



Range relationships of elk and livestock in the Crow Creek drainage, Elkhorn Mountains, Montana  
by David Ray Stevens

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 David Ray Stevens (1965)

Abstract:

A study of range relationships between elk and livestock was made in 1963-1964 on 100,000 acres of Crow Creek drainage, Elkhorn Mountains, Montana. The objective was to obtain quantitative data on food habits, forage utilization, and distribution of elk, cattle, and sheep on spring and summer ranges. The history of livestock and elk on the area was reviewed. A physiographic and vegetation description of the study area was made. Three vegetation zones were described; Fescue-Wheatgrass, Douglas-fir, and Spruce-Fir. Range use by elk was determined during 257 ground observation trips recording 3,125 elk and 15 aerial observation trips recording 1,814 elk. The Fescue-Wheatgrass Zone received almost 100 percent of the elk use from January through March and about 90 percent of the use in April and May. Each zone received considerable use in June and the Spruce-Fir Zone received most of the use in July and August. Cattle and sheep distribution on each grazing allotment was discussed. Elk food habits were determined by examination of 94 feeding sites and analyses of the contents of eight elk rumens. The results were tabulated by season and vegetation zone. The spring diet consisted of 77 percent grasses and 23 percent forbs while the summer diet consisted of 76 percent forbs and only 16 percent grasses. Data from fall rumen samples indicated a progressive shift to grasses during the period. Cattle food habits were determined by examination of 69 feeding sites which showed that grasses formed most of the diet on each vegetation zone. For all zones grasses made up 75 percent and forbs 24 percent of the summer diet. Sheep food habits were determined from the examination of 28 feeding sites which indicated forbs formed most of the summer diet. The percentage of forbs in the diet decreased as the intensity of grazing increased. The forage species most preferred by sheep were indicated. Forage utilization, studied by agronomy cages, exclosures, utilization transects, and ocular estimates, indicated several areas were used to a "heavy" degree. These were considered areas of possible competition for forage among the grazing animals. In the Spruce-Fir and Douglas-fir Zones, grazed in spring, summer, and fall by elk and summer and fall by cattle, interspecific competition was not considered significant during the study period. In the Fescue-Wheatgrass Zone, grazed in spring, fall, and winter by elk and summer and fall by cattle, competition was not considered serious, but the data indicated a potential for conflict on elk winter range areas. Cattle intraspecific competition existed to some degree in each zone. A potential for competition was indicated between sheep and elk, but the degree which existed on the study area was not considered excessive. Intraspecific sheep competition was heavy in some preferred grazing areas. Intraspecific elk competition was not found significant on any part of the study area at the present time.

RANGE RELATIONSHIPS OF ELK AND LIVESTOCK  
IN THE CROW CREEK DRAINAGE,  
ELKHORN MOUNTAINS, MONTANA

by

DAVID RAY STEVENS

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

of

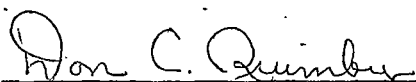
MASTER OF SCIENCE

in

Fish and Wildlife Management

Approved:

  
Head, Major Department

  
Chairman, Examining Committee

  
Dean, Graduate Division

MONTANA STATE COLLEGE  
Bozeman, Montana

June, 1965

## ACKNOWLEDGMENT

To the following, among others, the author wishes to express appreciation for their contributions to this study: Dr. Don C. Quimby, Montana State College, who directed the study and aided in preparation of the manuscript; Dr. Robert L. Eng, Montana Fish and Game Department, for project planning; Mr. Leroy Ellig, Mr. Joe Egan, and other personnel of District Three, Montana Fish and Game Department, for field assistance and cooperation; Mr. Kenneth Greer, Montana Fish and Game Department, for assistance and use of facilities in analysis of rumen samples; Mr. John Antonich, District Ranger, and all personnel of Townsend District, Helena National Forest, for field assistance and cooperation; Dr. John H. Rumely, Montana State College, for field assistance and aid in vegetation analysis; Dr. W. E. Booth, Montana State College, for aid in verification of plant specimens; Mr. Charles Eustace, Montana Fish and Game Department, for field assistance; my wife, Marilyn, for field assistance, patience, and encouragement. The writer was supported by the Montana Fish and Game Department under Federal Aid Projects W-98-R-4 and W-98-R-5, the U. S. Forest Service, and the National Science Foundation during the study.

