Mule deer food habits and range use in the Little Belt Mountains, Montana
by Allan L Lovaas

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

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Abstract:

A mule deer (*Odocoileus h. hemionus*) range use and food habits study was conducted in the Judith River drainage of the Little Belt Mountains, Montana, during the summer of 1956 and the winter of 1957, with some work in the fall and spring periods. Range use was determined by recording numbers of deer seen on the various vegetative types while traveling observational routes. Food habits were investigated by rumen analyses and feeding site examinations. Major differences were found in deer food habits between two types of winter ranges. Doe-fawn ratio counts were made and found to be very poor. The two methods of studying food habits gave very comparable results.

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Submitted to the Graduate Faculty

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partial fulfillment of the requirements

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Approved:

Head, Major Department

Chairman, Examining Committee

Dean, Graduate Division

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ABSTRACT

A mule deer (Odocoileus h. hemionus) range use and food habits study was conducted in the Judith River drainage of the Little Belt Mountains, Montana, during the summer of 1956 and the winter of 1957, with some work in the fall and spring periods. Range use was determined by recording numbers of deer seen on the various vegetative types while traveling observational routes. Food habits were investigated by rumen analyses and feeding site examinations. Major differences were found in deer food habits between two types of winter ranges. Doe-fawn ratio counts were made and found to be very poor. The two methods of studying food habits gave very comparable results.

INTRODUCTION

The Little Belt Mountains of Central Montana have been an important mule deer (Odocoileus h. hemionus) area since early Montana history. Some early inhabitants, such as Jake Hoover and Charles Russell, in 1880, reportedly subsisted by selling deer and elk meat and hides to ranchers living on the foothills and prairies (Adams and Britzman, 1948). Long time residents state that the deer herds have fluctuated in size through the years. Certain ranges in the area were considered as being overstocked with deer as early as 1942 (Leopold et al., 1947). Overbrowsed plants, very poor doe-fawn ratio counts and small body size of the deer point out an overabundant herd on some winter ranges at the present time. The abundance of deer, accessibility to and within the area, and central Montana location make the Little Belts one of the most popular mule deer hunting areas in the state.

Previous to this study, no detailed investigations of the food habits and range use of the deer herd had been made, although information on deer numbers, condition, and agricultural relationships has accumulated through the years. The present investigation was on a full time basis during the summer of 1956 and the winter of 1957. Trips to the area for specimen collections were made during the fall of 1956 and the spring of 1957. The results of this study may find some use in the future management of the mule deer on this area and on similar range types.

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DESCRIPTION OF THE AREA

The Little Belt Mountains are an isolated range located approximately 50 miles west-south-west of Lewistown, the geographical center of Montana. The region is described by Weed (1899) as being 60 miles across east to west and 40 miles wide on the western border, narrowing eastward to a sharp point. The average elevation is 7600 feet. The highest peak, Big Baldy, has an elevation of 9000 feet. The mountain range divide averages around 8000 feet (Weed, 1899). The mountains are plateau like with broad, flat tops prevailing. No big, broad valleys are present. The streams flow in deeply trenched courses which are open and wide in some areas and form narrow canyons in others (Weed, 1899).

The study area is included in the Judith River drainage on the eastern slopes of the mountains. During the summer of 1956, most observations were made along a route of approximately 32 miles, extending from the Judith River Game Range in the foothills, to Spur Park on the mountain range divide. The route paralleled the South Fork of the Judith River for the most part (Fig. 1). Additional observations were made along subsidiary routes in the general area at various times during the summer.

Fig. 1. Map of the study area.

The study area in the winter of 1957 was limited to a foothill region around the Judith River Game Range, the lower 11 mile segment of the route along the South Fork, and a five mile route in Dry Pole Canyon. Additional exploratory trips were made in the vicinity.

The vegetation in the study area is varied and intergraded. Four general types were recognized with many sub-types in each. Scientific and common names of plants used in the following descriptions follow those of Booth (1950), Wright and Booth (1956), or those given by the American Joint Committee on Horticultural Nomenclature (1942).

Spruce-fir. This type occurs in the study area from about 7000 feet elevation to the divide. The main study route extends for about 10 miles through this type. The type is characterized by Engelmann spruce (Picea engelmanni) with alpine fir (Abies lasiocarpa) in the upper regions. Limber pine (Pinus flexilis) is also abundant. Douglas fir (Pseudotsuga taxifolia) and lodgepole pine (Pinus contorta) are also found. The most common shrubs are common juniper (Juniperus communis) and shrubby cinquefoil (Potentilla fruticosa). A number of open parks are found throughout the type. In the upper areas along the divide, parks with islands of alpine fir predominate (Fig. 2). An abundance of forbs is found in these parks. The most common are geranium (Geranium spp.), cinquefoil (Potentilla spp.), arnica (Arnica spp.), dandelion (Taraxacum officinale), aster (Aster spp.), lupine (Lupinus spp.), yarrow (Achillea lanulosa), pussytoes (Antennaria spp.) and showy fraseria (Frasera speciosa). Prominent grasses are Idaho fescue (Festuca idahoensis), wheatgrass (Agropyron spp.), bluegrass (Poa spp.), timothy (Phleum spp.) and timber oatgrass (Danthonia

intermedia).

A burn, which occurred in 1946, extends for about two miles along the study route. Reforestation includes some Engelmann spruce, lodgepole pine and Douglas fir. Low growing browse plants present include Oregon grape (Mahonia repens), common juniper and snowbrush ceanothus (Ceanothus velutinus). The most common forbs are aster, thistle (Cirsium spp.), goldenrod (Solidago spp.), lupine, bedstraw (Galium spp.), strawberry (Fragaria virginiana) and yarrow. Idaho fescue is a prominent grass and elk sedge (Carex geyeri) is also abundant.

Douglas fir-lodgepole pine. This type occurs at elevations of 6000 to 7000 feet. The study route extends for about eight miles through this type. Characteristic plants are Douglas fir and lodgepole pine with quaking aspen (Populus tremuloides) also prominent. Low growing browse plants found in the lodgepoles are kinnikinnick (Arctostaphylos uva-ursi), low red huckleberry (Vaccinium scoparium), common juniper, snowberry (Symphoricarpos spp.), white spiraea (Spiraea betulifolia) and Oregon grape. In the more open Douglas fir type are found common juniper, snowberry and rose (Rosa spp.). Forbs are present in relatively small numbers in the lodgepoles, mostly in small openings (Fig. 3). Present are geranium, lupine, littleleaf allumroot (Heuchera parvifolia), dandelion and raceme pussytoes (A. racemosa). Forbs are very abundant in the Douglas firs, including geranium, cinquefoil, bedstraw, arnica, yarrow and lithospermum (Lithospermum ruderales).

