



Summer range habits of the pronghorn antelope in central Montana with special reference to proposed sagebrush control study plots
by Harold James Wentland

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 study of the range use, food habits and home range of the pronghorn antelope was conducted during the summers of 1966 and 1967 on an 83,597 acre area in central Montana which included four study plots on which sagebrush will be eradicated at a later date. The purpose of my study was to record data prior to sagebrush eradication on the study plots. These data will be available for comparison with those collected after the control of sagebrush.

The physiography of the area was described. The vegetation was classified into eight types as follows; Sagebrush-grassland, grassland, grease-wood, greasewood-sagebrush, shale slope, cropland, abandoned meadow and timber. Canopy coverage and frequency of occurrence was recorded for low growing vegetation. This provided data for quantitative descriptions of the first five types listed.

Population characteristics were determined by classification of 4,029 ground observations and 1,559 aerial observations of individual antelope by sex and age classes. Data from ground counts indicated 262 females per 100 males and 84 fawns per 100 females in 1966 and 190 and 71, respectively, in 1967. Data from aerial counts indicated 241 females per 100 males and 57 fawns per 100 females in 1967, Highest fawn-female ratios obtained during ground counts occurred in early August, 1966 and late July, 1967.

A total of 5,874 individual antelope observations were recorded by vegetation type. These data indicated declining use of the sagebrush-grassland vegetation type and a corresponding increase in use of the shale slope, greasewood, greasewood-sagebrush and cropland vegetation types combined, as the summer progressed in both 1966 and 1967. Despite this trend the sagebrush-grassland vegetation type received 50 percent or more of the total use both summers. The density of big sagebrush was recorded at 2,980 individual antelope observation sites in the sagebrush-grassland vegetation type. Both years at least 90 percent of these antelope were observed on areas where densities of big sagebrush were estimated to be scattered or common.

Antelope food habits data were obtained primarily by examination of 62 feeding sites and supplemented, in 1967, by analysis of the contents of 12 rumen samples. Forbs comprised 86 and 97 percent, shrubs 14 and 3 percent, and grasses a trace, of the total use at feeding sites in 1966 and 1967, respectively. In 1967 these forage classes averaged 85, 14 and 2 percent, respectively, of the total identifiable material in 12 rumen samples. Five forbs constituted 62 percent or more of the total use at feeding sites both years and averaged 35 percent of identifiable material in rumen samples. These included fringed sagewort (*Artemisia, frigida*), long-leaf sagebrush (*Artemisia longifolia*), three-leafed milkvetch (*Astragalus gilviflorus*), alfalfa (*Medicago sativa*) and sweetclover, (*Melilotus officinalis*). The latter four were the only plant species present in the antelope diet in significantly higher proportions than in the plant community. Four *Artemisia* species together constituted 28 and 14 percent of the total use at feeding sites in 1966 and 1967, respectively, and averaged 10 percent by volume of identifiable material in rumen samples.

Characteristics of summer home ranges were determined by successive observations of 19 individually recognizable antelope. Territorial males moved the shortest distances between successive observations and had the smallest home ranges. Males associated with male herds moved the greatest distances between successive observations and had the largest home ranges. Females associated with other females and fawns or with females, fawns and a single male were intermediate with respect to these measurements. Females moved 59 percent further between successive observations when not accompanied by a territorial male. The average size of home ranges of territorial males was 121 percent larger on the sagebrush-grassland vegetation type than on the greasewood vegetation type.

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WITH SPECIAL REFERENCE TO PROPOSED SAGEBRUSH CONTROL STUDY PLOTS

by

HAROLD JAMES WENTLAND

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

of

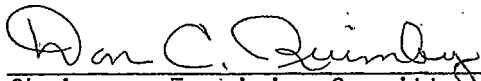
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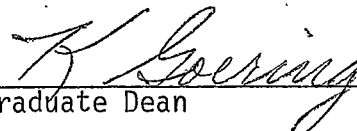
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ABSTRACT

A study of the range use, food habits and home range of the pronghorn antelope was conducted during the summers of 1966 and 1967 on an 83,597 acre area in central Montana which included four study plots on which sagebrush will be eradicated at a later date. The purpose of my study was to record data prior to sagebrush eradication on the study plots. These data will be available for comparison with those collected after the control of sagebrush.

The physiography of the area was described. The vegetation was classified into eight types as follows; Sagebrush-grassland, grassland, greasewood; greasewood-sagebrush, shale slope, cropland, abandoned meadow and timber. Canopy coverage and frequency of occurrence was recorded for low growing vegetation. This provided data for quantitative descriptions of the first five types listed.

