



Effects of livestock grazing on grizzly bear habitat along the east front of the Rocky Mountains,
Montana
by Thomas Scott Stivers

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Fish
and Wildlife Management
Montana State University
© Copyright by Thomas Scott Stivers (1988)

Abstract:

A study on the effects of cattle grazing on grizzly bear habitat along the East Front of the Rocky Mountains, in Montana, was conducted from June 1985 to October 1986. Objectives were to determine impacts of cattle grazing on cover and forage preferred by grizzlies within aspen and willow plant communities, and to test the possibility of reestablishing preferred forage species within aspen and willow stands where they were lacking. Information collected on the phenology of bear foods growing in aspen and willow stands revealed that the more nutritious bear foods produced seeds late in the growing season. The utilization of bear foods by cattle in 5 study pastures showed that in 41-47 days all bear foods were 50% utilized. Paired contrast sites were selected in aspen and willow stands and stand structure and herbaceous bear foods were measured. Sites annually grazed after June generally produced more of the desirable bear foods (cow-parsnip, sharptooth angelica, and western sweet-cicely) than did sites grazed during June. The cumulative information suggests that June cattle grazing is adversely affecting the abundance of the 3 desirable bear foods. Sites protected from cattle grazing for 2 to 9 years had more aspen and willow suckers than did grazed sites, though both sites appeared to be recruiting enough suckers for stand survival. Ungrazed vs. grazed sites and sites grazed after June vs. sites grazed during June, produced more horizontal cover to potentially conceal a bear. Results from experimental plantings of seeds from 3 Umbelliferae bear foods showed that seed germination and seedling reestablishment was possible. Management guidelines and recommendations are presented.

EFFECTS OF LIVESTOCK GRAZING ON GRIZZLY BEAR HABITAT
ALONG THE EAST FRONT OF THE ROCKY MOUNTAINS, MONTANA

by

Thomas Scott Stivers

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

May 1988

N 378
S 598

APPROVAL

of a thesis submitted by
Thomas Scott Stivers

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.

12 May 1988
Date

Lyman R. Selby
Chairperson, Graduate Committee

Approved for the Major Department

19 May 1988
Date

John F. Brunsell
Head, Major Department

Approved for the College of Graduate Studies

June 10, 1988
Date

Henry J. Parsons
Graduate Dean

STATEMENT OF PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for 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 acknowledgment 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 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



Date

5/19/88

ACKNOWLEDGMENT

I wish to express my sincere appreciation to the following people for their significant contribution to this study: Mr. Wayne Elliot and Mr. T. A. Day, Bureau of Land Management, for recognizing the need for this study; Dr. Lynn Irby, Montana State University, for helping with the study design, field work, and manuscript preparation; Dr. Harold Picton and Dr. Clayton Marlow for critically editing the manuscript; Dr. William Gould for reviewing the manuscript; Dr. Arnold Olsen and Mr. Keith Aune, Montana Department of Fish, Wildlife, and Parks for equipment and vehicles; and Mr. Loyd Swanger, Mr. Lewis Young, and the other employees of the Rocky Mountain Division of the Lewis and Clark National Forest for the use of equipment. I would also like to thank all the landowners and land managers within my study area for being very cooperative in granting access to their lands. Several landowners, Mr. and Mrs. Kurt Heinrich and Mr. Tom Salansky, were particularly considerate and often provided enjoyable interludes to my tedious field work. I also wish to express special thanks to my late father for encouragement, support, and sound advice. My utmost gratitude goes to my lovely wife, Germaine, for being supportive, helpful, and enduring.

TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
STUDY AREA.....	3
METHODS.....	6
Paired Contrast Sites.....	6
Site Selection.....	6
Transect and Plot Establishment.....	6
Transect Measurements:.....	7
Microplots.....	7
Line intercept/concealment cover.....	7
Arboreal canopy coverage.....	7
Plot Measurements:.....	7
Herbaceous bear foods.....	7
Low and medium height shrubs.....	8
Stand structure.....	8
Vegetative Nomenclature.....	9
Statistical Tests.....	9
Pasture Utilization by Cattle.....	9
Bear Food Phenology.....	11
Bear Food Re-establishment.....	12
RESULTS.....	13
Paired Contrast Sites.....	13
Site Selection and Characteristics.....	13
Transect Measurements:.....	15
Microplot ground cover.....	15
Arboreal canopy coverage.....	18
Line intercept/concealment cover.....	18
Plot Measurements:.....	19
Stand structure.....	19
Low and medium height shrubs.....	22
Herbaceous bear foods.....	22
Effects of historical grazing on bear foods.....	28
Pasture Utilization by Cattle.....	32
Bear Food Phenology.....	34
Bear Food Re-establishment.....	40

