



Structural characteristics and ecological relationships of male blue grouse (*Dendragapus obscurus* [Say]) territories in southwestern Montana  
by Robert Rehm Martinka

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY in Fish and Wildlife Management  
Montana State University  
© Copyright by Robert Rehm Martinka (1970)

Abstract:

Structural characteristics of male blue grouse (*Dendragapus obscurus*) territories and their relationship to land-use practices and forest succession were studied from 1967-1969 on a 700-acre area of the Sapphire Mountains in southwestern Montana. A description of the physiography and vegetation was given. The area has been selectively logged periodically since 1948. During 130 observation trips, 1,010 sightings of males on 40 territories were made. About 60 percent of the males were leg-banded for individual identification. Vegetative and physical characteristics were recorded for 27 territories where males were observed 14 or more times; Territory size averaged 1.99 acres. Thickets of coniferous trees, which were the major vegetational component of territories, averaged .211 acres and provided about 675 feet of edge. The density of thickets averaged about 1200 trees per acre. Average thicket tree diameter was 4.9 inches. Most trees in thickets were from 10 to 60 years old. Territory thickets composed mostly of Douglas-fir were generally of greater density and smaller total area than those composed mostly of ponderosa pine. The longevity of thickets used by males was apparently about 40 to 50 years. Territories that were occupied intermittently during an eight-year known history averaged 2.33 acres while those occupied continuously averaged 1.79 acres. Discriminant function analysis indicated that territories could be distinguished from unused areas with a high degree of success (96 percent) when ten variables were used. As the number of variables was reduced, the quality of the results decreased. Selective logging may be beneficial because it opens up the canopy which allows the regeneration of trees in the form of scattered thickets. Clear-cut logging might also be beneficial if used on small blocks of timber (10 to 60 acres). Silvicultural practices such as mistletoe control, terracing on clear-cut areas, and thinning were discouraged in multiple-use management where blue grouse breeding habitat is paramount. Breeding habitat was associated with a ponderosa pine fire successional stage in the Douglas-fir vegetational zone, or with immature climax stages in both the ponderosa pine and Douglas-fir vegetational zones. With the curtailment of uncontrolled fires, logging is probably necessary if blue grouse breeding habitat is to be maintained or created. Male territories tended to be evenly spaced which was possibly initially a result of habitat requirements and/or selection and secondarily of territorial behavior. Longevity of males did not seem to be related to habitat type.

STRUCTURAL CHARACTERISTICS AND ECOLOGICAL RELATIONSHIPS  
OF MALE BLUE GROUSE (*DENDRAGAPUS OBSCURUS* [SAY])  
TERRITORIES IN SOUTHWESTERN MONTANA

by

ROBERT REHM MARTINKA

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

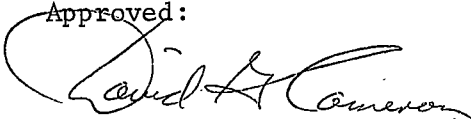
of

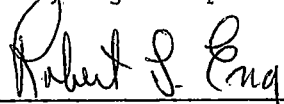
DOCTOR OF PHILOSOPHY

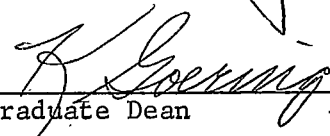
in

Fish and Wildlife Management

Approved:

  
Head, Major Department

  
Chairman, Examining Committee

  
Graduate Dean

MONTANA STATE UNIVERSITY  
Bozeman, Montana

June, 1970

## ACKNOWLEDGMENT

To the following, among others, I wish to extend sincere appreciation for their contributions to this study: Dr. Robert L. Eng, Montana State University, for technical supervision and guidance in preparation of the manuscript; Mr. Thomas W. Mussehl, Montana Fish and Game Department, for initial project planning, advice, and assistance; Mr. Phillip Schladweiler, Montana Fish and Game Department, for advice and assistance; Mr. L. Jack Lyon, Intermountain Forest and Range Experiment Station, for advice on statistical problems; Mr. Barry Frost for field assistance; Dr. W. E. Booth, Montana State University, for verification of plant specimens; Dr. Don C. Quimby and Dr. Richard J. Graham, Montana State University, for critical reading of the manuscript; Mr. and Mrs. Phillip E. Snider for hospitality during the field work phase; and to my wife, Kathy, for encouragement and understanding. During this study, I was supported by the Montana Fish and Game Department under Federal Aid Project Nos. W-91-R-10, W-91-R-11, and W-91-R-12.

