one summer area of activity upon which they were separated from the ' other segments. Competition between elk and cattle was relatively unimportant on higher summer range, but appeared significant on the lower winter range areas of the south slopes.

Statement of Permission to Copy

In presenting this thesis in partial fulfillment of the requirements for an advanced degree at Montana State University, I agree that the Library shall make it freely available for inspection. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by my major professor, or, in his absence, by the Director of Libraries. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Signature Thomas A. Day
Date April 16, 1973

Pg 31
20
32
35
36

USE OF CLEARCUTS BY ELK IN THE LITTLE BELT MOUNTAINS, MONTANA

by

THOMAS ALFRED DAY

A thesis submitted to the Graduate Faculty in partial
fulfillment of the requirements for the degree

of

MASTER OF SCIENCE

in

Fish and Wildlife Management

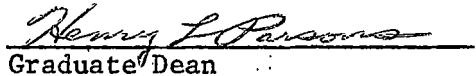
Approved:



Head, Major Department



Chairman, Examining Committee



Graduate Dean

MONTANA STATE UNIVERSITY
Bozeman, Montana

June, 1973

ACKNOWLEDGMENT

To the following, among others, the author wishes to express his sincere appreciation for their contributions to this study: Dr. Don C. Quimby, Montana State University, who directed the study and aided in preparation of the manuscript; Drs. Robert L. Eng and Richard J. Graham, Montana State University, for reviewing the manuscript; Dr. Richard Mackie, Montana State University, and Mr. Thomas Mussehl, Mr. H. O. (Buck) Compton, and Mr. Kenneth Coop, Montana Fish and Game Department, for advice and field assistance; Father John B. Kirsch, for aid with literature review; Dr. Martin Hamilton, for advice on statistical analysis; personnel of the Lewis and Clark National Forest for use of facilities and cooperation; my parents and my wife, Jill, for patience, encouragement, and assistance. During the study the author was supported by the Montana Fish and Game Department under Federal Aid Projects Nos. W-120-R3 and 4.

TABLE OF CONTENTS

	Page
VITA	ii
ACKNOWLEDGMENT	iii
LIST OF TABLES	vi
LIST OF FIGURES	ix
ABSTRACT	x
INTRODUCTION	1
METHODS	3
STUDY SITE	6
RESULTS	11
Vegetation	11
Vegetation of the Mature Lodgepole Pine Understory	11
Ground Level Vegetation of Clearcuts	13
Use of Clearcuts by Elk	20
Seasonal Use of Clearcuts	20
Importance of the Location of Logging Area	20
Use of Clearcuts by Elk in Relation to Other Factors	22
Importance of Location of the Clearcut Block in the Logging Pattern and Distance from Extensive Cover and Major Road Systems	23
Use by Elk of Clearcuts of Various Ages as Correlated with Vegetation and Food Habits	24
Cleanliness of Clearcut	31
Use by Elk of Openings of Varying Sizes and Amounts of Edge	32

TABLE OF CONTENTS
(Continued)

	Page
Minor Factors; Slope, Elevation, Aspect, and Moisture Condition of Clearcuts	36
Multiple Regression Analysis	37
Summary of Factors Influencing Use by Elk of Clearcuts	38
Use of Clearcuts by Deer and Cattle	40
Population Structure	42
Movements and Distribution of Elk	43
Use of the Study Area by Cattle	47
APPENDIX	51
LITERATURE CITED	68