TABLE OF CONTENTS--Continued

	Page
DISCUSSION AND CONCLUSIONS.....	43
Grazing Effects on Stand Structure/Survival.....	43
Grazing Effects on Food and Cover Values.....	46
Grazing Patterns and Their Effects on Bear Food Availability.....	49
Bear Food Re-establishment.....	53
MANAGEMENT GUIDELINES AND RECOMMENDATIONS.....	56
Management Guidelines.....	56
Management Recommendations.....	56
LITERATURE CITED.....	58
APPENDICES.....	63
APPENDIX A--Plant Abbreviations.....	64
APPENDIX B--Pasture Biomass Values.....	66
APPENDIX C--Weather Information.....	75
APPENDIX D--Maps.....	77

LIST OF TABLES

Table	Page
1. Characteristics of paired contrast sites.....	14
2. Values recorded for microplot, arboreal canopy coverage, and line intercept measurements for transects at paired contrast sites.....	16
3. Mean number of stems per 60 m ² by diameter and height categories for aspen, willow, and total trees and tall shrubs (potentially > 2.0 m) at paired contrast sites.....	20
4. Mean canopy coverage by height categories for the 4 most common, and total, low and medium height shrubs at paired contrast sites.....	23
5. Mean numbers or canopy coverage, and mean heights of herbaceous bear foods in 60 m ² plots at paired contrast sites. Heights were not measured in some plots in 1985.....	26
6. Relationships between pasture characteristics and abundance of specific herbaceous bear foods. Pluses indicate significantly greater (p<0.05) abundance (number or canopy coverage) than the other site in the pair.....	30
7. Characteristics of 5 pastures in which cattle utilization patterns were monitored.....	33
8. Results of 1985 and 1986 experimental plantings of 3 Umbelliferae bear foods.....	41
9. Key to plant species abbreviations.....	65
10. Biomass values from the Kurt Heinrich (KH) pasture, 1985, for Umbelliferae (U) and Nonumbelliferae (NU) bear foods.....	67
11. Biomass values from the North Cow Creek (NC) pasture, 1985, for Umbelliferae (U) and Nonumbelliferae (NU) bear foods.....	68

LIST OF TABLES--Continued

Table	Page
12. Biomass values from the South Dupuyer Creek (SD) pasture, 1985, for Umbelliferae (U) and Nonumbelliferae (NU) bear foods.....	69
13. Biomass values from the South Dupuyer Creek (SD) pasture, 1986, for Umbelliferae and Nonumbelliferae (NU) bear foods.....	70
14. Biomass values from the Tom Salansky (TS) pasture, 1986, for Umbelliferae (U) and Nonumbelliferae (NU) bear foods.....	71
15. Biomass values from the Hightower (HT) pasture, 1986, for Umbelliferae (U) and Nonumbelliferae (NU) bear foods.....	72
16. Mean percent of maximum biomass for all pastures through the grazing period.....	73
17. Mean percent of maximum biomass at end of grazing period for all pastures/plots by distance categories from the gate cattle entered the pastures.....	74
18. Average temperature ($^{\circ}$ C), total precipitation (cm), total snowfall (cm), and deviation from the long term average for Choteau, Montana airport from April 1985 through September 1986.....	76

LIST OF FIGURES

Figure	Page
1. Map of the East Front study area showing major features.....	4
2. Average, standard deviation, and range of residual biomass of the Umbelliferae category of bear foods in 5 pastures measured through the grazing period. The index of maximum biomass is defined in the text.....	35
3. Average, standard deviation, and range of residual biomass of the grass/sedge, dandelion, and clover category of bear foods in 5 pastures measured through the grazing period. The index of maximum biomass is defined in the text.....	36
4. Average, standard deviation, and range of residual biomass at the end of the grazing period for the Umbelliferae category of bear foods for plots at varying distances from the gate cattle entered a pasture.....	37
5. Average, standard deviation, and range of residual biomass at the end of the grazing period for the grass/sedge, dandelion, and clover category of bear foods for plots at varying distances from the gate cattle entered a pasture.....	38
6. The range of earliest and latest dates at which bear foods reached "seed ripe" phenological stage within the study area, 1985 and 1986.....	39
7. Map showing locations of paired contrast sites.....	78
8. Map showing locations and shapes of 5 utilization pastures.....	79
9. Map showing locations of experimental planting sites.....	80