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INTRODUCTION

In recent years there has been an increasing trend toward sagebrush (*Artemisia* spp.) eradication, and the consequent reduction of associated forbs (Martin 1965), to increase the volume of grasses for livestock on public and private rangelands. These changes in floral composition have caused much concern among wildlife biologists in Montana with respect to the possible effects on various non-game and game species. To study the short and long range effects on wildlife of ecological changes resulting from sagebrush eradication, a 10-year project was initiated in 1965 by the Montana Fish and Game Department, in cooperation with the Bureau of Land Management, in Central Montana. The current study is a part of that project.

The predominant role of sagebrush-grassland vegetation in the general ecology of the pronghorn antelope (*Antilocapra americana*) in Montana has been elucidated by Cole (1956) and Cole and Wilkins (1958). Quantitative data concerning the effects of sagebrush eradication on the pronghorn are lacking. Insight about possible effects may be gained by reference to studies of both pronghorn food and range use habits (Ferrel and Leach 1952; Cole, *op cit.*; Cole and Wilkins, *op cit.*; and Dirschl 1963) and the effects of sagebrush eradication on associated vegetation (Hurd 1955; Blaisdell and Mueggler 1956; and Hedrick *et al.* 1966). Results of these studies strongly suggest that the ecological changes in floral composition resulting from sagebrush eradication would produce results incompatible with pronghorn food and range use habits.

My study was conducted during the summers of 1966 and 1967 in central Montana to obtain quantitative data on range use, food habits and behavior of the pronghorn antelope in summer on and adjacent to sagebrush control study plots prior to the control of sagebrush. These quantitative data will be available for comparison with those collected after the control of sagebrush on the study plots.

DESCRIPTION OF THE STUDY AREA

The study area, with boundaries as shown on Figure 1 and located approximately 50 miles east of Lewistown in central Montana, comprised about 83,597 acres including four sagebrush control study plots. Private lands constituted 57.9 percent of the area and public lands, which are administered by the Bureau of Land Management or the State of Montana, 42.1 percent (Appendix, Figure 13). Rangeland predominates. Croplands, restricted largely to bottoms, comprised 2 percent of the total. Alfalfa was the principal crop but some wheat was also grown.

The physiography is characterized by undulating and sharply rolling upland plains, gravel capped benches, shale slopes and bottomlands (Giesecker 1938). The latter two occur where erosion has dissected the upland plains. McDonald, Elk, Spring, Yellow Water, and Pike Creeks flow through the area. Yellow Water Storage Reservoir and numerous small stock ponds are also located here.

The soils have developed over cretaceous shales of the Colorado formation (Andrews *et al.* 1944). Upland soils range from heavy clays to shaly clay loams. Shale slopes have soils ranging from fine shale loams to coarse shale gravels. Bottomlands have thin surface horizons ranging from silty clays to clay loams interspersed with barren hardpan spots.

Giesecker (*op cit.*) describes the climate of the area as semiarid ".....characterized by a comparatively low rainfall, great temperature extremes, a large number of sunny days, and a relatively low humidity." The average annual precipitation at Flatwillow (U.S. Department of Commerce

