



The food habits and summer distribution of juvenile sage grouse in central Montana
by Joel Gordon Peterson

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:

The food habits of juvenile sage grouse (*Centrocercus urophasianus*) were studied in central Montana during the summers of 1966 and 1968. The vegetation was analyzed at all feeding sites where birds were collected. A measure of preference was established for each plant by correlating the percent volume found in the crops with the percent canopy coverage found at the feeding sites. For the two years combined, forbs averaged 75 percent of the diet of 127 juveniles through 12 weeks of age. Use of forbs was greater in 1968, apparently due to the above average precipitation and the resulting greater forb cover. The flower buds and leaves of common dandelion (*Taraxacum officinale*) and common salsify (*Tragopogon dubius*) were the most highly preferred and utilized forbs, comprising 25 and 15 percent of the diets, respectively. Other forbs commonly utilized by various ages of juveniles were prairie pepperweed (*Lepidium densiflorum*), prickly lettuce (*Lactuca serriola*), alfalfa (*Medicago sativa*), curlcup gumweed (*Grindelia squarrosa*), and fringed sagewort (*Artemisia frigida*). Big sagebrush (*Artemisia tridentata*) received little use until the birds were 11 weeks old. Insect use declined steadily from a high of 60 percent of the diet in one-week chicks to 5 percent in 12-week-old juveniles. The vegetational and topographical characteristics of brood sites found along two observation routes were recorded during each week of the study. After the first few weeks of age, observed brood locations were less frequent on the sagebrush-grass land benches and more frequent on lower areas until by September, the majority of broods were located on bottomlands. Sagebrush heights of 6 to 18 inches were the most prevalent heights at brood sites during their morning and evening activity periods. Important components of juvenile sage grouse habitat in this area appears to be an abundance and diversity of forbs and scattered (1-5 percent) or common (5-20 percent) densities of sagebrush.

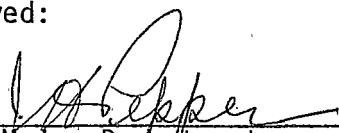
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IN CENTRAL MONTANA

by
JOEL GORDON PETERSON

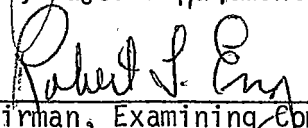
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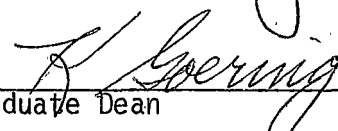
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ABSTRACT

The food habits of juvenile sage grouse (*Centrocercus urophasianus*) were studied in central Montana during the summers of 1966 and 1968. The vegetation was analyzed at all feeding sites where birds were collected. A measure of preference was established for each plant by correlating the percent volume found in the crops with the percent canopy coverage found at the feeding sites. For the two years combined, forbs averaged 75 percent of the diet of 127 juveniles through 12 weeks of age. Use of forbs was greater in 1968, apparently due to the above average precipitation and the resulting greater forb cover. The flower buds and leaves of common dandelion (*Taraxacum officinale*) and common salsify (*Tragopogon dubius*) were the most highly preferred and utilized forbs, comprising 25 and 15 percent of the diets, respectively. Other forbs commonly utilized by various ages of juveniles were prairie pepperweed (*Lepidium densiflorum*), prickly lettuce (*Lactuca serriola*), alfalfa (*Medicago sativa*), curlcup gumweed (*Grindelia squarrosa*), and fringed sagewort (*Artemisia frigida*). Big sagebrush (*Artemisia tridentata*) received little use until the birds were 11 weeks old. Insect use declined steadily from a high of 60 percent of the diet in one-week chicks to 5 percent in 12-week-old juveniles. The vegetational and topographical characteristics of brood sites found along two observation routes were recorded during each week of the study. After the first few weeks of age, observed brood locations were less frequent on the sagebrush-grassland benches and more frequent on lower areas until by September, the majority of broods were located on bottomlands. Sagebrush heights of 6 to 18 inches were the most prevalent heights at brood sites during their morning and evening activity periods. Important components of juvenile sage grouse habitat in this area appears to be an abundance and diversity of forbs and scattered (1-5 percent) or common (5-20 percent) densities of sagebrush.

