



Grizzly bear activity and human-induced modifications in Pelican Valley, Yellowstone National Park  
by Kerry Allan Gunther

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 Kerry Allan Gunther (1991)

Abstract:

Grizzly bear (*Ursus arctos horribilis*) activity, distribution, habitat use, predation, and earn on use were documented through visual observations in Pelican Valley, Yellowstone National Park, from 1984 through 1988. The impact of recreational activity on grizzly bear behavior, and visitor compliance with bear management regulations and safety warnings were also investigated. Of 961 bear sightings recorded, 83% were identified to species. Most (98%) bears identified to species were grizzly bears. There appeared to be a spatial separation between black bears (*Ursus americanus*) and grizzly bears within the study area. From 14 to 23 individual grizzly bears and 1 to 2 black bears were observed each year. Six to 7 breeding-age females frequented Pelican Valley during the study. Cub production in the valley averaged 3.8 cubs/year; mean litter size was 1.9 cubs/litter. Bear sightings were composed of 66% unclassified adults, 20% females with cubs-of-the-year (COY), 4% females with yearlings, and 11% subadults. The frequency of bear sightings was highest from 16 May through 15 July ( $x = 3.7$  bear sightings/year), decreased slightly from 16 July through 15 August ( $x = 2.7$  bear sightings/day), then declined significantly after 15 August ( $x = 1.3$  bear sightings/day). Bear activity increased from an average of 36 min active/sighting during May and June to 84 min active/sighting during August. Major peaks in diurnal activity occurred at 0600 hours and 2000 hours. Females with COY and subadult bears were more day active than other observed bears. The average distance bears moved from forest cover while being observed was 290 m. Bears used the silver sagebrush (*Artemisia cana*)/Idaho fescue (*Festuca idahoensis*) habitat type and *Trifolium* spp. microsite type in significantly greater proportion than availability. Grizzly bears attempted predation on elk (*Cervus elaphus nelsoni*) calves in 21%, 13%, and 4% of all bear sightings in May, June, and July, respectively. Grizzly bears were successful in killing elk calves in 71%, 42%, and 7% of the observed hunts in May, June, and July, respectively. The mean distance from forest cover of carcasses scavenged by grizzly bears was 327 m. Pelican Valley was managed for 3 levels of backcountry use: open (both day use and overnight camping allowed), restricted use (day use between 0900 hours and 1900 hours only), and closed (no visitor use allowed). The average flight distance of grizzly bears to tree cover following disturbance by backcountry users was 422 m. When the valley was open to visitors, bear activity in areas greater than 500 m from forest cover was significantly reduced, and bears avoided areas around occupied backcountry campsites. No differences in diurnal hourly activity patterns were observed among the open, restricted, and closed periods. During an encounter with a grizzly bear, foot parties were more likely to be charged than people on horseback. All incidents in which hikers were charged by bears involved groups of less than 3 people. Only 17% of the observed hiking parties followed the recommended group size of 4 or more people. Compliance with the area closure and day-use-only regulations was 99% and 83%, respectively.

GRIZZLY BEAR ACTIVITY AND HUMAN-INDUCED  
MODIFICATIONS IN PELICAN VALLEY,  
YELLOWSTONE NATIONAL PARK

by

Kerry Alan Gunther

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

March 1991

N378  
G 958

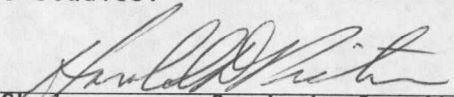
APPROVAL

of a thesis submitted by

Kerry Alan Gunther

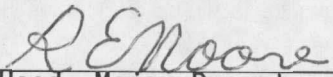
This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

3/29/91  
Date

  
Chairperson, Graduate Committee

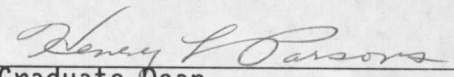
Approved for the Major Department

3/29/91  
Date

  
Head, Major Department

Approved for the College of Graduate Studies

4/4/91  
Date

  
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 absence, by the Dean 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