## TABLE OF CONTENTS

	Page
VITA . . . . .	ii
ACKNOWLEDGMENT . . . . .	iii
TABLE OF CONTENTS . . . . .	iv
LIST OF TABLES . . . . .	vi
LIST OF FIGURES . . . . .	vii
ABSTRACT . . . . .	ix
INTRODUCTION . . . . .	1
PHYSIOGRAPHY OF STUDY AREA . . . . .	3
VEGETATION OF STUDY AREA . . . . .	9
Fescue-Wheatgrass Zone . . . . .	9
Fescue-Wheatgrass Type . . . . .	10
Sagebrush-Fescue Type . . . . .	10
Juniper-Fescue Type . . . . .	12
Aspen-Willow Type . . . . .	12
Douglas-fir Zone . . . . .	12
Douglas-fir Type . . . . .	12
Lodgepole pine Type . . . . .	15
Aspen-Willow Type . . . . .	15
Grass-Forb Park Type . . . . .	15
Engelmann Spruce - Alpine Fir Zone . . . . .	16
Spruce-Fir Type . . . . .	16
Lodgepole pine Type . . . . .	18
Aspen-Willow Type . . . . .	18
Grass-Forb Park Type . . . . .	18
DISTRIBUTION AND RANGE USE . . . . .	20
Elk . . . . .	20
Cattle . . . . .	26
Sheep . . . . .	30

TABLE OF CONTENTS  
(continued)

	Page
FOOD HABITS . . . . .	32
Elk . . . . .	32
Spring . . . . .	35
Summer . . . . .	35
Vegetation Zones . . . . .	36
Rumen Analyses . . . . .	37
Cattle . . . . .	39
Sheep . . . . .	43
FORAGE UTILIZATION . . . . .	48
Elk and Cattle . . . . .	48
Tizer Cattle Allotment . . . . .	51
North Crow Cattle Allotment . . . . .	53
South Crow Cattle Allotment . . . . .	54
Elk and Sheep . . . . .	56
RANGE RELATIONSHIPS . . . . .	58
Elk and Cattle . . . . .	58
Elk and Sheep . . . . .	62
APPENDIX . . . . .	65
LITERATURE CITED . . . . .	66

## LIST OF TABLES

Table	Page
I. CONSTANCY, CANOPY COVERAGE, AND FREQUENCY OF TAXA IN THE VEGETATION ON NINETEEN GRASSLAND AND PARK STANDS AS DETERMINED BY TWENTY 2 X 5 DECIMETER PLOTS ALONG A PACED TRANSECT ON EACH STAND . . . . .	7
II. PERCENT OF ELK OBSERVED ON EACH VEGETATION TYPE BY MONTH AS RECORDED BY AERIAL AND GROUND OBSERVATION TRIPS IN 1963 AND 1964 . . . . .	21
III. ELK OBSERVED IN JULY, AUGUST, AND SEPTEMBER BY WEEK IN 1963 AND 1964 . . . . .	26
IV. STOCKING ON THE NORTH CROW CATTLE ALLOTMENT UNDER THE RESTROTATION GRAZING SYSTEM IN 1963 AND 1964 . . . . .	28
V. SCHEDULE OF SHEEP USE ON EACH CAMP UNIT OF THE WILSON CREEK SHEEP ALLOTMENT IN 1963 AND 1964 . . . . .	31
VI. ELK FOOD HABITS AS DETERMINED BY EXAMINATION OF 94 ELK FEEDING SITES IN 1963 AND 1964 . . . . .	33
VII. ELK FOOD HABITS AS DETERMINED FROM THE COMPOSITION OF RUMEN SAMPLES FROM EIGHT ELK COLLECTED IN 1963 AND 1964 . . . . .	38
VIII. CATTLE FOOD PREFERENCES AS DETERMINED FROM EXAMINATION OF 69 FEEDING SITES IN 1963 AND 1964 . . . . .	40
IX. SHEEP FOOD HABITS AS DETERMINED FROM EXAMINATION OF 28 FEEDING SITES DURING 1963 AND 1964 . . . . .	44
X. PERCENT FORAGE UTILIZATION IN 1964 ON KEY AREAS OF THE TIZER CATTLE ALLOTMENT AS DETERMINED BY AGRONOMY CAGES . . . . .	52
XI. PERCENT FORAGE UTILIZATION BY WEIGHT ON WILSON CREEK SHEEP ALLOTMENT AS DETERMINED BY CLIPPED PLOTS ALONG ELEVEN TRANSECTS IN 1963 . . . . .	57