A large open park (Russian Flat), through which the study route extends for about 4.5 miles, is found in this type (Fig. 4). Shrubs present include

Fig. 2. Spruce-fir type, showing open park-like terrain.

Fig. 3. Dense lodgepole pine forest in Douglas fir-lodgepole pine type.

rose, shrubby cinquefoil and big sagebrush (Artemisia tridentata); prevalent forbs are aster, cinquefoil, lupine, yarrow and balsam root (Balsamorhiza sagittata). Idaho fescue, rough fescue (F. scabrella), wheatgrass, bluegrass and needlegrass (Stipa spp.) are prominent. Some patches of willow (Salix spp.) are found in moist areas.

Ponderosa pine-Douglas fir. The study route extends through this type for about nine miles, between elevations of approximately 5000 and 6000 feet. Ponderosa pine (Pinus ponderosa) and Douglas fir are the characteristic plants (Fig. 5). Other prominent trees, mostly along the stream are: quaking aspen, Rocky Mountain maple (Acer glabrum), water birch (Betula occidentalis) and cottonwood (Populus spp.). Shrubs include common juniper, Rocky Mountain juniper (J. scopulorum), Canadian buffalo-berry, shrubby cinquefoil, rose, snowberry, kinnikinnick and redshoot gooseberry (Ribes setosum). Prominent among the great variety of forbs present are geranium, cinquefoil, bedstraw, aster, yarrow, horse mint (Monarda fistulosa), goldenrod and strawberry. Grasses include timothy, brome (Bromus spp.), bluebunch wheatgrass (Agropyron spicatum) and Idaho fescue.

Foothills-prairie. This type is found mainly below the forested parts of the mountains at about 5000 feet elevation. Approximately five miles of prairie are found along the route and about seven square miles of this type are included in the winter study area. Part of this area is included in the Judith River Game Range which is an elk wintering area. The terrain is rolling and primarily open but stands of ponderosa pine and limber pine are common (Fig. 6). Creeping juniper (J. horizontalis), chokecherry

Fig. 4. Open grassy area of Russian Flats. Lodgepole pine forest in the background.

Fig. 5. Open ponderosa pine area in ponderosa pine-Douglas fir type.

(Prunus virginiana), sticky current (Ribes viscosissimum), rose, kinnikinnick, snowberry, shrubby cinquefoil and fringed sagebrush (A. frigida) are prominent browse plants. Forbs present include pussytoes, Hoods phlox, (Phlox hoodii), Erigonum (Eriogonum spp.), aster and bedstraw. The major grasses are Idaho fescue, rough fescue and bluebunch wheatgrass. Old abandoned fields in the area are seeded to bluestem wheatgrass (A. smithii) and brome grasses.

Dry Pole Canyon. Dry Pole Canyon leads south eastwardly from the South Fork of the Judith River about half way up the ponderosa pine-Douglas fir type (Fig. 1). The canyon was used as a study area in the winter period because it reportedly had been an important deer concentration area, and snow limited travel to higher elevations up the South Fork. Furthermore, the canyon rises from approximately 5000 feet elevation to 8000 feet in a distance of approximately eight miles providing conditions similar to those of the South Fork area. Representatives of all of the types mentioned except foothills-prairie are found in the canyon. An old burn is also present. A good representation of the previously mentioned trees, shrubs and forbs are found in this steep-sided canyon (Fig. 7).

METHODS

Three study methods were employed. Deer use of vegetative types was investigated by covering the study routes and wintering areas by vehicle and on foot. Numbers of deer seen on the various types were recorded.

Deer rumen analysis was used following techniques similar to, or modified from those of Saunders (1955), Cole (1956) and Wilkins (1957). Twenty-five deer (11 mature females, 5 mature males, 5 yearlings, 4 fawns)

Fig. 6. Foothills-prairie type with some limber and lodgepole pines.

Fig. 7. Dry Pole Canyon showing old burn in Douglas fir-lodgepole pine type on the west-facing slope.

were collected for rumen samples in the period from July 12, 1956 to May 12, 1957. At least two samples were collected in every month of the year except May, which had one, and June, with none. Samples were preserved in 10 per cent formalin solution in glass jars or frozen in plastic bags. A sample of approximately 685 cc (a one quart Mason jar filled to the top) was washed with water first on a 3 mm mesh screen and then on a 2 mm mesh screen. The material remaining on the 3 mm mesh screen was placed in a pan of water. Individual items were separated and identified as to species, genus, family or general group by comparison with plants in a reference plant collection from the study area. The material retained on the 2 mm mesh screen was placed in a pan of water and looked through once. Conifer needles and stems of plants were recovered. The remainder of this material and that which passed through the 2 mm mesh screen were discarded. The segregated portions were dried on paper toweling to remove excess moisture and volumes (to the nearest 0.5 cc) were measured by water displacement. The material was then air dried while wrapped in paper toweling and weighed to the nearest 0.01 gram. Material of less than 0.5 cc was recorded as trace. A total of 1776.5 cc of material was measured, which is approximately 7.2 per cent of the material washed. A total of 35.5 per cent of the common juniper and 50 per cent of the Douglas fir in one sample tested, passed through the 3-mm screen but were retained by the 2-mm screen.

The aggregate percentage method (Martin, et al., 1946) was used to compute the percentage that one item constituted in the total retained rumen contents of a period. This was determined by finding the percentage

of each item of the retained material of each individual rumen sample and then averaging the percentages from all the samples for the period.

The third method used was deer feeding site examinations modified from methods of Saunders (1955), Cole (1956) and Wilkins (1957). This involved observing deer feeding in an area and then examining the area closely. Each fresh clipping or bite that could be determined on a plant was recorded as an instance of use. Non use on prominent plants was also recorded. To prevent duplication, summer feeding sites were examined systematically beginning on one side and continuing to the opposite side. On many sites, the use of bright yellow-colored cord delimited the strip being examined. Tracks in the snow distinguished areas examined in winter. In order to increase the number of feeding sites examined for a morning feeding period, several feeding sites were often determined and delimited by a cord before an examination was made. Use on plants could be detected for at least 3.5 hours after use.

Observing deer for potential feeding sites was most easily done from a vehicle. Deer were not greatly startled if the vehicle was stopped quietly and the observer did not move about more than necessary. Feeding site examinations were much more difficult to accomplish in Dry Pole Canyon in the winter period. Observations were made on foot and it was necessary to move about carefully and stalk the deer or else to observe them from a distance with binoculars.