LIST OF TABLES

Table	Page
1. CANOPY COVERAGE, FREQUENCY, AND CONSTANCY OF TAXA FOR FORBS AND SHRUBS OCCURRING IN THE MATURE LODGEPOLE PINE UNDERSTORY AS INDICATED BY MEASUREMENTS FROM ONE HUNDRED AND TWENTY, 2 X 5 DECIMETER PLOTS ON THREE DIFFERENT SITES	12
2. PERCENT CANOPY COVERAGE, FREQUENCY, AND CONSTANCY OF LOW-GROWING TAXA IN FOUR AGE GROUPS OF CLEARCUTS; 2-4, 7-10, 11-15, AND 16, 17, AND 20 YEARS AFTER CUTTING AS DETERMINED BY EXAMINATION OF TWENTY, FORTY, OR FIFTY, 2 X 5 DECIMETER PLOTS AT EACH CLEARCUT EXAMINED	14
3. USE OF CLEARCUTS BY ELK DURING DIFFERENT SEASONS AS DETERMINED DURING AERIAL FLIGHTS AND GROUND OBSERVATIONS (INCLUDES DUPLICATE OBSERVATIONS OF THE SAME ANIMALS)	21
4. VALUES FOR COMPARISON OF ELK USE OF THE FOUR MOST USED CLEARCUT BLOCKS. BLOCKS ARE RANKED FROM GREATER TO LESSER USE ON THE BASIS OF ELK OBSERVED	24
5. A SUMMARY OF THE RESULTS OF KIRSCH'S (1962) FOOD HABITS STUDY OF ELK OF THE LITTLE BELT MOUNTAINS	30
6. CANOPY COVERAGES, FREQUENCIES, AND MOST ABUNDANT FORB FORAGE SPECIES AS DETERMINED BY EXAMINATION OF FORTY 2 X 5 DECIMETER PLOTS IN EACH OF THE FOUR MOST USED BLOCKS	30
7. PARTIAL CORRELATION COEFFICIENT VALUES AND CORRESPONDING PROBABILITY LEVEL VALUES FOR THE RELATIONSHIP BETWEEN CURRENTLY DEPOSITED PELLET GROUPS/ACRE (Y_1), AND FOUR VARIABLES INFLUENCING ELK USE OF CLEARCUTS ($X_1 - X_4$)	39
8. USE OF EACH OF FOUR AGE GROUPS OF CLEARCUTS BY DEER AND CATTLE AS INDICATED BY PELLET GROUPS/ACRE DEPOSITED DURING CURRENT AND PREVIOUS YEARS	41
9. USE OF EACH OF THREE SIZE CLASSES OF OPENINGS BY DEER AND CATTLE AS INDICATED BY PELLET GROUPS/ACRE DEPOSITED DURING CURRENT AND PREVIOUS YEARS	41

LIST OF TABLES
(Continued)

Table	Page
10. CLASSIFICATION BY SEX AND AGE OF ELK OBSERVED DURING THE PERIODS JUNE 16-SEPTEMBER 19, 1971 AND JUNE 8-NOVEMBER 26, 1972 (INCLUDES DUPLICATE OBSERVATIONS OF THE SAME INDIVIDUALS)	43
11. MOVEMENTS OF MARKED ELK BETWEEN SUMMER CENTER OF ACTIVITY AREAS DURING 1972	46
12. PERCENT CANOPY COVERAGE, FREQUENCY, AND CONSTANCY OF LOW-GROWING TAXA IN CLEARCUTS 2, 3, AND 4 YEARS AFTER CUTTING AND COMBINED TOTALS FOR THE AGE GROUP, 2-4 YEARS, AS DETERMINED BY EXAMINATION OF TWENTY OR FORTY, 2 X 5 DECIMETER PLOTS AT EACH CLEARCUT EXAMINED	52
13. PERCENT CANOPY COVERAGE, FREQUENCY, AND CONSTANCY OF LOW-GROWING TAXA IN CLEARCUTS 7, 8, 9, AND 10 YEARS AFTER CUTTING AND COMBINED TOTALS FOR THE AGE GROUP, 7-10 YEARS, AS DETERMINED BY EXAMINATION OF TWENTY OR FORTY, 2 X 5 DECIMETER PLOTS AT EACH CLEARCUT EXAMINED	54
14. PERCENT CANOPY COVERAGE, FREQUENCY, AND CONSTANCY OF LOW-GROWING TAXA IN CLEARCUTS 11, 12, 13, 14, AND 15 YEARS AFTER CUTTING AND COMBINED TOTALS FOR THE AGE GROUP, 11-15 YEARS, AS DETERMINED BY EXAMINATION OF TWENTY OR FORTY, 2 X 5 DECIMETER PLOTS AT EACH CLEARCUT EXAMINED	57
15. PERCENT CANOPY COVERAGE, FREQUENCY, AND CONSTANCY OF LOW-GROWING TAXA IN CLEARCUTS 16, 17, AND 20 YEARS AFTER CUTTING AND COMBINED TOTALS FOR THE AGE GROUP, 16, 17, AND 20 YEARS, AS DETERMINED BY EXAMINATION OF TWENTY, FORTY, OR FIFTY, 2 X 5 DECIMETER PLOTS AT EACH CLEARCUT EXAMINED	60

LIST OF TABLES
(Continued)