## LIST OF FIGURES

Figure	Page
1. Map of the Crow Creek Study Area . . . . .	4
2. Fescue-Wheatgrass Type in the Fescue-Wheatgrass Zone Near Muddy Lake Creek . . . . .	11
3. Sagebrush-Fescue Type in the Fescue-Wheatgrass Zone South of Eagle Ranger Station . . . . .	11
4. Juniper-Fescue Type in the Fescue-Wheatgrass Zone Near Roberts Creek. . . . .	13
5. Aspen-Willow Type in the Fescue-Wheatgrass Zone on Jenkins Gulch . . . . .	13
6. Grass-Forb Park Type (Sagebrush-Fescue Subtype) in the Douglas-fir Zone with the Douglas-fir Type in the Background in the Vicinity of Eureka Creek . . . . .	14
7. Douglas-fir Zone Showing the Grass-Forb Park Type (Fescue-Wheatgrass Subtype) Intermixed with the Douglas-fir Type at the Head of Slim Sam Creek . . . . .	14
8. Grass-Forb Park Type (Bluegrass-Timothy Subtype), Foreground, and Spruce-Fir Type, Background, in the Spruce-Fir Zone at the Head of Prickly Pear Creek . . . . .	17
9. Spruce-Fir Zone Showing the Grass-Forb Park Type (Fescue-Sedge Subtype), Aspen-Willow Type, and Lodgepole Pine Type in Background on Wilson Creek. . . . .	17
10. Map of Study Area Showing Elk Winter and Summer Ranges . . .	23
11. Map of Study Area Showing Cattle and Sheep Allotments . . .	27
12. The Large Size Agronomy Cage in Place on a Bluegrass-Timothy Subtype Near Tizer Ranger Station . . . . .	49
13. "Jump-over" Enclosure in Bluegrass-Timothy Subtype Southwest of Tizer Ranger Station on the Tizer Cattle Allotment . . .	49

LIST OF FIGURES  
(continued)

Figure		Page
14.	"Total" Exclosure on Park at the Head of Prickly Pear Creek in Spruce-Fir Zone . . . . .	50
15.	"Heavy" Use by Cattle in Pasture #3, North Crow Cattle Allotment . . . . .	50



## ABSTRACT

A study of range relationships between elk and livestock was made in 1963-1964 on 100,000 acres of Crow Creek drainage, Elkhorn Mountains, Montana. The objective was to obtain quantitative data on food habits, forage utilization, and distribution of elk, cattle, and sheep on spring and summer ranges. The history of livestock and elk on the area was reviewed. A physiographic and vegetation description of the study area was made. Three vegetation zones were described; Fescue-Wheatgrass, Douglas-fir, and Spruce-Fir. Range use by elk was determined during 257 ground observation trips recording 3,125 elk and 15 aerial observation trips recording 1,814 elk. The Fescue-Wheatgrass Zone received almost 100 percent of the elk use from January through March and about 90 percent of the use in April and May. Each zone received considerable use in June and the Spruce-Fir Zone received most of the use in July and August. Cattle and sheep distribution on each grazing allotment was discussed. Elk food habits were determined by examination of 94 feeding sites and analyses of the contents of eight elk rumens. The results were tabulated by season and vegetation zone. The spring diet consisted of 77 percent grasses and 23 percent forbs while the summer diet consisted of 76 percent forbs and only 16 percent grasses. Data from fall rumen samples indicated a progressive shift to grasses during the period. Cattle food habits were determined by examination of 69 feeding sites which showed that grasses formed most of the diet on each vegetation zone. For all zones grasses made up 75 percent and forbs 24 percent of the summer diet. Sheep food habits were determined from the examination of 28 feeding sites which indicated forbs formed most of the summer diet. The percentage of forbs in the diet decreased as the intensity of grazing increased. The forage species most preferred by sheep were indicated. Forage utilization, studied by agronomy cages, exclosures, utilization transects, and ocular estimates, indicated several areas were used to a "heavy" degree. These were considered areas of possible competition for forage among the grazing animals. In the Spruce-Fir and Douglas-fir Zones, grazed in spring, summer, and fall by elk and summer and fall by cattle, interspecific competition was not considered significant during the study period. In the Fescue-Wheatgrass Zone, grazed in spring, fall, and winter by elk and summer and fall by cattle, competition was not considered serious, but the data indicated a potential for conflict on elk winter range areas. Cattle intraspecific competition existed to some degree in each zone. A potential for competition was indicated between sheep and elk, but the degree which existed on the study area was not considered excessive. Intraspecific sheep competition was heavy in some preferred grazing areas. Intraspecific elk competition was not found significant on any part of the study area at the present time.