A total of 91 feeding sites, involving approximately 325 deer, was examined. A total of 7464 instances of use was recorded on browse plants, forbs, grasses and lichens.

RANGE USE

From June 23 to September 27, 50 observational trips of various lengths were made along the different study routes. Numbers of deer on vegetative types were recorded. Twenty-seven of these trips were made along the main route during which areas from all four major cover types were observed (Tab. 1). Deer movements to higher elevations are shown for the summer with a downward movement in September. In July, the majority of deer observed (58) were in the Douglas fir-lodgepole pine type. Of these, 40 (69 per cent) were recorded on Russian Flat. During August Russian Flat became dry and brown and was grazed heavily by livestock. A movement upward to the spruce-fir type, where vegetation was more succulent, occurred in that month. By the later part of September, some snow and freezing weather were encountered in the higher elevations and the movement downward to winter range began.

This downward movement trend is substantiated by including data taken during shorter observational trips that included only the two lower types. Total deer observed on the prairie type increased from none in June and two in July, to 11 in August and 66 in September. In the ponderosa pine-Douglas fir type the total number of deer seen fluctuated from 20 in June (4 trips) to a low of 11 in July (7 trips), to 42 for August (18 trips) to a high for all types of 320 in September (21 trips). Totals for the 50 trips for the summer include 79 (11 per cent) prairie, 393 (53 per cent) ponderosa pine-Douglas fir, 164 (22 per cent) Douglas fir-lodgepole pine and 103 (14 per cent) spruce-fir.

In addition to the 50 trips discussed, nine trips were made up Dry

Pole Canyon; these are discussed later.

During the winter period (January 17 to March 29) 34 trips were made up the South Fork, 24 of these extended into Dry Pole Canyon. Twenty-six trips were made in the prairie type in the vicinity of the Judith River Game Range. Ninety-nine deer were recorded in the ponderosa pine-Douglas fir type of the South Fork and 184 in Dry Pole Canyon. The major winter range in the area was the prairie type as 1368 deer were recorded there. On a trip of about 10 miles up the Middle Fork of the Judith River, March 3 and 4, no deer and very few tracks were seen. A forest ranger in the vicinity of Burley Peak at elevations of about 6500 to 7000 feet, for about a week in early March, reported that no deer were seen in the area.

Numbers of deer on the prairie winter range varied with the weather (Fig. 8). During cold and snowy periods the deer, in herds up to 350 in size, moved onto the open range (Fig. 9) and into patches of timber. When the weather moderated, they moved back and spread out into the timbered gulches of the Middle Fork and Yogo Canyons. Of the 1368 deer recorded on the prairie type in the winter, 931 (68 per cent) were on open range, 354 (26 per cent) in timbered patches or gulches and 83 (6 per cent) in old agricultural fields.

Of the 184 deer observed in Dry Pole Canyon in the winter period, 46 (25 per cent) were in the ponderosa pine-Douglas fir type, 132 (72 per cent) in the Douglas fir-lodgepole pine type with 78 (60 per cent) of these on the extensive old burn, and five (3 per cent) were in the spruce-fir type. This is compared with the summer observations where of 62 deer, five (8 per cent) were in the ponderosa pine-Douglas fir type, 27 (43 per

Table I. Number of deer seen per month and percentages observed per vegetative type for 27 trips along the main route, summer 1956.

	June 2 trips 33 deer	July 6 trips 97 deer	August 10 trips 94 deer	September 9 trips 196 deer
Spruce-fir	33	27	45*	7
Doug. fir-lodg. p.	30	60*	34	9
Pond. p.-Doug. fir	36*	11	16	68*
Foothills-prairie	0	2	5	15

* Highest percentage for the month.

Fig. 8. Deer numbers observed on the prairie winter range in relation to weather. Average number of deer seen per trip.

* Approximate mean temperature for the period.

cent, of which 63 per cent were on the old burn) were in the Douglas fir-lodgepole pine type and 30 (48 per cent, of which 77 per cent were on the old burn) were in the spruce-fir type. Deer were most easily seen when on the old burn. Tracks indicated, however, that extensive use was made of dense Douglas fir areas, especially during the frequently windy weather. Deer were difficult to see in this type of cover, especially when the observer was on foot. The burn in Dry Pole Canyon is not dated, but a long time resident stated that 50 years ago he secured poles from the fresh burn.

FOOD HABITS

Summer (July, August, September)

Six deer were collected for rumen samples during this period. Two were collected from the Douglas fir-lodgepole pine type in July; one in dense lodgepoles and one from a large open meadow above Russian Flat. Two were collected from the spruce-fir type in August and two from the ponderosa pine-Douglas fir type in September. The results of the analyses of these rumen samples are shown in Table II. In the following discussions only the volume measurements are considered.

Forbs made up 65.8 per cent of the samples. Raceme pussytoes was the most prominent forb (12.6 per cent). However, the importance of this forb is due mainly to its constituting 67.9 per cent of one sample from the deer collected July 25 in dense lodgepole pines. This was the greatest percentage of any one item in a single sample during the period. Other important forbs were geranium (8.3 per cent), aster (6.6 per cent), dandelion (6.1 per cent) and cinquefoil (3.2 per cent). Most of the use on

Table II. Mule deer food habits as determined by analysis of 25 rumen samples and 7464 observed instances of plant use
(T=trace--less than 0.5 per cent)