INTRODUCTION

Range management practices in many areas of the west have shown an increasing trend toward removal or manipulation of stands of sagebrush. In light of the potential effect this trend may have on certain game species, the Montana Fish and Game Department and the United States Bureau of Land Management initiated in 1965 a study to determine the ecological effects of this manipulation.

As part of this project, my study was conducted during the summers of 1966 and 1968 to determine the food habits of juvenile sage grouse (*Centrocercus urophasianus*).

Past studies of food habits have indicated a heavy use of forbs and varying amounts of animal matter by adult sage grouse during the summer months, as opposed to almost total dependence upon sagebrush during the late fall, winter, and early spring (Patterson 1952; Batterson and Morse 1948; Griner 1939; and Rasmussen and Griner 1938). It has also been shown that juvenile sage grouse rely heavily upon forbs and animal matter during the first few months of their lives (Klebenow and Gray 1967; Patterson 1952; Griner 1939; and Rasmussen and Griner 1938). My study placed emphasis on plant food items with respect to availability of these items.

DESCRIPTION OF THE AREA

The study area is located in central Montana near the town of Winnett. This region was described by Gieseke (1938) as having a semiarid climate, great temperature extremes, and a large number of sunny days. The average precipitation for the study area from June to September each year is 6.74 inches. During the first summer of the study precipitation was 4.28 below normal, while during the second summer it was 3.21 inches above. Average summer temperature for the area is 65.4 degrees F. Slightly above normal temperatures prevailed during 1966, while those during the summer months of 1968 were below average (United States Department of Commerce Weather Station at Flat Willow).

Plants dominating the higher prairie elevations included the shrubs big sagebrush (*Artemisia tridentata*) and broom snakeweed (*Gutierrezia sarothrae*). The predominant forbs were fringed sagewort (*Artemisia frigida*), plains pricklypear (*Opuntia polyacantha*), plantain (*Plantago* spp.), American vetch (*Vicia americana*), and Hood's phlox (*Phlox hoodii*). Several species of wheatgrass (*Agropyron* spp.) were the most predominant grasses. Other common grass species included blue grama (*Bouteloua gracilis*), Junegrass (*Koeleria cristata*), blue grass (*Poa* spp.), needle and thread (*Stipa comata*), and green needlegrass (*S. viridula*).

The lower elevations, especially those adjacent to creek bottoms, were often dominated by shrubs such as big sage, silver sage (*Artemisia cana*), greasewood (*Sarcobatus vermiculatus*), and rubber rabbitbrush (*Chrysothamnus nauseosus*). Common dandelion (*Taraxicum officinale*),

yarrow (*Achillea millefolium*), and curlcup gumweed (*Grindelia squarrosa*), were common forbs. Wheatgrasses were the major grasses found at the lower elevations. Others commonly found were foxtail barley (*Hordeum jubatum*), brome (*Bromus* spp.) and desert saltgrass (*Distichlis stricta*).

Many of the stream bottoms have been planted to alfalfa (*Medicago sativa*), whereas the adjoining sagebrush-grasslands are used almost exclusively for livestock grazing.

METHODS

Initially, all portions of the study area were searched by vehicle for sage grouse broods during the morning and afternoon activity periods. Morning searches were later abandoned after it was discovered that crop contents were minimal from birds collected at this time. Collections made from about an hour before sundown until dark provided more adequate crop volumes.

Most collections were made with either a .22 caliber rifle or a .410 shotgun. Chicks less than two weeks old were easily caught by hand.

Each collection was made in essentially the same manner. After a brood was discovered, the birds while feeding were carefully observed with the aid of a 15-60x variable spotting scope and/or a 7 x 35 binocular. Observations were made for approximately 30 minutes at a sufficient distance to prevent disturbance. At the end of this period, I collected one of the chicks, marked the feeding area with stakes for later vegetational analysis and briefly described the vegetational and physical characteristics of the site.

The age of each collected bird was determined by measurements of certain external features: tail length, foot length, leg length, and the stage of molt found on the primary wing feathers (Eng 1955; Pyrah 1963). Sex was determined by internal examination. One wing was saved from each bird for reference. Both the crop and gizzard were marked and preserved in 10 percent formalin.