## INTRODUCTION

Range relationships of elk (Cervus canadensis nelsoni) and domestic livestock have been a matter of controversy on the Crow Creek drainage, Helena National Forest, west-central Montana. Several studies of elk and livestock relationships, including those of Pickford and Reid (1943), Rouse (1957), and Mackie (1962), have been made in various parts of the West but the findings are not entirely applicable to this area. A cooperative study was initiated by the Montana Fish and Game Department and the U. S. Forest Service on approximately 100,000 acres in the Crow Creek area of the Elkhorn Mountains. The objective was to obtain quantitative data on the food habits, forage utilization, and distribution of elk, cattle, and sheep on spring and summer ranges. Full time field studies were conducted from June 10 to September 27, 1963 and from April 1 to September 2, 1964. Supplementary data were obtained during October and November 1963 and March and October 1964.

Grazing by livestock on the Crow Creek drainage apparently began about 1864. The area was utilized as free range until the formation of the Helena National Forest in 1906. Forest Service records show that from 1912 to 1918 the range was heavily stocked with cattle on an eight month permit basis and with sheep the year around on certain parts. Serious range deterioration resulted and reductions in livestock were initiated in 1919. By 1925 sheep were removed from the lower allotments and cattle numbers were reduced. In 1926 severe damage was still in evidence over much of the area (Sandvig, 1926). Continued reductions were made until 1943 when

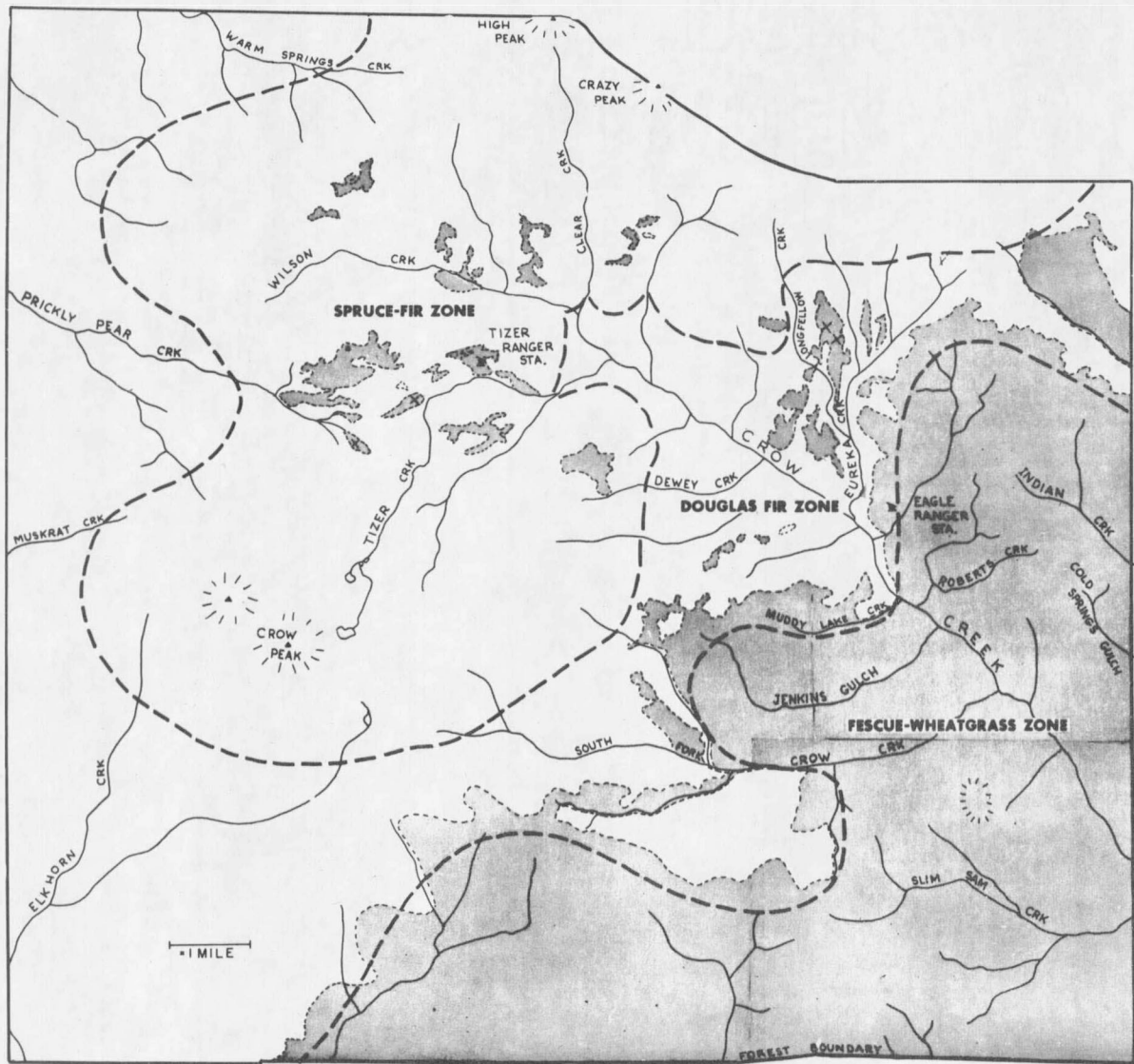
cattle numbers were stabilized for a  $4\frac{1}{2}$  month period on the Crow Creek allotments. The sheep had been reduced to a small band for a short season in high elevations not utilized by cattle. The area has recently been the subject of an intensive management program by the U. S. Forest Service.