Plants	Jul-Aug-Sept				Oct-Nov-Dec		Jan-Feb-Mar				April-May		Prairie Type Range			
	47 Feeding Site Exams		6 Rumen Samples		6 Rumen Samples		27 Feeding Site Exams		6 Rumen Samples		2 Rumen Samples		17 Feeding Site Exams		5 Rumen Samples	
	Instances of Use						Instances of Use						Instances of Use			
	%	No	% Vol	% Wt	% Vol	% Wt	%	No	% Vol	% Wt	% Vol	% Wt	%	No	% Vol	% Wt
<u>Juniperus communis</u>					8.2	12.4	63.8	2295	56.7	61.6	30.7	41.0	0.5	10	T	T
<u>Juniperus horizontalis</u>							0.3	9	1.5	1.7			49.2	1046	21.1	27.2
<u>Juniperus scopulorum</u>							T	1								
<u>Arctostaphylos uva-ursi</u>			0.9	1.5	0.7	1.0	2.4	88	8.7	9.9	7.0	9.0	14.9	317	1.5	2.0
<u>Mahonia repens</u>			T	T	29.1	28.1	0.9	34	4.7	3.9					6.0	6.1
<u>Pseudotsuga taxifolia</u>			T	T	1.7	2.4	T	2	3.6	4.7	3.8	6.7	0.6	13	T	T
<u>Pinus ponderosa</u>			T	T	T	T	0.6	20	T	T			1.6	35	12.7	13.9
<u>Pinus contorta</u>			T	T												
<u>Pinus flexilis</u>															T	T
<u>Pinus spp.</u>			0.6	1.4	0.3	0.5					T	T				
<u>Artemisia frigida</u>							3.6	128					1.2	25	3.5	2.6
<u>Shepherdia canadensis</u>	T	1	0.4	0.4	1.0	1.3	1.5	54	0.1	0.1	T	T				
<u>Vaccinium scoparium</u>	0.3	5	3.9	6.0	T	T										
<u>Vaccinium caespitosum</u>			1.1	1.1												
<u>Vaccinium occidentale</u>			0.3	0.3												
<u>Vaccinium spp.</u>			0.4	0.2												
<u>Prunus virginiana</u>	1.1	20	0.7	0.7	T	T	1.4	52	2.6	3.5	T	T	0.3	7		
<u>Spiraea betulifolia</u>	2.3	41	0.7	1.2	T	T	0.3	12	T	T	T	T				
<u>Salix spp.</u>	2.8	49	0.1	0.2	0.2	0.3	0.1	4								
<u>Acer glabrum</u>	0.2	3							T	T						
<u>Betula occidentalis</u>	0.4	7							T	T						
<u>Cornus stolonifera</u>	0.3	5							T	T						
<u>Alnus sinuata</u>	0.4	7														
<u>Populus tremuloides</u>			T	T												
<u>Ceanothus velutinus</u>															1.0	1.1
<u>Rosa spp.</u>	14.0	244	2.3	2.7	T	T			T	T	T	T	T	2	T	T
<u>Ribes viscosissimum</u>	0.1	2					0.7	26	T	T						
<u>Ribes setosum</u>	1.1	20														

Table II (Continued). Mule deer food habits as determined by analyses of 25 rumen samples and 7464 observed instances of plant use
(T=trace--less than 0.5 per cent)

Plants	Jul-Aug-Sept				Oct-Nov-Dec		Jan-Feb-Mar				April-May		Prairie Type Range			
	47 Feeding	6 Rumen		%	6 Rumen		27 Feeding	6 Rumen		%	2 Rumen		17 Feeding	5 Rumen		%
	Site Exams	Samples			Site Exams	Samples			Site Exams		Samples					
	Instances of Use	% Vol	% Wt		% Vol	% Wt	Instances of Use	% Vol	% Wt		% Vol	% Wt	Instances of Use	% Vol	% Wt	
%	No					%	No					%	No			
<u>Symphoricarpos</u> spp.	3.5	61	7.8	6.3	T	T			T	T	T	T			T	T
<u>Tetradymia canescens</u>									T	T			5.6	119		
<u>Potentilla fruticosa</u>									T	T						
Unidentified Browse			0.3	0.7	2.6	3.4			T	T	T	T			2.0	1.6
Totals browse	26.5	465	19.5	22.7	43.8	49.4	75.6	2725	77.9	85.4	41.5	56.7	73.9	1574	47.8	54.5
<u>Aster</u> spp.	22.4	390	6.6	4.9	12.1	9.5	2.5	90	8.7	5.3	T	T	17.3	367	8.6	6.9
<u>Taraxacum officinale</u>	7.2	126	6.1	4.8							7.0	3.7			T	T
<u>Erigeron</u> spp.	6.5	114					1.3	45								
<u>Geranium</u> spp.	3.6	62	8.3	8.8												
<u>Arnica</u> spp.	4.0	70														
<u>Potentilla</u> spp.	3.3	58	3.2	3.3											T	T
<u>Fragaria virginiana</u>	1.4	24	1.4	1.2	T	T			0.1	T	2.3	1.3			T	T
<u>Heuchera parvifolia</u>	0.4	7			0.1	0.1	T	3	T	T	2.3	1.3			0.2	0.1
<u>Penstemon</u> spp.	0.2	4	0.2	0.3	T	T			0.4	0.3					1.3	1.4
<u>Galium</u> spp.	0.2	3	0.1	0.1	T	T	1.0	37	0.1	T	T	T	0.7	14	1.0	0.6
<u>Antennaria</u> spp.	T	1			0.2	T	0.5	17	0.2	0.1			0.8	18	3.6	2.6
<u>Antennaria racemosa</u>			12.6	10.1												
<u>Cirsium</u> spp.			1.4	1.2	3.0	2.1	1.8	64	0.2	T	T	T			0.6	0.5
<u>Balsamorhiza sagittata</u>					9.0	7.4	0.7	25					0.8	16	T	T
<u>Phlox hoodii</u>					6.9	5.9	0.9	32	0.4	0.3	T	T	0.6	12	3.5	2.1
<u>Linnaea borealis</u>			T	T	8.7	7.4	1.1	38	5.1	3.4						
<u>Astragalus</u> spp.	2.5	44														
<u>Lupinus</u> spp.	0.7	13	0.9	0.9												
<u>Trifolium</u> spp.															T	T
Unidentified Legumes	0.2	4	T	T	0.9	0.8	0.4	13								
<u>Agoseris</u> spp.	1.1	19	0.2	0.2			T	2								
<u>Solidago</u> spp.							1.0	36							0.2	0.1
<u>Tranopogon dubius</u>	0.6	10					1.3	45					0.1	3		
<u>Artemisia ludoviciana</u>	0.1	2											0.4	8		
<u>Campanula rotundifolia</u>	1.8	32			T	T	0.1	5					T	2		

Table II (Continued). Mule deer food habits as determined by analysis of 25 rumen samples and 7464 observed instances of plant use
(T=trace--less than 0.5 per cent)