Crop and gizzard analyses were conducted after the field season. Normally only the crop was considered since the items found in it

should have been most representative of items being fed upon immediately prior to collection. Measurements of food items were made volumetrically by the displacement of water. Measurements within each age class were grouped by use of the aggregate volume method (Martin *et al.* 1946). Supplemental crops were obtained during both years from predator and road kills throughout the summer and hunter-killed birds on the opening day of grouse season.

Vegetation analysis of the feeding area at each collection site took place within several days. A method similar to that used by Daubenmire (1959) was utilized to determine canopy coverage. Twenty, 2 x 5 decimeter plots were placed at five-foot intervals along a hundred-foot tape. This tape was placed as close as possible along the observed path the brood used while feeding. Within these plots, the coverage of each plant species was visually determined and recorded into classes. The coverage classes used in 1966 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 analysis of data. The coverage classes used in 1968 were similar to those just mentioned, but slightly refined for greater accuracy. Additional information included in the 1968 analysis was the recording of the heights and phenology of all plant species occurring within the 2 x 5 decimeter plots. Shrub (primarily big sagebrush) characteristics such as canopy coverage and average heights, were recorded by the use of the line

intercept (Canfield 1941) along the hundred-foot tape. The amount of bareground, moss, lichen, rock, and litter was also recorded. Plant nomenclature is that of Booth (1950) and Booth and Wright (1959).

Two vehicle brood routes which followed roads and trails through sagebrush-grasslands with an interspersed benchland and stream bottoms, were traversed once a week throughout the summer. The War Horse route, 45.1 miles in length, was north of Winnett and the Yellow Water Triangle route, 50.4 miles, was south of Winnett (Figure 1). These routes were used only in the morning to facilitate comparison and to reserve late afternoons for chick collections. Each route was begun at or near sunrise on mornings when relatively clear, calm weather prevailed. The vehicle was driven at 15-20 mph and route coverage was usually completed before the broods ceased their morning activities. To prevent bias caused by the length of the routes, they were driven in alternate directions every other week.

When a brood was observed the birds were flushed, counted, and the spot where the hen was first seen was marked with a stake. Notation was then made of the characteristic features of the surrounding area in the same manner as described for chick collection sites.

After a route was finished, vegetation analysis was conducted at each brood site. The methods employed were basically similar to those used at the collection sites, but modified to suit conditions.

One modification involved the measurement of canopy coverage. The 2 x 5 decimeter plot frame was placed at 10-foot intervals along two