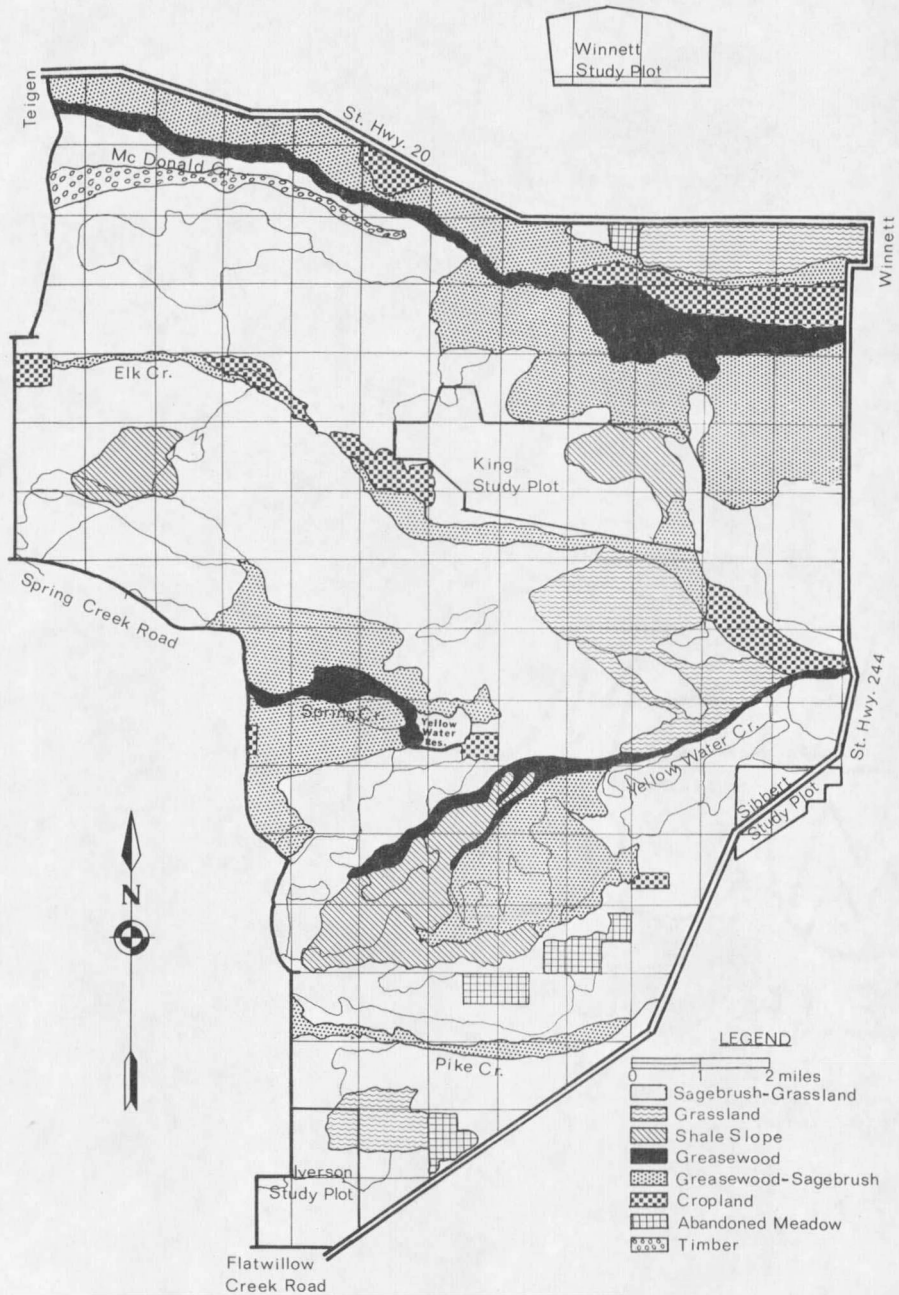


Figure 1. The study area showing the sagebrush control study plots and the vegetation types.

Weather Station), on the east edge of the study area, is 12.57 inches. The average summer (June-August) precipitation is 5.76 inches. During the summers of 1966 and 1967 precipitation was 61.3 percent below and 12.7 percent above normal, respectively. The mean average annual temperature is 45.4 degrees. The highest temperature recorded during the study period was 105 degrees in July, 1966 and the lowest was 35 degrees in June, 1966. Monthly climatological data for both summers are shown in the Appendix, Table XI.

Major influent wild mammals on the area, besides the pronghorn antelope, include the white-tailed deer (*Odocoileus virginianus*) and the mule deer (*Odocoileus hemionus*).

VEGETATION

Cole (*op cit.*) and Bayless (1967) studied the vegetation of the same general area as that of the current study. My analysis follows closely that of the latter. His investigation made use of quantitative measurements and included my study area. The occurrence and distribution of vegetation types shown on Figure 1, with slight modification, are from Bayless. Plant nomenclature is that of Booth (1950) and Booth and Wright (1959).

Floral composition of the vegetation types of the study area, including the sagebrush control study plots, was determined by a modification of the technique of Daubenmire (1959). The canopy coverage and frequency of each taxon occurring within 2 x 5 decimeter plots, systematically placed within a relatively homogeneous and undisturbed portion of each vegetation stand, were visually estimated. The coverage classes were: Class 1=0-5 percent; Class 2=5-25 percent; Class 3=25-50 percent; Class 4=50-75 percent; Class 5=75-95 percent; and Class 6=95-100 percent. The midpoints of these classes were used in data tabulations. Ground cover was evaluated by making a visual estimate of the percent of bare-ground, rock and litter within the plot frames.

A sample unit consisting of twenty 2 x 5 decimeter plots placed at 10-foot intervals along 50-foot radial lines of a circle's cardinal points was examined within each of 79 vegetation stands on the area exclusive of the sagebrush control study plots (Table I and Appendix, Table XII). One sample unit was located at each of 48 antelope feeding sites as well as

TABLE I. CONSTANCY, CANOPY COVERAGE AND FREQUENCY OF TAXA FOR FIVE VEGETATION TYPES AS DETERMINED BY EXAMINATION OF 2 X 5 DECIMETER PLOTS.