Plants	Jul-Aug-Sept				Oct-Nov-Dec		Jan-Feb-Mar				April-May		Prairie Type Range			
	47 Feeding		6 Rumen		6 Rumen		27 Feeding		6 Rumen		2 Rumen		17 Feeding		5 Rumen	
	Site Exams		Samples		Samples		Site Exams		Samples		Samples		Site Exams		Samples	
	% of Use	No	% Vol	% Wt	% Vol	% Wt	% of Use	No	% Vol	% Wt	% Vol	% Wt	% of Use	No	% Vol	% Wt
<u>Monarda fistulosa</u>	0.9	15			T	T	T	3								
<u>Lomatium spp.</u>	0.4	7														
<u>Pyrola spp.</u>	0.3	5														
<u>Apocynum pumilum</u>	0.3	5					T	1								
<u>Clematis spp.</u>	T	1														
<u>Hedysarum spp.</u>	T	1														
<u>Epilobium spp.</u>	T	1														
<u>Linum lewisii</u>	T	1														
<u>Aquilegia spp.</u>	T	1														
<u>Eriogonum spp.</u>	T	1	0.4	0.3			T	2							8.9	5.6
<u>Liatris punctata</u>	T	1														
<u>Achillea lanulosa</u>			0.2	0.2	T	T	0.1	4	0.2	T	T	T			T	T
<u>Geum triflorum</u>			0.1	T							5.5	3.2	0.8	17		
<u>Rumex spp.</u>													0.2	4		
<u>Disporum trachycarpum</u>							0.1	4								
<u>Heracleum lanatum</u>							T	3								
<u>Mentha arvensis</u>							T	1								
<u>Cerastium spp.</u>					0.2	0.1	T	1			T	T				
<u>Anemone spp.</u>					T	T	T	1	T	T	T	T				
<u>Phacelia leucophylla</u>					T	T										
<u>Douglasia montana</u>					T	T					T	T				
<u>Frasera speciosa</u>			0.5	0.4												
<u>Thalictrum venulosum</u>			0.6	0.5												
<u>Mertensia spp.</u>			T	T							T	T				
<u>Paronchia sessiliflora</u>															0.2	T
Unidentified Forbs	3.2	55	23.0	27.9	12.0	13.1	2.0	72	4.5	3.3	3.5	2.4	0.6	13	15.5	16.2
Total Forbs	61.3	1077	65.8	65.1	53.1	46.4	14.8	544	19.9	12.7	20.6	11.9	22.3	474	43.6	36.3
Gramineae	11.5	201	2.0	2.4	3.0	4.3	9.1	326	1.3	0.7	37.8	31.2	3.6	76	8.5	8.7
Mushrooms			12.1	9.4												
Lichens			0.1	T					0.2	0.1	T	T			T	T
Antler									0.1	0.5						

geranium, dandelion and cinquefoil occurred in the early part of the summer. For example, geranium constituted 27.0 per cent of the July 12 sample, but dropped steadily in importance to the September 9 sample where it made up 0.9 per cent, and in the September 25 sample no geranium was found. Dandelion and cinquefoil also show a similar pattern of use. The later flowering asters were not detected in the rumens until the September 12 sample (28.8 per cent) and were also important in the September 25 sample (10.7 per cent). Unidentified forbs constituted 23.0 per cent for the period. The September 25 sample had 53.6 per cent of unidentified forbs.

Browse plants made up 19.5 per cent of the samples for the period. Most prominent browse plants were snowberry (7.8 per cent), low red huckleberry (3.9 per cent) and rose (2.3 per cent). Snowberry use was mainly in the September period (for two samples, 32.7 and 14.2 per cent) in the samples from the ponderosa pine-Douglas fir type, where it is most abundant. Low red huckleberry was most prominent in the August 25 sample (22.7 per cent) which was from a deer collected in a patch of dense limber pines in the spruce-fir type. Rose is very abundant in the lower types but not in the higher spruce-fir type. It was present in three of the four samples from the lower types but was not found in the samples from the spruce-fir type. Its use was consistent when present, with percentages of 4.9, 5.3 and 3.6 for the three occurrences.

Other materials present were mushroom (12.1 per cent), lichen (0.1 per cent) and grass (2.0 per cent). Mushroom was the major item in the August 25 sample (59.5 per cent) which was from the spruce-fir type. It was also present in the other spruce-fir type sample and the July 25 sample

from the lodgepole pines. Grass was present in measureable amounts in every sample; the maximum amount in any one sample was 3.6 per cent for the September 25 sample from the ponderosa pine-Douglas fir type.

Forty-seven feeding sites involving 62 deer were examined in this period and 1743 instances of plant use were recorded. Sites examined by type were prairie one, ponderosa pine-Douglas fir 22, Douglas fir-lodgepole pine 19 (11 of these on Russian Flat) and spruce-fir 5 (one of these on the burn).

Forbs were most prominent with 61.3 per cent (1077 instances) of the usage. Most forb usage was as follows: aster (22.4 per cent, 390 instances), dandelion (7.2 per cent, 126 instances), daisy (Erigeron spp.) (6.5 per cent, 114 instances), arnica (4.0 per cent, 70 instances), geranium (3.6 per cent, 62 instances) cinquefoil (3.3 per cent, 58 instances) and milkvetch (Astragalus spp.) (2.5 per cent, 44 instances). Thirteen examinations were in July (from July 17 to 28), 20 in August and 14 in September. This over-all lateness in observations largely explains the greater abundance of aster as compared with geranium, cinquefoil and dandelion, as indicated by the rumen samples. Arnica is important mainly because of one feeding site where 63 of the total 70 instances of use for this plant, were recorded. It was not present or else not recognized in the rumen samples. Daisy was not identifiable from aster in the rumens. Milkvetch in the rumens would have been classified as unidentified legumes.

Browse plants made up 26.5 per cent (465 instances) of the total instances of use. Rose (14 per cent, 244 instances), snowberry (3.5 per cent, 61 instances), willow (2.8 per cent, 49 instances) and spiraea (2.3

per cent, 41 instances) were most prominent. Use on rose was determined on 20 feeding sites, which was the largest number of sites for any plant during the period. One hundred twenty-seven of 244 instances of use were on two feeding sites in the ponderosa pine-Douglas fir type. Willow use was determined on a moist area in Russian Flat and along the creek bottom. No deer were collected from these areas. Determining usage on low red huckleberry (0.3 per cent, 5 instances) is very difficult because of the physical nature of the plant.

Grass use constituted 11.5 per cent (201 instances). No use was found on mushroom. This plant was apparently found only under trees in dense cover where feeding site examinations were very difficult.

Fall (October-November-December)

Food habits investigations for this period consisted exclusively of analyses of six rumen samples. Five of these were from deer collected in Dry Pole Canyon and one was from a hunter killed deer in Bower Canyon, the next canyon east of Dry Pole which is very similar in vegetation and terrain. Four of the deer from Dry Pole Canyon were collected in the Douglas fir-lodgepole pine type and one from the ponderosa pine-Douglas fir type. Two samples were obtained each month of the period. One sample was obtained from a hunter killed deer on the prairie type; this sample is included in a later discussion of the prairie type winter range.