## TABLE OF CONTENTS

	Page
VITA . . . . .	ii
ACKNOWLEDGMENT . . . . .	iii
TABLE OF CONTENTS . . . . .	iv
LIST OF TABLES . . . . .	v
LIST OF FIGURES . . . . .	vi
ABSTRACT . . . . .	viii
INTRODUCTION . . . . .	1
DESCRIPTION OF THE STUDY AREA . . . . .	3
METHODS . . . . .	9
Observational Procedures . . . . .	9
Territory Structure Analysis . . . . .	12
Overall Vegetational Analysis . . . . .	15
RESULTS . . . . .	17
Territory Occupancy . . . . .	17
Vegetational Measurements . . . . .	25
Physical Characteristics . . . . .	31
Discriminant Function Analysis . . . . .	40
LAND-USE AND SUCCESSIONAL RELATIONSHIPS . . . . .	42
Logging . . . . .	42
Silvicultural Practices . . . . .	44
Successional Relationships . . . . .	46
DISCUSSION . . . . .	52
APPENDIX . . . . .	58
LITERATURE CITED . . . . .	71

## LIST OF TABLES

Table	Page
1. CANOPY COVERAGE AND FREQUENCY OF TAXA FOR THE TWO HERBACEOUS TYPES AS DETERMINED BY EXAMINATION OF TWENTY 2 X 5 DECIMETER PLOTS ON EACH OF 16 SITES . . . . .	7
2. A COMPREHENSIVE LIST OF THE FLORA PRESENT ON THE STUDY AREA . . . . .	59
3. THE NUMBER OF OBSERVATIONS AND MINIMUM AGE OF INDIVIDUAL MALES ON DIFFERENT TERRITORIES FOR 1968 AND 1969 . . . . .	20
4. DAILY OBSERVATIONAL DATA FOR 1968 AND 1969 . . . . .	21
5. CHARACTERISTICS OF CONIFEROUS THICKETS USED BY TERRITORIAL MALE BLUE GROUSE . . . . .	27
6. CHARACTERISTICS OF CONIFEROUS THICKETS NOT USED BY TERRITORIAL MALE BLUE GROUSE . . . . .	28
7. THICKET CHARACTERISTICS OF TERRITORIES AND NON-TERRITORIES GROUPED ACCORDING TO TREE SPECIES COMPOSITION . . . . .	30
8. PHYSICAL CHARACTERISTICS OF 27 MALE BLUE GROUSE TERRITORIES . . . . .	33
9. DISCRIMINANT FUNCTION ANALYSES OF TERRITORIES AND NON-TERRITORIES IN WHICH FOUR COMBINATIONS OF VARIABLES WERE USED . . . . .	41
10. RESULTS OF THE DISCRIMINANT FUNCTION ANALYSIS IN WHICH ALL TEN VARIABLES WERE USED . . . . .	67
11. RESULTS OF THE DISCRIMINANT FUNCTION ANALYSIS IN WHICH FIVE VARIABLES WERE USED (THICKET SIZE, EDGE, TREES PER ACRE IN THREE CATEGORIES) . . . . .	68
12. RESULTS OF THE DISCRIMINANT FUNCTION ANALYSIS IN WHICH THREE VARIABLES WERE USED (THICKET SIZE, EDGE, AVERAGE DBH) . . . . .	69
13. RESULTS OF THE DISCRIMINANT FUNCTION ANALYSIS IN WHICH TWO VARIABLES WERE USED (THICKET SIZE, EDGE) . . . . .	70

## LIST OF FIGURES

Figure	Page
1. The study area showing network of logging roads . . . . .	4
2. A view of the open slopes with heavily wooded draws . . . . .	5
3. Leg band combination on a blue grouse for individual identification . . . . .	11
4. Vegetation density board used to determine shrubby vegetation density profile . . . . .	14
5. The relationship between the number of observations of males and territory size . . . . .	19
6. Seasonal distribution of the number of territorial male observations per hour in 1968 and 1969 . . . . .	22
7. Blue grouse displaying under a ponderosa pine during rainy weather . . . . .	24
8. A thicket of ponderosa pine and Douglas-fir used by a territorial male blue grouse . . . . .	26
9. Shrubby vegetation density profile of territories and non-territories . . . . .	32
10. A sloping ridgeline that is open on the south side and heavily wooded on the north side which was often used by a territorial male blue grouse . . . . .	36
11. The location of territories with respect to coniferous vegetation on the study area . . . . .	38
12. The composition of territories and non-territories with respect to the relative occurrence of three vegetative classes: open, shrub, and thicket . . . . .	39
13. Terracing on a clear-cut area in the Douglas-fir vegetational zone near the study area . . . . .	43
14. A Douglas-fir thicket destroyed in a dwarfmistletoe control program. It was once used by a territorial male blue grouse . . . . .	45

LIST OF FIGURES .  
(continued)