Taxa ^{1/}	Vegetation Type				
	Sagebrush- Grassland	Grassland	Greasewood	Greasewood- Sagebrush	Shale Slope
	46 Stands 920 Plots	5 Stands 100 Plots	7 Stands 140 Plots	8 Stands 160 Plots	13 Stands 260 Plots
	Cy/Cv/Fr ^{2/}	Cy/Cv/Fr	Cy/Cv/Fr	Cy/Cv/Fr	Cy/Cv/Fr
SHRUBS					
<i>Artemesia tridentata</i>	96/11/39	X		63/ 3/15	31/ 1/ 4
<i>Chrysothamnus nauseosus</i>	X3/		X	25/ 4/ 3	46/ 2/15
<i>Gutierrezia sarothrae</i>	74/ 3/26	60/ 1/16	X	50/ 1/ 9	31/ 1/ 9
<i>Rosa arkansana</i>	X		14/ 1/ 4	13/ 1/ 1	54/ 2/11
<i>Sarcobatus vermiculatus</i>	X		29/ 1/ 4	63/ 2/ 8	
Total Shrubs	100/12/40	80/ 1/18	43/ 1/14	88/ 5/26	85/ 8/44
FORBS					
<i>Achillea millefolium</i>	X		86/ 6/50	63/ 1/17	X
<i>Androsace septentrionalis</i>	X			38/tr/ 6	
<i>Arenaria hookeri</i>	48/ 1/15	X			15/ 8/ 1
<i>Artemesia frigida</i>	72/ 3/25	100/ 4/50	43/ 2/14	88/ 7/36	
<i>Artemesia longifolia</i>	X				92/ 5/32
<i>Artemesia ludoviciana</i>			29/ 1/ 8	X	
<i>Astragalus spp.</i>	X		29/ 1/ 6	38/ 1/ 6	
<i>Astragalus gilviflorus</i>	31/tr/ 7				
<i>Aster spp.</i>			14/ 1/ 9		
<i>Aster commutatus</i>	X		43/ 4/24		
<i>Chenopodium album</i>			29/tr/ 5		
<i>Eriogonum multiceps</i>	X				31/ 1/ 8
<i>Grindelia squarrose</i>	24/tr/ 5		29/ 1/ 6	63/tr/ 8	
<i>Haplopappus nuttallii</i>	33/tr/ 8				
<i>Hymenoxys richardsonii</i>	20/tr/ 7				
<i>Medicago sativa</i>	X		86/14/30	X	
<i>Melilotus officinalis</i>	30/ 1/ 9		57/ 9/41	88/ 9/38	

TABLE I. (CONTINUED).

Taxa	Vegetation Type				
	Sagebrush- Grassland	Grassland	Greasewood	Greasewood- Sagebrush	Shale Slope
	46 Stands 920 Plots	5 Stands 100 Plots	7 Stands 140 Plots	8 Stands 160 Plots	13 Stands 260 Plots
	Cy/Cv/Fr	Cy/Cv/Fr	Cy/Cv/Fr	Cy/Cv/Fr	Cy/Cv/Fr
<i>Microseris</i> spp.			14/ 2/ 3		
<i>Opuntia polycantha</i>	46/ 1/ 6	60/tr/12		63/ 1/ 6	
<i>Petalostemon candidum</i>	11/ 1/ 4				
<i>Phlox hoodii</i>	65/ 2/25	40/ 1/17			
<i>Plantago purshii</i>	43/ 1/12	100/tr/25		X	
<i>Polygonum aviculare</i>			X	X	8/tr/ 5
<i>Potentilla pennsylvanica</i>				13/tr/63	
<i>Psoralea tenuiflora</i>	X	X	14/ 1/ 3	13/ 1/ 2	
<i>Sphaeralcea coccinea</i>	78/ 1/22	100/ 1/36	X	X	X
<i>Taraxacum officinale</i>	X	X	57/ 4/27	63/ 1/ 4	
<i>Thermopsis rhombifolia</i>	X			X	100/ 6/43
<i>Tragepogon dubius</i>	X	X	57/ 4/16	X	
<i>Vicia americana</i>	57/ 1/16	60/tr/ 6	X	63/ 1/ 7	X
Unknown Forbs	63/tr/10	80/tr/12	X	75/ 1/13	X
Total Forbs	100/15/89	100/ 1/14	100/42/92	100/22/86	100/ 9/64
GRASSES AND GRASS-LIKE PLANTS					
<i>Agropyron desertorum</i>	X		14/ 1/ 5		
<i>Agropyron smithii</i>	98/14/70	100/12/76	100/44/86	100/23/86	85/ 3/17
<i>Agropyron spicatum</i>	52/ 3/18	X		X	38/ 2/13
<i>Bouteloua gracilis</i>	63/10/32	100/21/76	43/ 1/ 6	50/ 3/12	X
<i>Bromus tectorum</i>	11/ 1/ 4		43/ 4/20	50/ 3/19	
<i>Calamagrostis montanensis</i>	24/tr/ 5				62/ 6/32
<i>Calamovilfa longifolia</i>	X				77/16/53
<i>Carex</i> spp.	74/ 2/16	80/ 5/36	X	63/ 1/ 9	X