Elk in this area were apparently "transitory" prior to 1939. On January 26, 1939, 34 elk (3 mature bulls, 4 bull calves, and 27 cows and calves) from Yellowstone National Park were released just outside the Forest boundary on Elkhorn Creek (USDA, Forest Service, 1939). By 1941 some of the herd had drifted east and were wintering in the Crow Creek drainage (Cooney, 1941). West (1941) reported the population to be only 30 at that time. The first hunting season was held in 1943 for forked-horned bulls only. In 1948 regular hunting seasons were initiated; the herd continued to increase and by 1952 was estimated at over 250. Today the herd, numbering approximately 400, winters almost entirely on Forest Service land. During the build-up of elk numbers, some complaints of elk damage south of the Forest boundary were made by ranchers.

## PHYSIOGRAPHY OF STUDY AREA

The Elkhorn Mountain Range, 21 miles long and 18 miles wide, covering about 172,000 acres, lies southeast of Helena. It is bounded by the Missouri River Valley on the north and east, the Beavertown-Prickly Pear Creek drainages on the west, and the Boulder River Valley to the southwest. The highest point, Crow Peak, is 9,414 feet high while the surrounding plains are between 4,000 and 5,000 feet above sea level. The central mass of the range is composed of Upper-Cretaceous volcanic rocks, primarily andesitic. The western slope is a part of the Boulder Batholith (quartz monzonite), a more recent volcanic intrusion of the Miocene Epoch (Klepper et al, 1957). The foothills to the south and east are primarily sedimentary, composed of limestones and shales. Considerable portions of the original substrate have been altered by recent glaciation (Stone, 1910).

The study area (Figure 1) comprised the southern part of the mountain range, with the ridgeline formed by High Peak and Crazy Peak the northern boundary. Crow Creek and its tributaries, flowing southeast to the Missouri River, drain most of the area. The drainage is naturally divided topographically into two portions by a ridgeline broken only by Crow Creek flowing through a steep canyon. The upper part, the Tizer Area, is a basin at an elevation of 6,500 to 8,000 feet surrounded by rocky ridges. The lower part is largely foothills composed of rolling ridges with occasional rock outcrops on the crests. No road directly joins these two portions of the study area. Other smaller parts of the study area are drained by Prickly Pear Creek, Muskrat Creek, Elkhorn Creek, and Indian Creek.



### LEGEND

- Estimated division between vegetational zones - - - - -
- Grassland and park types - - - - -
- Study area boundary - - - - -
- Major drainages - - - - -
- Exclosures - - - - - x

Figure 1. Map of the Crow Creek Study Area.

Climatological data for Townsend, Montana, eight miles east of the study area and at an elevation of 3,800 feet, show the mean annual temperature for 1963 was 43.6° F. with extremes of 97° and -32° F. The annual precipitation was 15.16 inches of which 4.13 inches fell in June. No departures from the 29-year normal were indicated. Snow accumulates over the entire study area in the winter varying in depth with altitude. Open ridges of the lower elevations are normally blown clear.