Figure	Page
15. A photo sequence of forest succession over a 40-year period following logging. The photos were taken in 1909 (A), 1927 (B), 1938 (C), and 1948 (D) (Courtesy U. S. Forest Service) . . . . .	48
16. A photo sequence showing the growth of a ponderosa pine thicket over a 20-year period. The photos were taken in 1938 (A) and 1958 (B) (Courtesy U. S. Forest Service) . .	50

## ABSTRACT

Structural characteristics of male blue grouse (*Dendragapus obscurus*) territories and their relationship to land-use practices and forest succession were studied from 1967-1969 on a 700-acre area of the Sapphire Mountains in southwestern Montana. A description of the physiography and vegetation was given. The area has been selectively logged periodically since 1948. During 130 observation trips, 1,010 sightings of males on 40 territories were made. About 60 percent of the males were leg-banded for individual identification. Vegetative and physical characteristics were recorded for 27 territories where males were observed 14 or more times. Territory size averaged 1.99 acres. Thickets of coniferous trees, which were the major vegetational component of territories, averaged .211 acres and provided about 675 feet of edge. The density of thickets averaged about 1200 trees per acre. Average thicket tree diameter was 4.9 inches. Most trees in thickets were from 10 to 60 years old. Territory thickets composed mostly of Douglas-fir were generally of greater density and smaller total area than those composed mostly of ponderosa pine. The longevity of thickets used by males was apparently about 40 to 50 years. Territories that were occupied intermittantly during an eight-year known history averaged 2.33 acres while those occupied continuously averaged 1.79 acres. Discriminant function analysis indicated that territories could be distinguished from unused areas with a high degree of success (96 percent) when ten variables were used. As the number of variables was reduced, the quality of the results decreased. Selective logging may be beneficial because it opens up the canopy which allows the regeneration of trees in the form of scattered thickets. Clear-cut logging might also be beneficial if used on small blocks of timber (10 to 60 acres). Silvicultural practices such as mistletoe control, terracing on clear-cut areas, and thinning were discouraged in multiple-use management where blue grouse breeding habitat is paramount. Breeding habitat was associated with a ponderosa pine fire successional stage in the Douglas-fir vegetational zone, or with immature climax stages in both the ponderosa pine and Douglas-fir vegetational zones. With the curtailment of uncontrolled fires, logging is probably necessary if blue grouse breeding habitat is to be maintained or created. Male territories tended to be evenly spaced which was possibly initially a result of habitat requirements and/or selection and secondarily of territorial behavior. Longevity of males did not seem to be related to habitat type.



## INTRODUCTION

Most blue grouse (*Dendragapus obscurus*) populations exhibit a seasonal, altitudinal migration. After spending fall and winter in coniferous forests on the higher mountain ridges, the males migrate in late March and early April to relatively open forests in lower mountain areas where they establish and defend breeding territories. Females arrive shortly after the males and nest in the same general areas (Bendell and Elliott 1967).

Structural characteristics of the vegetation found at male blue grouse territories have been discussed by several authors; however, no one has described them in a quantitative manner. Bendell and Elliott (1966 and 1967) noted that the position of territories in dense cover may depend on the location of openings, and other authors (Blackford 1958 and Mussehl 1962) have described territories in open areas as being associated with thickets of coniferous vegetation. Forest succession, following fire or logging activities, undoubtedly acts as a control on the density and positioning of territories (Bendell and Elliott 1966; Mussehl 1962). Breeding blue grouse accept a variety of different forest types, from moist forests in the Pacific Northwest to relatively dry forests of the interior Rocky Mountain region.

Personnel of the Montana Fish and Game Department have been conducting blue grouse population and pesticide studies (Mussehl and Finley 1967) since 1962 on a small area of the Sapphire Mountains in southwestern Montana. This area was chosen for a quantitative study of the vegetational characteristics of male blue grouse territories because of the known history of approximately 40 different territories. Also, a large proportion of the territorial males had been leg-banded for individual identification. Objectives of the study were to determine the structural makeup of male breeding territories and to evaluate the effects of forest succession in relation to silvicultural practices on blue grouse breeding habitat in ponderosa pine, (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) vegetation zones.

Full time field studies were conducted from late July to late August, 1967, from mid-April to mid-September, 1968, and from early April to early September, 1969. Approximately 130 trips to the study area were made for the purpose of locating male grouse, and about 200 were made for the purpose of vegetation analysis.

## DESCRIPTION OF THE STUDY AREA

The study area (Figure 1), located 10 miles southeast of Hamilton, Montana, contains about 700 acres of Bitterroot National Forest land near Skalkaho Creek. According to Perry (1962), this area is composed of granitic rock of the late Cretaceous to early Tertiary periods. Elevations range from approximately 4550 to 5750 feet mean sea level.