ABSTRACT

A study on the effects of cattle grazing on grizzly bear habitat along the East Front of the Rocky Mountains, in Montana, was conducted from June 1985 to October 1986. Objectives were to determine impacts of cattle grazing on cover and forage preferred by grizzlies within aspen and willow plant communities, and to test the possibility of reestablishing preferred forage species within aspen and willow stands where they were lacking. Information collected on the phenology of bear foods growing in aspen and willow stands revealed that the more nutritious bear foods produced seeds late in the growing season. The utilization of bear foods by cattle in 5 study pastures showed that in 41-47 days all bear foods were 50% utilized. Paired contrast sites were selected in aspen and willow stands and stand structure and herbaceous bear foods were measured. Sites annually grazed after June generally produced more of the desirable bear foods (cow-parasit, sharp-tooth angelica, and western sweet-cicely) than did sites grazed during June. The cumulative information suggests that June cattle grazing is adversely affecting the abundance of the 3 desirable bear foods. Sites protected from cattle grazing for 2 to 9 years had more aspen and willow suckers than did grazed sites, though both sites appeared to be recruiting enough suckers for stand survival. Ungrazed vs. grazed sites and sites grazed after June vs. sites grazed during June, produced more horizontal cover to potentially conceal a bear. Results from experimental plantings of seeds from 3 Umbelliferae bear foods showed that seed germination and seedling reestablishment was possible. Management guidelines and recommendations are presented.

INTRODUCTION

Studies on the East Front of the Rocky Mountains in the northwest chinook zone of Montana have provided a large data set on grizzly bear (*Ursus arctos horribilis*) habitat use, movements, and distribution (Schallenberger and Jonkel 1978, 1979, 1980; Aune and Stivers 1981, 1982, 1983; Aune et al. 1984; Aune 1985; Aune et al. 1986; and Aune and Brannon 1987). Along the East Front, approximately 65 percent (%) of spring and early summer grizzly range is managed primarily for the production of livestock forage. Eighty nine % of livestock grazing is by cattle. During spring / early summer, cattle and grizzly bears show considerable overlap in diet and habitat use -- primarily due to their common use of riparian plant communities (Aune 1985).

Many researchers have suggested that livestock grazing may have negative impacts on grizzly bear habitat and distribution (Mealey et al. 1977, Schallenberger and Jonkel 1980, Knight et al. 1981, and Aune and Stivers 1982). Varying intensities and seasonality of livestock grazing could change vegetation composition, phenology, and/or the structure of riparian communities in favorable or unfavorable ways. This study, conducted from April 1985 through September 1986, was designed to provide some site

specific information needed for determining impacts of cattle grazing on grizzly bear habitat along the East Front of the Rocky Mountains. The specific objectives were:

- 1) to determine the impacts of cattle grazing on cover and forage preferred by grizzly bears within mesic plant communities.
- 2) to develop guidelines to mitigate negative influences and enhance positive influences of cattle grazing on bear habitat.
- 3) to identify sites suitable for long term studies on the influence of livestock on cover types and foods preferred by bears.
- 4) to test the possibility of establishing preferred bear foods at sites where they were lacking.

This study was supported by the U.S. Bureau of Land Management through a contract with the U.S. Fish and Wildlife Service.

STUDY AREA

The study area encompassed 600 square kilometers (km²) in Teton and Pondera counties (Fig. 1). Land ownership was divided between the U.S. Forest Service, the Bureau of Land Management (BLM), Montana Department of Fish, Wildlife, and Parks (MDFWP), The Nature Conservancy, the Boone and Crockett Club's Theodore Roosevelt Memorial Ranch, and private individuals. The dominant land uses were ranching and recreation. The area had been subjected to extensive oil and gas exploration, but few wells were in production.

Elevations in the study area ranged from 1340 to 2070 meters (m). Precipitation averaged between 30 and 50 centimeters (cm) annually. Temperatures ranged from -40 to 32 C annually. The average growing season was 90 days. Strong westerly to southwesterly winds were common.

The study area was in the transition zone between the Rocky Mountains (Sawtooth Range) and the Great Plains. The foothills and prairie were abundantly trellised with small streams. Along streams, dominant plant communities consisted of aspen (Populus tremuloides), cottonwood (P. trichocarpa), and willow (Salix spp.). The prairie and higher elevation grasslands were dominated by bluebunch wheatgrass / Idaho fescue (Agropyron spicatum / Festuca