Hoofed mammals of the area, in addition those studied, included a few moose (Alces alces) and numerous mule deer (Odocoileus hemionus).

## VEGETATION OF STUDY AREA

To aid in field recognition of plants a plant collection was made. Identification of species was verified by W. E. Booth. Scientific and common plant names are from Booth (1950) and Booth and Wright (1962).

Vegetational classification was influenced by Daubenmire (1943), Kirsch (1962), and Rumely (1964). Composition and canopy coverage of the vegetation in open parks and grassland areas was sampled as described by Daubenmire (1959) with modifications. Twenty 2 X 5 decimeter plots were placed at various intervals on each of 19 paced transects through representative sites (Table I). Other vegetation types were studied only by direct observation. The vegetation of the study area was described as part of a forest formation with a grassland formation at lower elevations. Two zones were recognized in the forest formation, the Douglas-fir (Pseudotsuga taxifolia) Zone and the Engelmann spruce (Picea engelmanni) - Alpine fir (Abies lasiocarpa) Zone, with four types described for each. On the west side a Ponderosa pine (Pinus ponderosa) Zone was present below the Douglas-fir Zone but was not represented in the study area. The grassland formation was represented by the Fescue (Festuca spp.) - Wheatgrass (Agropyron spp.) Zone. There was a considerable interfingering of zones related to uneven topography.

### Fescue-Wheatgrass Zone

Only one grassland zone was represented in the study area. It occupied about 35,000 acres of the lower elevations and foothills up to about 6,500 feet above sea level. Four major types are described.

TABLE I. CONSTANCY,<sup>1/</sup>CANOPY COVERAGE AND FREQUENCY, OF TAXA IN THE VEGETATION ON NINETEEN GRASSLAND AND PARK STANDS, DETERMINED BY TWENTY 2 X 5 DECIMETER PLOTS ALONG A PACED TRANSECT ON EACH STAND.

Taxa <sup>2/</sup>	Fescue-Wheatgrass Zone		Douglas-fir Zone Grass-Forb Park Type			Spruce-Fir Zone Grass-Forb Park Type	
	Fescue- Wheat- grass 3 stands	Sage- brush- Fescue 1 stand	Fescue- Wheat- grass 1 stand	Fescue- Sedge 2 stands	Sage- brush- Fescue 1 stand	Fescue- Sedge 7 stands	Bluegrass- Timothy 4 stands
SHRUBS							
<u>Artemisia tridentata</u>	- 3/	13/ 65 <sup>4/</sup>	-	-	15/ 30	-	-
<u>Chrysothamnus viscidiflorus</u>	-	-	-	-	2/ 5 <sup>2/</sup>	-	-
<u>Tetradymia canescens</u>	-	-	-	-	x/ 5	-	-
Total average cover		13			18		
GRASS AND GRASS LIKE PLANTS							
<u>Agropyron spicatum</u>	13/ 58	2/ 25	3/ 16	4/ 18	15/ 65	-	-
<u>Agropyron</u> spp.	-	-	-	-	-	14/ 1/10 <sup>6/</sup>	75/ 1/21
<u>Bromus marginatus</u>	-	-	-	1/ 10	-	71/ 4/26	75/ 1/ 6
<u>Carex</u> spp.	-	x/ 5	x/ 5	16/ 95	-	100/20/64	100/ 7/51
<u>Danthonia</u> spp.	x/ 5	2/ 20	x/ 6	2/ 15	x/ 5	100/ 2/27	50/ 1/ 5
<u>Festuca idahoensis</u>	25/ 96	22/ 90	24/100	17/ 85	24/ 95	100/13/61	75/ 3/40
<u>Festuca scabrella</u>	x/ 5	-	10/ 74	9/ 65	3/ 10	86/ 9/33	-
<u>Koeleria cristata</u>	6/ 71	3/ 45	2/ 63	3/ 35	2/ 15	-	25/ x/11
<u>Phleum</u> spp.	-	-	-	-	-	57/ x/ 2	100/ 8/57
<u>Poa secunda</u>	x/ 12	-	3/ 58	-	12/ 2	-	-
<u>Poa</u> spp.	-	9/ 80	-	14/ 88	-	57/ 1/10	100/20/70
<u>Stipa</u> spp.	-	-	-	1/ 15	-	71/ x/20	50/ x/ 5
Total average cover	46	41	42	69	56	50	43











































































































