Kerry Sumner

Date

3/29/91

## ACKNOWLEDGMENTS

This study was funded by the National Park Service, Yellowstone National Park. I wish to express my appreciation to the following individuals whose efforts made this study possible: S. Fowler and G. Brown for providing logistical support, encouragement, and helpful ideas; M. Meagher for providing advice and reviewing drafts of the manuscript; J. Varley for suggesting the study; D. Fraser-Herring and D. Dunbar for conducting the vegetation phenology portion of the study; R. Renkin for consultation on statistical analysis of the data; M. Martinec for grammatical editing of the manuscript; Drs. H. Picton, L. Irby, and W. Gould, Montana State University, who reviewed the manuscript and provided helpful advice on the study design. I would especially like to thank all of my family, friends, and coworkers for never forgetting about me while I spent periods of up to four months living in a remote backcountry cabin conducting this study.

## TABLE OF CONTENTS

	Page
APPROVAL PAGE . . . . .	ii
STATEMENT OF PERMISSION TO USE . . . . .	iii
VITA . . . . .	iv
ACKNOWLEDGMENTS . . . . .	v
TABLE OF CONTENTS . . . . .	vi
LIST OF TABLES . . . . .	ix
LIST OF FIGURES . . . . .	xi
ABSTRACT . . . . .	xii
INTRODUCTION . . . . .	1
STUDY AREA . . . . .	3
Geology . . . . .	3
Climate . . . . .	5
Flora . . . . .	6
Fauna . . . . .	8
Recreational Use . . . . .	9
METHODS . . . . .	12
Monitoring Bear Activity in Pelican Valley . . . . .	12
Bear Observations . . . . .	12
Identifying Species Of Bear . . . . .	13
Identifying Individual Bears . . . . .	14
Breeding-Age Females . . . . .	15
Population Structure . . . . .	15
Activity-Pattern Monitoring . . . . .	15
Weather . . . . .	15
Distance From Forest Cover . . . . .	16
Habitat Use . . . . .	16
Vegetation Phenology . . . . .	16
Food Habits . . . . .	18
Scat Collection and Analysis . . . . .	18
Feeding Site Analysis . . . . .	18
Predation . . . . .	18
Evaluating Visitor Impact on Grizzly Bear Activity . . . . .	19
Bear Observations . . . . .	19
Recreational Activity . . . . .	19
Bear-Human Encounters . . . . .	20
Displacement of Bears From Nonforested Areas . . . . .	20

TABLE OF CONTENTS--Continued

	Page
Proximity to Backcountry Campsites . . . . .	20
Statistical Analysis . . . . .	21
RESULTS . . . . .	22
Bear Activity in Pelican Valley . . . . .	22
Species of Bear . . . . .	22
Individual Bears . . . . .	22
Population Structure . . . . .	23
Activity Patterns . . . . .	27
Habitat Use . . . . .	29
Food Habits . . . . .	34
Vegetation . . . . .	34
Predation . . . . .	36
Use of Carrion . . . . .	44
Bear-Coyote Interactions . . . . .	44
Bear-Bison Interactions . . . . .	45
Bear-Moose Interactions . . . . .	46
Visitor Impact on Grizzly Bear Activity . . . . .	46
Bear-Human Interactions . . . . .	46
Distance From Cover . . . . .	48
Proximity of Bears to Backcountry Campsites . . . . .	49
Activity Patterns . . . . .	50
Visitor Compliance With Bear-Safety Warnings and Regulations . . . . .	50
DISCUSSION . . . . .	53
Grizzly Bear Activity in Pelican Valley . . . . .	53
Species of Bear . . . . .	53
Intraspecific Avoidance of Conspecifics by Females With Cubs-of-the-Year . . . . .	53
Monthly Activity Patterns . . . . .	54
Diel Activity Patterns . . . . .	55
Use of Nonforested Areas . . . . .	56
Food Habits . . . . .	57
Predation on Elk Calves . . . . .	58
Predation on Spawning Fish . . . . .	59
Use of Carrion . . . . .	61
Visitor Impact on Grizzly Bear Activity . . . . .	62
MANAGEMENT IMPLICATIONS . . . . .	65
REFERENCES CITED . . . . .	68
APPENDICES . . . . .	76
Appendix A - Bear Observation Field Form . . . . .	77
Appendix B - Bear Predation Field Form . . . . .	79