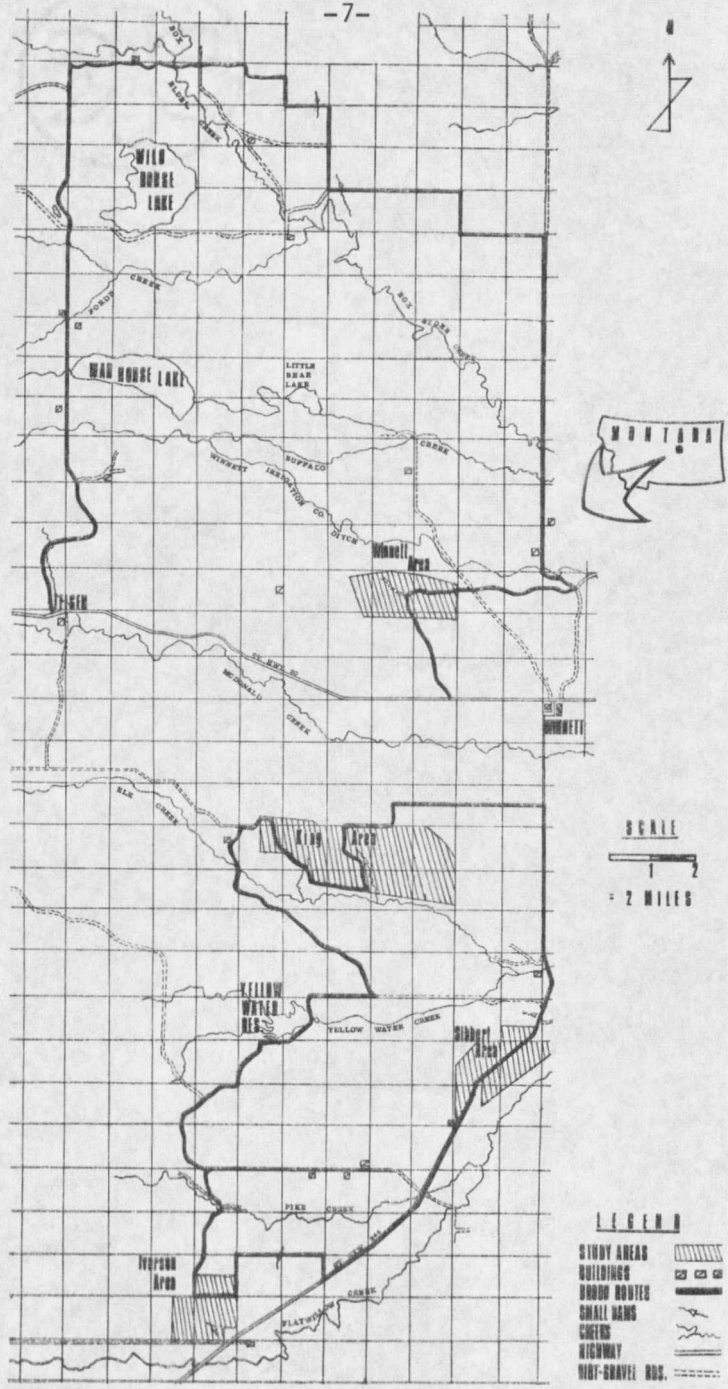


Figure 1. Map showing the study area and the two vehicle brood observation routes.

50-foot steel measuring tapes. The center of the tapes crossed at 90 degree angles over the stake which marked the location of the hen. To prevent bias in placement, one tape was placed perpendicular to the roadway used by the vehicle.

In 1968, a modification was implemented when measuring a brood site in a roadside ditch. The center of the crossed tapes was placed in the center of the ditch and the angle adjusted so the tape ends fell on the edges of the ditch. Thus, all the measurements recorded were within the roadside ditch and more accurately portrayed the vegetative type in which the birds were actually feeding. In 1966, segments of the vegetative sample which fell on the road were deleted. Thus, sites measured between the years were comparable, but sample sizes on certain individual sites in 1966 were smaller.

Another difference existed in measurement of shrub intercept between 1966 and 1968. In 1966 an 11.7-foot chain was used as the radius with the hen location as the center. Measurements were made by placing the chain on radii to cardinal points and recording the shrub intercept along the chain. The number, average height, and average diameter of the shrubs found within the circle formed by the chain were determined. In 1968, a larger sample was obtained by measuring shrub intercept, height, and density along two perpendicular 50-foot tapes.

RESULTS

FOOD HABITS

Crop Content Analysis

During the two summers of the study, I analyzed the crop contents from 151 juvenile and 32 adult sage grouse. The juveniles were separated into weekly age classes, and the source and age distribution of 127 birds through 12 weeks is presented in Table I. The frequency and volume of food items found in these birds are presented by two-week age divisions in Table II.

TABLE I. SOURCE AND AGE DISTRIBUTION OF 127 JUVENILE SAGE GROUSE, AGES 1 THROUGH 12 WEEKS, 1966 AND 1968.

Age in Weeks	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Total
<u>1966</u>													
Intentional													
Collection	-	5	4	2	5	4	5	4	5	4	-	3	41
Road Kill	-	-	-	-	2	1	1	2	8	2	4	3	23
Hunter Kill	-	-	-	-	-	-	-	-	1	1	3	3	8
Sub-total	0	5	4	2	7	5	6	6	14	7	7	9	72
<u>1968</u>													
Intentional													
Collection	2	2	3	7	3	7	4	3	5	2	3	3	44
Road Kill	-	-	-	-	2	1	1	1	2	-	2	-	9
Hunter Kill ^{1/}	-	-	-	-	-	-	-	-	-	-	-	-	-
Predator Kill	-	-	1	-	-	-	1	-	-	-	-	-	2
Sub-total	2	2	4	7	5	8	6	4	7	2	5	3	55
GRAND TOTAL	2	7	8	9	12	13	12	10	21	9	12	12	127

^{1/} No birds younger than 14 weeks old were collected at the hunter checking station in 1968.