Totals of forbs (53.1 per cent) and browse plants (43.8 per cent) were more nearly equal during this period than they were in the summer period. Aster was the most prominent forb (12.1 per cent); balsam root (9.0 per cent), twin flower (Linnaea borealis) (8.7 per cent) and Hoods

phlox (6.9 per cent) were also important. Bedstraw was found in all six samples but only as traces. Unidentified forbs made up 23.0 per cent. Some of the important forbs for the summer period (geranium, cinquefoil, dandelion and raceme pussytoes) were not found in the fall period. Balsam root and Hoods phlox were not found in the summer period, and twin flower occurred as a trace. No trends of forb use within the fall period could be determined.

The most prominent browse plant in this period was Oregon grape (29.1 per cent). It was found in five of the six samples. It constituted 84.6 per cent of the November 24 sample. This was the greatest percentage for any item of the 25 rumen samples studied. Other important browse plants were common juniper (8.2 per cent) and Douglas fir (1.7 per cent). Kinnikinnick and Canadian buffalo-berry were found in all six samples but only in minor amounts. No common juniper was found in the summer samples; traces of Douglas fir were found in three. Both were found in all six fall samples. Amounts of rose, snowberry and low red huckleberry dropped to traces during the winter period, but rose was found in five samples. No definite use trends were determined for the browse plants during the period.

Grass increased slightly from the summer period to 3.0 per cent. It was again found in all six samples. No use of mushroom was found in this period.

To illustrate the lack of trends in vegetative use within the period: Oregon grape was the major plant found in two samples; twin flower, balsam root, aster and Hoods phlox in one each.

Winter (January-February-March)

Food habits investigations for this period consisted of feeding site examinations and analyses of rumen samples from deer collected in the South Fork-Dry Pole Canyon area and the prairie type wintering area. The data from the prairie type are discussed in a later section.

Three samples were from deer collected in the Douglas fir-lodgepole pine type. Two of these were from Dry Pole Canyon and one from Indian Hill, an area between Dry Pole and Bower Canyons. Three samples were from the ponderosa pine-Douglas fir type along the South Fork, one of these was from a regular collection and two were from coyote killed fawns. The collections by month were: one in January, two in February and three in March.

Browse plants were much more important (77.9 per cent) than forbs (19.9 per cent), during the period. Common juniper was the most important plant, constituting 56.7 per cent. It was present in all six samples and varied from a minimum of 43.5 per cent to a maximum of 68.7 per cent. Kinnikinnick (8.7 per cent), Oregon grape (4.7 per cent), Douglas fir (3.6 per cent) and chokecherry (2.6 per cent) were other important browse plants. Douglas fir and kinnikinnick were found in all six samples, Canadian buffalo-berry and chokecherry were found in five each. Kinnikinnick was present in moderate amounts (trace to 6.3 per cent) in all except the sample collected March 23 from a fawn, where it constituted 42.9 per cent. Oregon grape was snow covered during much of the period. Douglas fir use showed a slight increase over the previous period. Greatest amounts were in a sample from a fawn collected March 14. It constituted

14.9 per cent of this sample. Chokecherry was a trace item in three of five samples in which it was present but had a maximum of 13.0 per cent of the March 26 sample.

Aster (8.7 per cent) and twin flower (5.1 per cent) were the only two identified forbs that constituted more than 0.4 per cent during the period. Unidentified forbs made up 4.5 per cent. Aster was the only forb identified in all six samples. The maximum amount of aster was found in the January 29 sample from a deer collected along the South Fork. It constituted 35.5 per cent of this sample. Twin flower made up 20.8 per cent of the March 11 sample which was collected in dense Douglas firs. Use of balsam root was not detected. Hoods phlox constituted 0.4 per cent and was found in three samples. Grass dropped to 1.3 per cent and was present in only four samples.

Twenty-seven feeding sites involving 99 deer were examined in the South Fork-Dry Pole Canyon area during this period; 3597 instances of use were recorded. Eight sites were in the ponderosa pine-Douglas fir type. Nineteen were in the Douglas fir-lodgepole pine type, six of these were on the old burn. Three sites were examined in June, 16 in February and eight in March.

Browse plants were found to be much more important (75.6 per cent, 2725 instances) than forbs (14.8 per cent, 544 instances) by this method also. Common juniper was the most important plant with 63.8 per cent, 2295 instances (Fig. 10). Fringed sagebrush (3.6 per cent, 128 instances), kinnikinnick (2.4 per cent, 88 instances), Canadian buffalo-berry (1.5 per cent, 54 instances) and chokecherry (1.4 per cent, 52 instances) were

Fig. 9. Mule deer on the open prairie in the prairie type winter range.

Fig. 10. A clump of common juniper in the South Fork of the Judith River. A total of 122 instances of use was recorded on this clump.

also important. Total use of fringed sagebrush came from two sites, one in the open area at the mouth of Dry Pole Canyon and one on an open slope near the mouth of the South Fork Canyon. No deer were collected near these areas or similar areas. The use of Douglas fir was found on only two sites but it was present at 14 sites where no use was recorded. It was probably browsed on some of those occasions but was not detected. Oregon grape use (0.9 per cent, 34 instances) was on four sites. It is well dispersed in the area and heavy use on any one site would not be likely to occur. Canadian buffalo-berry was present on 12 feeding sites in Dry Pole Canyon, but on only one site in the South Fork Canyon (from where half the deer rumen samples were collected).

The most prominent forb was aster (2.5 per cent, 90 instances). Thistle (1.8 per cent, 64 instances), daisy (1.3 per cent, 45 instances), salsify (Tragopogon dubius) (1.3 per cent, 45 instances), twin flower (1.1 per cent, 38 instances), bedstraw (1.0 per cent, 37 instances) and goldenrod (1.0 per cent, 36 instances) were also prominent. All of these except daisy, salsify and goldenrod were identified in rumen samples for the period.

Grass constituted 9.1 per cent with 326 instances of use. A total of 245 of these instances of use were on one site near the mouth of the South Fork Canyon, March 16. The grass taken was alive and green. No green grass was found in the rumen samples for the period.

Spring (April-May)

Food habits study for this period in the South Fork-Dry Pole Canyon area, consisted of analyses of two rumen samples. One sample was from a

deer collected April 26 in the ponderosa pine-Douglas fir type in Dry Pole Canyon and one was from a deer collected May 12 in a Douglas fir-lodgepole pine type in Hay Canyon, just off the South Fork.

Browse plants were the most abundant items present (41.5 per cent). The most important was common juniper (30.7 per cent). The only other browse species found in measureable amounts were kinnikinnick (7.0 per cent) and Douglas fir (3.8 per cent). Oregon grape use was not detected. Chokecherry and Canadian buffalo-berry were present as traces in both samples. Total browse plants in the April sample constituted 26.8 per cent. In the May sample they totaled 56.2 per cent.