Table	Page
16. TAXA WITH LESS THAN .5 PERCENT CANOPY COVERAGE AND/OR FREQUENCIES OF LESS THAN 5 PERCENT IN FOUR DIFFERENT AGE GROUPS OF CLEARCUTS AS DETERMINED BY EXAMINATION OF TWENTY, FORTY, OR FIFTY 2 X 5 DECIMETER PLOTS AT EACH CLEARCUT EXAMINED	62
17. PARTIAL CORRELATION COEFFICIENT VALUES FOR THE RELATION- SHIPS BETWEEN EACH OF FOUR VALUES FOR AMOUNT OF ELK USE OF CLEARCUTS (DEPENDENT VARIABLES, $Y_1 - Y_4$) AND TEN VALUES FOR FACTORS WHICH WERE SUSPECTED OF INFLUENCING ELK USE (INDEPENDENT VARIABLES, $X_1 - X_{10}$)	65
18. SEX, AGE COMPOSITION, AND AVERAGE GROUP SIZE RECORDED FOR TWO WEEK INTERVALS FROM BOTH GROUND AND AIR (INCLUDES DUPLICATE OBSERVATIONS OF THE SAME INDIVIDUALS)	67

LIST OF FIGURES

Figure	Page
1. Map of study area showing distribution of clearcut areas	7
2. Map of intensive study area showing distribution of clearcut blocks. The blocks receiving the most use by elk are designated A, B, C, or D. Ages are for the first summer of study	8
3. Comparison of canopy coverage data of ground level vegetation by forage class of the mature lodgepole pine understory and clearcuts of four age groups; 2-4, 7-10, 11-15, and 16, 17, and 20 years. Successional trends are indicated by arrows	18
4. Clearcut A, located at the head of Whitetail Drainage	25
5. Clearcut heavily laden with slash, located at the head of Lion Creek	25
6. Green Mountain Thinning Study; 14 blocks forming 251 acres of opening	26
7. Mesic meadow, located on the east face of Green Mountain, where Kirsch (1962) made most observations of elk	26
8. Use of each of four age groups of clearcuts by elk as indicated by elk observed/acre/year, frequency of use as expressed by percent of observations resulting in sighting of elk, and pellet groups/acre	27
9. Use of each of three size classes of openings as indicated by elk observed/acre/year and pellet groups/acre	34
10. Map of study area indicating movements of three herd segments of elk from winter to summer range and distributions of each on summer range	44
11. Map of study area indicating cattle allotment boundaries and number of cattle and animal month units allowed on each during the grazing season of 1972	48

ABSTRACT

A study was conducted during two summers and one fall in the southeastern Little Belt Mountains of central Montana to obtain data pertaining to use by elk of clearcuts located in extensive stands of lodgepole pine. Secondary objectives were to record data on movements and summer distributions of two separate elk herds that winter on the south slopes and to note areas used by cattle. Ground vegetation of the lodgepole pine understory and of four groups of clearcuts; 2-4, 7-10, 11-15, and 16, 17, and 20 years of age, was evaluated from measurements within randomly spaced 2 X 5 dm. plots. Coverage values for grasses, forbs, and shrubs were greatest in the 7-10, 2-4, and 16, 17, and 20 year age groups, respectively. Elk used clearcuts only when they were located within or near traditional summer range areas. Data of observations of elk and pellet group counts in 40 intensively studied clearcut blocks indicated the most suitable conditions for elk were present when the block was located the greatest distance from human disturbance, closest to extensive stands of timber cover, adequately treated for disposal of slash, and of younger age (2-10 years). The size of opening appeared to be a negligible factor of influence. Elk were observed using 26 of the 40 clearcuts. Ninety-two percent of 1816 observations of elk using these 26 clearcuts were made in four of them. Apparently all conditions must be suitable for a block to receive appreciable elk use. Elk wintering on one area of the south slopes moved along two major routes to summer range where they concentrated activities in three main areas which they shared with elk from a larger herd that wintered on the north slopes. Elk wintering on another area of the south slopes moved along one main route to one summer area of activity upon which they were separated from the other segments. Competition between elk and cattle was relatively unimportant on higher summer range, but appeared significant on the lower winter range areas of the south slopes.

INTRODUCTION

Rising public concern with environmental quality has recently brought to light some "so-called" undesirable results of clearcut logging practices. Immediately apparent to at least some individuals are gross changes that degrade the scenic quality of our forests. Changes of a more subtle nature that may have significant effects on the quality of wildlife habitat are not revealed by casual observations. Thus the ecological effects of block clearcutting of lodgepole pine on quality of elk (*Cervus canadensis nelsoni*) (Bailey) habitat have not been completely elucidated. Investigative committees such as Bolle, *et al.* (1970), and Berntsen, *et al.* (1971) have indicated that much more information is needed concerning the relationship of elk to other resource management objectives. These groups, from qualitative observations of more or less survey types of studies, could find little evidence of either an overall adverse or beneficial effect of clearcutting on the welfare of elk, but they did find greater amounts of forage for big game following increased clearcutting.