Steep, open, south-facing slopes intermingled with heavily wooded draws characterize the area (Figure 2). Numerous logging roads traverse the hillsides providing excellent accessibility. Logging was begun in 1947 and has continued until the present.

Climatological data for Hamilton (elevation 3529 feet) show a mean annual temperature of 46.1 F. January is the coldest month and July is the warmest with average temperatures of 24.1 F and 67.9 F, respectively. Average annual precipitation is 12.74 inches. The only months with average precipitation exceeding 1.20 inches are May and June which average 1.67 and 2.04 inches, respectively. Because precipitation generally increases with elevation in this region, the study area undoubtedly receives more moisture than Hamilton. On April 1, 1969, portions of the study area had 18 inches of snow remaining on the ground while Hamilton had none.

In addition to the influence of logging operations on the area, heavy summer grazing pressure was exerted by domestic livestock,

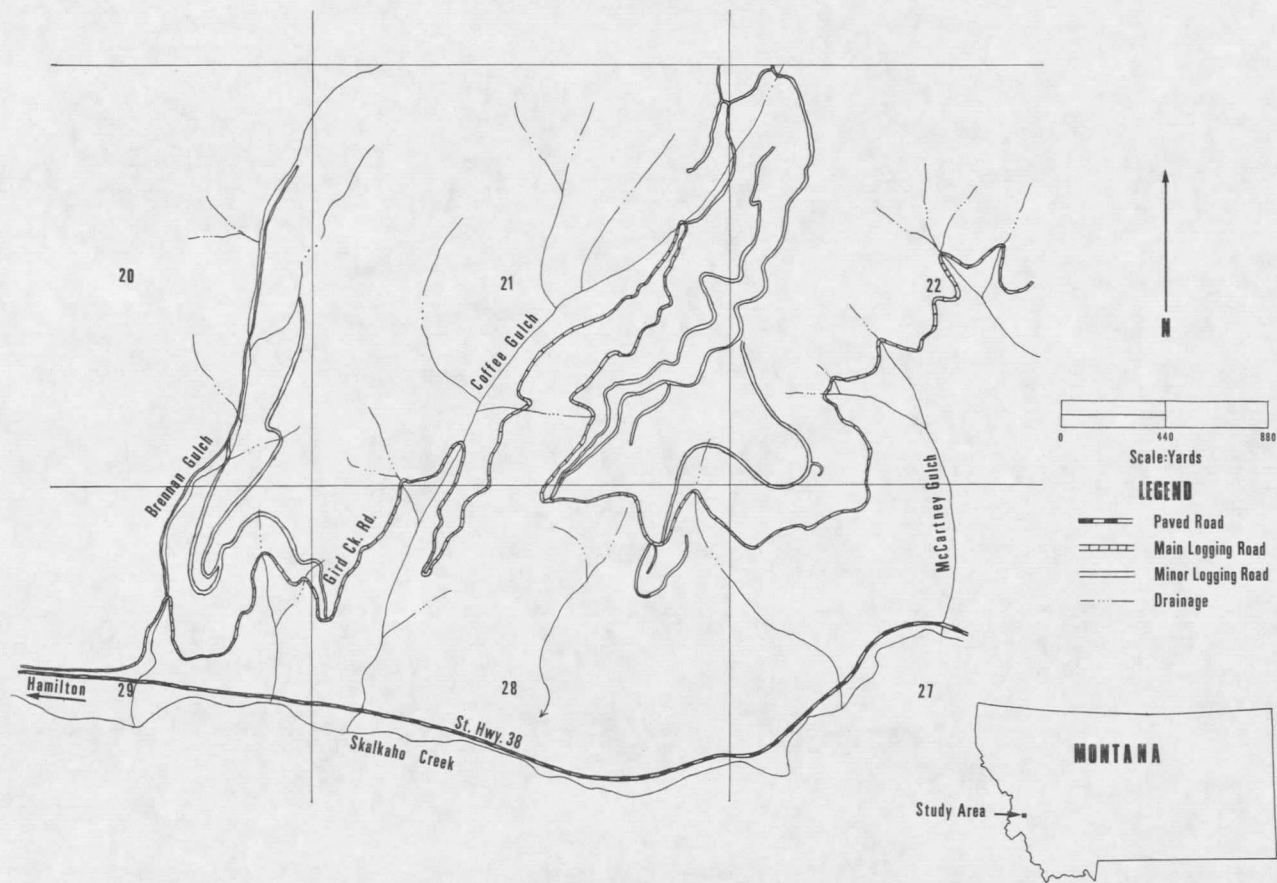


Figure 1. Map of the study area showing network of logging roads.





























































































































