Grass was next in importance in this period (37.8 per cent), nearly equalling browse plants in volume. In the April sample, grass constituted 70.9 per cent. This volume is second in amount only to that of Oregon grape in a fall sample (84.6 per cent) as being the greatest volume of any one item in any sample of the 25 rumen samples. Grass use dropped to 4.7 per cent in the May sample. The significance of this is not known in the small sampling for the period. The grasses taken were mostly fresh and green.

Forbs constituted 20.6 per cent. Dandelion was most important (7.0 per cent) followed by prairiesmoke (Geum triflorum) (5.5 per cent), strawberry and littleleaf allum-root (both 2.3 per cent). Unidentified forbs made up 3.5 per cent. Aster was found as a trace in one sample; twin flower use was not detected. Forbs totaled 2.4 per cent in the April sample and rose to 39.1 per cent in the May sample.

Prairie Type Winter Range

Food habits of the deer when on the prairie type winter range were investigated by analyses of rumen samples and examination of feeding sites. Five rumen samples were used, one each month for November (hunter kill), January, February (coyote killed fawn), March and April.

Browse plants were the most important food items (47.8 per cent). Creeping juniper was the prominent browse plant (21.1 per cent), followed by ponderosa pine (12.7 per cent), Oregon grape (6.0 per cent) and fringed sagebrush (3.5 per cent). Creeping juniper was found in four of the five samples and was the most abundant species in three, all collected from deer on the open prairie. Ponderosa pine was the dominant species (57.0 per cent) in the sample from the coyote killed fawn in February which was found in a dense ponderosa pine area. No creeping juniper was found in this sample. Ponderosa pine was found in four samples. Oregon grape was the dominant species (29.9 per cent) in the November sample which was from a deer shot on the north edge of the Game Range next to an old extensive timber burn. No Oregon grape was found growing on the prairie type. Fringed sagebrush use was fairly consistent. It was present in measureable amounts in four samples. Its maximum use was 10.1 per cent in the February sample. Kinnikinnick and Douglas fir were other species present in four of the five samples. Kinnikinnick made up 1.5 per cent and Douglas fir was found as traces. No other species of browse plant was found in more than one sample.

Forbs were nearly as prominent as browse plants in this sampling (43.6 per cent). Eriogonum (Eriogonum spp.) (8.9 per cent) and aster (8.6 per

cent) were the two most important forbs. Pussytoes (3.6 per cent) and Hoods phlox (3.5 per cent) were also important. Unidentified forbs constituted 15.5 per cent. Aster was the only plant except grass that was present in measureable amounts in all five samples. The maximum amount found was 16.3 per cent in the January sample. Eriogonum was found in measureable amounts in three samples and its maximum amount was 20.6 per cent in the April sample. Pussytoes was found in four samples, phlox in three. Bedstraw was found in four samples and made up 1.0 per cent of the samples for the type.

Grass made up 8.5 per cent and was present in measureable amounts in all five samples. Its maximum use was in the November sample of which it constituted 15.0 per cent.

Seventeen feeding sites involving 164 deer were examined from January 22 to March 29 on this type. A total of 2124 instances of plant use was recorded. Nine sites were on open prairie, five in timber patches and three in old abandoned agricultural fields.

Browse plants were found to be the most important food items (73.9 per cent, 1574 instances). Creeping juniper was the prominent species (49.2 per cent, 1046 instances) followed by kinnikinnick (14.9 per cent, 317 instances), horsebrush (Tetradymia canescens) (5.6 per cent, 119 instances), ponderosa pine (1.6 per cent, 35 instances) and fringed sagebrush (1.2 per cent, 25 instances). Use on creeping juniper is difficult to detect. For this reason, feeding sites examined on the open prairie where creeping juniper is found, were made only during or just after a snow fall (Fig. 11). Deer use appeared to be especially heavy on creeping

juniper at these times. Some of the apparent use recorded may have resulted from pawing, although attempts were made to minimize this.

Horsebrush use was detected on only three sites. It is found in only a few patches and no deer were collected in the vicinity of these areas.

Forb use constituted 22.3 per cent with 474 instances of use. Aster was the most important forb (17.3 per cent, 367 instances). It was the only forb to constitute over 0.8 per cent of the usage. Aster use was detected on 11 of the 17 feeding sites. It was the prominent plant used in the old agricultural fields (137 of 144 total instances of use). No deer were collected from agricultural fields. Pussytoes use was 0.8 per cent with 18 instances, Hoods phlox totaled 0.6 per cent with 12 instances. No use was detected on eriogonum. Grass use was 3.6 per cent with 76 instances of use.

DISCUSSION OF METHODS AND FOOD HABITS

The results obtained by using the two different methods of studying food habits are surprisingly comparable. From observations and working with rumen samples, it is believed that in feeding, deer using the forbs and evergreen browse plants found in this area, take about equal sized bites of both forage types. Therefore if a sample is large enough, the results by the two methods should be comparable to some extent. Combination of the two methods in one study reveals much more information than either one would alone. Use of the feeding site examination technique increased the number of deer involved from 25 to approximately 350 and also greatly increased the area covered.

Year long trends are apparent in the deer use of forage classes

during the course of the study. Forbs were the most important class in the summer period, browse was second and grass use was minor. Browse plant use became more pronounced during the fall period and the average amounts of browse and forbs found in the samples for the entire period were nearly equal. Grass use remained minor in this period. Browse was of greatest importance in the winter period, forbs second and grass was even lower than for previous periods. Browse, although in smaller amounts than for the winter periods, was still the most important in the limited spring sampling. Forb use was low but an increase was seen during the period and grass use rose to maximum amounts, nearly equaling browse. These trends are very similar to those found by Smith (1952) in Utah and Wilkins (1957) in the Bridger Mountains, Montana.

Common juniper and creeping juniper were the most important plants during the winter period. This is in contrast to the findings of Cowan (1947) for mule deer in Alberta, and Hill and Harris (1943) for mule deer and white tail deer (O. virginiana) in South Dakota. In those studies kinnikinnick was found to be the most important plant and junipers rated very low in importance. Morris and Schwartz (1957) studying mule deer in western Montana, found Douglas fir use in the winter to be important.