TABLE OF CONTENTS--Continued

	Page
Appendix C - Bear-Human Encounter Field Form . . . . .	81
Appendix D - Individual Bears . . . . .	83
Appendix E - Bear-Coyote Interactions . . . . .	87
Appendix F - Bear-Bison Interactions . . . . .	92
Appendix G - Vegetation Phenology . . . . .	96
Appendix H - Reproductive Behavior . . . . .	101



## LIST OF TABLES

Table	Page
1. Campsite number, UTM location, person limit, and stock limit for backcountry campsites in Pelican Valley, Yellowstone National Park . . . . .	10
2. Number of grizzly, black, and unknown species of bear observed in the nonforested areas of Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	23
3. Number of female grizzly bears with COY, total number of COY, and mean litter size observed in the nonforested areas of Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	24
4. Number of observations of grizzly bear mating pairs, unclassified adults, females with COY, females with yearlings, and subadults recorded during May through September in the nonforested areas of Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	26
5. Yearly comparison between the number of observations of female grizzly bears with COY in Pelican Valley, Yellowstone National Park, and the whitebark-pine cone production in the Yellowstone ecosystem from the fall of the previous year . . . . .	27
6. Number of observations of grizzly bears and black bears in the nonforested areas of Pelican Valley, Yellowstone National Park, during 2-week periods from May through September, 1984-1988 . . . . .	28
7. Distance of observed grizzly bears from forest cover in Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	32
8. Proportion of use versus availability of observed bear activity minutes in different nonforested vegetation types in Pelican Valley, Yellowstone National Park, 1985-1988 . . . . .	33
9. Bear vegetal food species present in the nonforested areas of Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	35
10. Activities recorded at grizzly bear feedsite locations in nonforested areas of Pelican Valley, Yellowstone National Park, May through August 1987 . . . . .	37
11. Weekly summary of grizzly bear predation on elk calves in the Pelican Valley area of Yellowstone National Park, 1984-1988 . . . . .	38

LIST OF TABLES--Continued

Table	Page
12. Number of chases, number of kills, and success rate of attempted grizzly bear predation on different size elk cow/calf groups in the Pelican Valley area of Yellowstone National Park, 1984-1988 . . . . .	39
13. Characteristics of grizzly bears observed chasing elk in Pelican Valley, Yellowstone National Park, 1984-1988 . . .	40
14. Number and type of recreational use in Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	47
15. Frequency of bear activity at different distances from tree cover during open, restricted, and closed periods of visitor use in Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	49
16. Comparison between the number of bear sightings within 400 m of occupied vs. unoccupied campsites in Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	49
17. Individual bears observed in Pelican Valley, Yellowstone National Park, 1984-1988 . . . . .	84
18. Phenological changes of vegetal bear foods from June through August in Pelican Valley, Yellowstone National Park, 1986 . . . . .	97
19. Phenological changes of vegetal bear foods from May through August in Pelican Valley, Yellowstone National Park, 1987 . . . . .	99

LIST OF FIGURES

Figure	Page
1. Map of Pelican Valley . . . . .	4
2. Grizzly bear diel activity patterns, all bears combined . .	30
3. Grizzly bear diel activity patterns by cohort . . . . .	31
4. Grizzly bear diel activity patterns by visitor use regulation . . . . .	51