Information concerning forage changes following clearcutting is more extensive than information concerning the effects of clearcutting and associated activities, such as road building, on the year long ecology of elk. The most extensive work of this nature was done in Oregon with the Roosevelt elk by Harper (1966 and 1971). In Montana,

two studies were conducted in the Little Belt Mountains. Kirsch (1962) studied elk use of clearcuts in summer 9 and 10 years after the first block of timber was harvested in the Deadhorse Sale Area in 1951. Coop (1971) obtained data concerning habitat use and associated behavior of elk in major drainages prior to extensive logging.

From June - September, 1971, and June - December, 1972, I collected data in this general area which would add to that compiled previously. Emphasis was placed primarily on use by elk of clearcuts in the Deadhorse Sale Area. Information concerning the movements and distribution of those elk that winter on the south-facing slopes of the Little Belts was another objective of the study. Range use of the area by livestock was also noted.

METHODS

Botanical nomenclature follows Booth (1950) and Booth and Wright (1959). Assistance in species recognition of plants was provided by comparisons with specimens in the extensive collection made by Coop from the study area in 1969 and 1970 (Coop 1971).

All vegetation sampled was within the intensively studied portion of the Deadhorse Sale Area. Using the method proposed by Daubenmire (1959), quantitative data expressing species composition of vegetation, and frequencies and canopy coverages of individual taxa less than one meter in height were collected and analyzed. Twenty or forty 2 X 5 decimeter plots spaced 15 to 50 paces apart were evaluated in each clearcut or lodgepole timber stand sampled. Numbers of plots and spacing between plots were roughly proportional to the size of the vegetation stand sampled. Shape of vegetation stands dictated the pattern of plot locations to adequately cover all portions. Data were also collected at plots established and evaluated in 1961 by Kirsch (1962) in both clearcuts and mature timber stands. Differences in forage production between stands of mature lodgepole pine and clearcuts of varying ages were shown by average canopy-coverage values for forage classes (Daubenmire 1959). These data also indicated successional changes.

At the location of each vegetation plot in clearcuts elk, deer, and cattle pellet groups within an 11.7' radius circle, 1/100 acre,

were counted and classified as to time of deposition (current or previous years). These recordings were converted to pellet groups/acre to provide a comparative index of animal use.

Physical characteristics of clearcuts including cutting and thinning dates, slopes, elevations, aspects, and tree regeneration measurements were compiled from U. S. Forest Service records. Recent aerial photographs were used to calculate acreages of separate clear-cut blocks. Approximate areas were determined using a dot grid.

Thirty-three elk wintering on the south-facing slopes have been marked for individual identification since the winter of 1970. Fifteen elk were marked with 3" neckbands similar to those described by Knight (1966), and 18 were marked with a 6" pattern. In addition, a large number of elk had been marked on the Judith Game Range during previous years.

Distribution, movements, and use of individual clearcuts were determined by recording the locations of marked and unmarked animals observed. Group size, sex, age, and activity of the elk were also recorded. Foot and vehicle travel provided the modes of transportation while making observations. Aerial observations from a 150 Super Cub were scheduled on a monthly basis during the first summer of study and weekly when practical during the second summer and fall. A 25-60 X spotting scope and a 7 X 50 binocular aided in making observations.

Cattle allotment boundaries, numbers of cattle present, and dates of use of lands suitable for elk during any season were provided from U. S. Forest Service records. Cattle distributions were secondarily noted during observation periods and aerial flights.

STUDY SITE

Gieseke *et al.* (1953) described the 1,648 square mile area comprising the Little Belt Mountains as being formed by a broad folded-arched uplift which has been eroded and dissected to produce rounded peaks and deep rock-walled canyons with limestone of carboniferous age exposed on the northern and southern slopes. The study area of approximately 250 square miles lies in the southeastern portion (Figure 1). Latitudinal boundaries were the Higgins Park area on the west and the East Fork of Haymaker Canyon on the east. The Lewis and Clark National Forest Boundary was the southernmost extremity. Prominent features of the northern boundary were High Mountain, Dry Pole Canyon, Ettien Ridge Road, and the West Fork of Lost Fork. Twenty square miles of the Deadhorse Sale Area which lies between the Musselshell and Judith River drainages were designated an intensive study portion (Figure 2). Boundaries were the East Fork of Lion Creek on the west, Spring Creek Road on the east, the Forest Boundary on the south, and the heads of Corral and Big Hill Creeks and Hoover Springs on the north. Previous work (Kirsch 1962) indicated heavy use by elk of clearcuts in this area. It contained 62 clearcut blocks which form 34 separate entities because of adjoining edges. The blocks varied from 2-20 years of age and 7-104 acres in size.