Some plant species in the area appear to have low palatability. Shrubby cinquefoil was present on 30 feeding sites but no use of it was ever detected. It was present in trace amounts in four rumen samples but the total amount found consisted of only four leaves. Yarrow use was detected on only three of 27 sites. It was found in 17 rumen samples:

15 times as a trace and as a maximum of 1.4 per cent. Detecting use on this plant is very difficult unless the main stem is clipped. Rose was readily taken during the summer period (used on 20 of 23 sites where present) but not during the winter (used on one of 26 sites). It was found as traces in five of nine winter rumen samples. Snowberry use was detected on seven of 22 summer sites but none of 21 winter sites. It was found as traces in two winter rumen samples. Other species present on sites but little used were lupine (used three of 10 sites), limber pine (not used on eight sites), Englemann spruce (not used on seven sites), and Rocky Mountain juniper (used one of five sites).

Some major differences are apparent between the food habits of the deer wintering in the South Fork-Dry Pole area and those wintering in the prairie type area. Common juniper was the most important plant during the winter period in the South Fork-Dry Pole area but was found only as a trace in one rumen sample on the prairie type area. Common juniper is very abundant in the South Fork-Dry Pole area but is extremely scarce on the prairie type where a total of only two, heavily browsed plants was found. Creeping juniper was the most important browse plant on the prairie type range but was relatively unimportant in the South Fork-Dry Pole area. Creeping juniper is present in some abundance in the South Fork-Dry Pole area but common juniper is much more prevalent. Rocky Mountain juniper is also present in fair amounts in the South Fork-Dry Pole area but none was found in the rumen samples. It is possible that some Rocky Mountain juniper may have been present in the samples but was identified as creeping juniper.

Total browse plant use in the South Fork-Dry Pole area was greater than in the prairie type where more forbs and grasses were taken. Deer collected for rumen samples from the South Fork-Dry Pole area were in much better physical condition than those from the prairie type. Kidney weights were obtained from two deer collected from the prairie type and three deer collected from the South Fork-Dry Pole area during the winter period. The kidneys were handled as described by Riney (1955) except that no trimming was done. The process involved taking out the kidneys with the surrounding fat and weighing them. Then the fat was peeled away and the kidneys were weighed without fat. A "kidney fat index" rating was found by expressing the weight of the fat around the kidneys as a percentage of the kidney weight. Weights were taken to the nearest gram. A mature male collected on the prairie type area January 16 had an index rating of only four per cent kidney fat, while a mature male taken from the South Fork-Dry Pole area February 25 had an index rating of 10 per cent kidney fat. Two mature females from the South Fork-Dry Pole area, January 29 and March 26, had indexes of 25 and 22 per cent kidney fat, while a mature female from the prairie type, March 13 had an index rating of only four per cent kidney fat.

The Biennial Report for 1941 and 1942 of the Montana Fish and Game Commission reported that the deer population in the Judith River Drainage of the Little Belt Mountains rose to a maximum in 1939. A two man crew censused deer full time from November 1, 1941 to the end of April, 1942. Results of their findings led to the statement that serious damage had resulted to the range species in the Sapphire Mine area (prairie type area)

due to abnormal use over a period of years, while several adjacent ranges were underused. Weed (1899) stated that mat like growths of ground cedar (creeping juniper) were present in the area in about 1900. Long time residents in the area related that great difficulty was encountered by early farmers in attempting to plow up creeping juniper patches. The creeping juniper that remains is in poor condition and dead creeping juniper stems are found throughout the area (Fig. 12).

The 1941-1942 survey also indicated that deer migrated to the prairie type wintering area from the Lost, Middle and South Forks of the Judith River and Yogo Creek. This is substantiated to some extent by deer tagging which is done in the prairie type area by crews from the Judith River Game Range. Since 1950, a total of 43 deer have been trapped and ear tagged with metal tags and colored plastic disks. None of the tagged deer have been seen and no tags have been returned from the South Fork-Dry Pole area. This seems to indicate that a large percentage of the deer using the prairie type winter range migrate to it from other drainages than from the South Fork.

Doe-fawn ratios in both areas were found to be very poor. Two hundred and sixty-eight does and 101 fawns were censused along the main route up the South Fork in September, 1956 for a doe-fawn ratio of 2.65 does to one fawn. Doe-fawn ratio counts were made on the prairie type area by a two man crew from the Judith River Game Range. A total of 814 does and 290 fawns were recorded during November and December, 1956 and January, 1957 for a doe-fawn ratio of 2.81 does to one fawn.

Fig. 11. Creeping juniper on the prairie type winter range after a fresh snow and browsing by deer.

Fig. 12. Dead stems of creeping juniper on the prairie type wintering area.

SUMMARY

1. A mule deer food habits and range use study was conducted in the Judith River drainage of the Little Belt Mountains, Montana, during the summer of 1956 and the winter of 1957. Additional trips were made to the area in the fall of 1956 and spring of 1957 for specimen collections. Methods used included observations of deer on various vegetative types, rumen analyses and feeding site examinations.

2. Four main vegetative types were determined. Present are a spruce-fir type with a burn sub-type, Douglas fir-lodgepole pine type with an open grass flat sub-type, ponderosa pine-Douglas fir type and foothills-prairie type. Dry Pole Canyon, an area containing all the types except foothills-prairie, was also important in the study. Trips were made through these types observing deer, making feeding site examinations and collecting deer for rumen samples.

3. Deer were found to move upward in elevation during the summer period. The largest number observed in August was in the spruce-fir type, which is in the upper elevations. A downward movement trend is seen in September. The most important winter range was found to be in the prairie type near the Judith River Game Range, while the South Fork of the Judith River and Dry Pole Canyon were used to lesser extents.

4. Forbs were found to be most important in the deer food habits during the summer period. Browse was next in importance and grasses were little used. Mushrooms were also used in fair amounts. During the fall period, browse and forb use were about equal and grass use remained low. In the winter period, separate studies were conducted on the prairie

type winter range and the South Fork-Dry Pole area winter ranges. Browse was found to be used most in both areas but to a lesser extent on the prairie type. Common juniper was the most important plant in the South Fork-Dry Pole area and creeping juniper use was of minor importance. The reverse was true for the prairie type range. Forbs were second in importance in both areas and grass use was low. Spring studies consisted of two rumen analyses from deer collected in the South Fork-Dry Pole area. Browse was still of greatest importance, although less than in the winter period; grass was second in importance and forbs were low for the period. A trend is noticeable in an increase in forb use and a decrease in grass use in the two samples. The two study techniques were found to give surprisingly comparable results.

5. Physical conditions of the deer wintering in the prairie type area were found to be poorer than those of deer wintering in the South Fork-Dry Pole area. Doe-fawn ratios were low in both areas. Deer tagging operations suggest that deer migration to the prairie type wintering area is greater from other areas than from the South Fork.

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