## ABSTRACT

Grizzly bear (*Ursus arctos horribilis*) activity, distribution, habitat use, predation, and carrion use were documented through visual observations in Pelican Valley, Yellowstone National Park, from 1984 through 1988. The impact of recreational activity on grizzly bear behavior, and visitor compliance with bear management regulations and safety warnings were also investigated. Of 961 bear sightings recorded, 83% were identified to species. Most (98%) bears identified to species were grizzly bears. There appeared to be a spatial separation between black bears (*Ursus americanus*) and grizzly bears within the study area. From 14 to 23 individual grizzly bears and 1 to 2 black bears were observed each year. Six to 7 breeding-age females frequented Pelican Valley during the study. Cub production in the valley averaged 3.8 cubs/year; mean litter size was 1.9 cubs/litter. Bear sightings were composed of 66% unclassified adults, 20% females with cubs-of-the-year (COY), 4% females with yearlings, and 11% subadults. The frequency of bear sightings was highest from 16 May through 15 July ( $\bar{x} = 3.7$  bear sightings/year), decreased slightly from 16 July through 15 August ( $\bar{x} = 2.7$  bear sightings/day), then declined significantly after 15 August ( $\bar{x} = 1.3$  bear sightings/day). Bear activity increased from an average of 36 min active/sighting during May and June to 84 min active/sighting during August. Major peaks in diurnal activity occurred at 0600 hours and 2000 hours. Females with COY and subadult bears were more day active than other observed bears. The average distance bears moved from forest cover while being observed was 290 m. Bears used the silver sagebrush (*Artemisia cana*)/Idaho fescue (*Festuca idahoensis*) habitat type and *Trifolium* spp. microsite type in significantly greater proportion than availability. Grizzly bears attempted predation on elk (*Cervus elaphus nelsoni*) calves in 21%, 13%, and 4% of all bear sightings in May, June, and July, respectively. Grizzly bears were successful in killing elk calves in 71%, 42%, and 7% of the observed hunts in May, June, and July, respectively. The mean distance from forest cover of carcasses scavenged by grizzly bears was 327 m. Pelican Valley was managed for 3 levels of backcountry use: open (both day use and overnight camping allowed), restricted use (day use between 0900 hours and 1900 hours only), and closed (no visitor use allowed). The average flight distance of grizzly bears to tree cover following disturbance by backcountry users was 422 m. When the valley was open to visitors, bear activity in areas greater than 500 m from forest cover was significantly reduced, and bears avoided areas around occupied backcountry campsites. No differences in diurnal hourly activity patterns were observed among the open, restricted, and closed periods. During an encounter with a grizzly bear, foot parties were more likely to be charged than people on horseback. All incidents in which hikers were charged by bears involved groups of less than 3 people. Only 17% of the observed hiking parties followed the recommended group size of 4 or more people. Compliance with the area closure and day-use-only regulations was 99% and 83%, respectively.

## INTRODUCTION

Backcountry recreational use in Yellowstone National Park (YNP) increased by 53% from 36,219 visitor use nights (VUN) in 1973 to 55,331 VUN's in 1977 (YNP records). Backcountry use then averaged 52,662 VUN's per year from 1978 through 1982, a 45% increase from 1973. As use of backcountry in YNP increased, park managers became concerned over the potential impact of high levels of recreational use on grizzly bear activity in backcountry areas.

Craighead (1980) recommended delineation of critical bear habitat in the Yellowstone ecosystem and restriction of certain types of human activity within these areas. Beginning in 1983, the park seasonally restricted recreational use in specific areas of prime bear habitat. The purposes behind these restrictions, referred to as Bear Management Areas, included: 1) minimizing bear-human interactions that may lead to habituation of bears to people (habituation often results in the bear being removed from the population due to concern for human safety), 2) preventing human-caused displacement of bears from prime food sources, and 3) decreasing the risk of human injury in areas with a high density of bear activity (National Park Service 1982).

In 1984, a 5-yr study to evaluate the effectiveness of using Bear Management Areas as a management tool was initiated. The primary objectives of the study were to: 1) determine the level and distribution of grizzly bear activity in Pelican Valley; 2) document general grizzly bear behavior in the valley including diurnal activity patterns, habitat use, predation, and carrion use; 3) determine if backcountry recreational activity displaced bears from productive

nonforested habitat; 4) determine if backcountry recreational activity disrupted grizzly bear diurnal-activity patterns; and 5) evaluate visitor compliance with bear management regulations and safety warnings.

## STUDY AREA

The study area encompassed approximately 4,850 hectares (ha) of nonforested habitat in the Pelican Creek drainage located in the east-central portion of YNP (Fig. 1). Elevations in the study area ranged from 2,377 m to 2,939 m. Most of the study area, however, was relatively flat with elevations between 2,377 m and 2,438 m.

### Geology

Three major geologic episodes influenced the formation of Pelican Valley (Keefer 1972). These episodes began when volcanic activity in the Yellowstone area (approximately 600,000 yr ago) released large amounts of magma from underground chambers. Following release of the magma, the area overlying the emptied chambers collapsed creating the Yellowstone caldera:

After formation of the caldera, rhyolite lava flows began seeping from fractures in the bottom of the crater and partially covered the caldera floor. This renewed volcanic activity continued until sometime between 60,000 yr and 75,000 yr ago.

































































































































































































































