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SOME ASPECTS OF BLUE GROUSE SUMMER  
ECOLOGY IN THE IDAHO PRIMITIVE  
AREA  
DENDRAGAPUS OBSCURUS

UNIVERSITY of IDAHO  
RESEARCH CENTER

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Some Aspects of Blue Grouse Summer Ecology  
in the Idaho Primitive Area

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## INTRODUCTION

This Blue Grouse Ecology study took place during the summer of 1975 near the Taylor Ranch, lower Big Creek drainage, Middle Fork of the Salmon River. The region is within the boundaries of the Idaho Primitive Area.

Blue grouse on the study area may receive some hunting pressure from big game hunters desiring an occasional change in camp meat but the effect on the grouse population is probably minimal. The blue grouse population studied is therefore, essentially unexploited by man.

The objective of the study was to describe several of the events and characteristics of the blue grouse population on its summer range. The population events and characteristics which were investigated included: (1) mating and nesting activity (2) brood hen characteristics (3) brood movements (4) blue grouse behavior and (5) population productivity.

Funds for this project were made available through the Wilderness Research Center of the University of Idaho College of Forestry, Wildlife and Range Sciences. I am grateful to Dean Ehrenreich for providing this opportunity. Materials for this project were provided by the Idaho Cooperative Wildlife Research Unit and Idaho Cooperative Fisheries Research Unit. I gratefully acknowledge Dr. Elwood Bizeau's assistance with marking techniques. Dr. Jerran Flinders provided valuable advice and assistance with many aspects of this project, for which I would like to express my gratitude.

## STUDY AREA

Topography The Idaho Primitive Area is part of the Central Idaho Batholith. The Big Creek drainage is an east-west trending region of sharp relief within the area. The streams flowing into Big Creek have shaped the land into a typical dendritic pattern.

Elevation at the base of Big Creek Canyon near Taylor Ranch is approximately 3,800 feet and the highest peak in the immediate vicinity is Dave Lewis Peak, 9,252 feet. The lower canyon walls tend to be much steeper than slopes above 6,000 feet. In these canyons it is common to have a 3,000 foot rise in elevation with a horizontal distance of one mile. Many of the lower canyon walls have sharp cliffs with large rock outcrops and the resulting talus slides trailing down to the creek bottoms. Narrow belts of relatively flat meadows border the creeks over much of their courses.

Climate The climate is under the West Coast marine influence with most of the precipitation and weather changes moving in from the west. Mean annual precipitation is 15 inches, most of which comes in the form of winter snow and spring rains (December - May). January mean minimum temperature is 0°F and July mean maximum temperature is 85°F (Highsmith 1973).

Vegetation Vegetation on the study area is divided into fairly distinct zones with elevation, soil, and exposure dictating the habitat types found in a particular location. Although the Salmon River constitutes the southern boundry of the area described, several of the habitat types set forth by Daubenmire and Daubenmire (1968) are present, and their classification scheme was used.

There are no south facing slopes in either of the study areas but adjacent south slopes are characterized by Agropyron spicatum/Balsamorhiza sagittata association types with scattered Pinus ponderosa. Draws on these slopes are of the Pseudotsuga menziesii/Physocarpus malvaceus habitat types.

North, east and west facing slopes of the study areas are characterized by the Pseudotsuga menziesii/Physocarpus malvaceus habitat type (on one east facing slope Pinus ponderosa is more abundant than typical of this habitat type) from near the canyon bottoms to approximately 5,600 feet elevation. Above this zone the slopes are of the Pseudotsuga menziesii/Calamagrostis rubescens habitat type which transitions into a Pinus albicaulis/Abies lasiocarpa type on the higher peaks and ridges.

Stream courses in the large canyon bottoms are bordered by narrow belts of deciduous shrubs, trees and grassy meadows. Characteristic species of these are Betula spp., Cornus stolonifera and Agropyron spp., Elymus glaucus respectively.

#### METHODS AND MATERIALS

The study was conducted from May 31st. to August 21st., 1975. Two study areas of approximately equal size were marked off using natural land features as boundaries (Figure 1). The Goat Creek area is referred to as Area II and the Taylor Ranch area as Area I for convenience. The first two weeks were spent observing the mating activity. A system of transect routes was laid out on each study area. The transects were run on three consecutive days on one study area before alternating

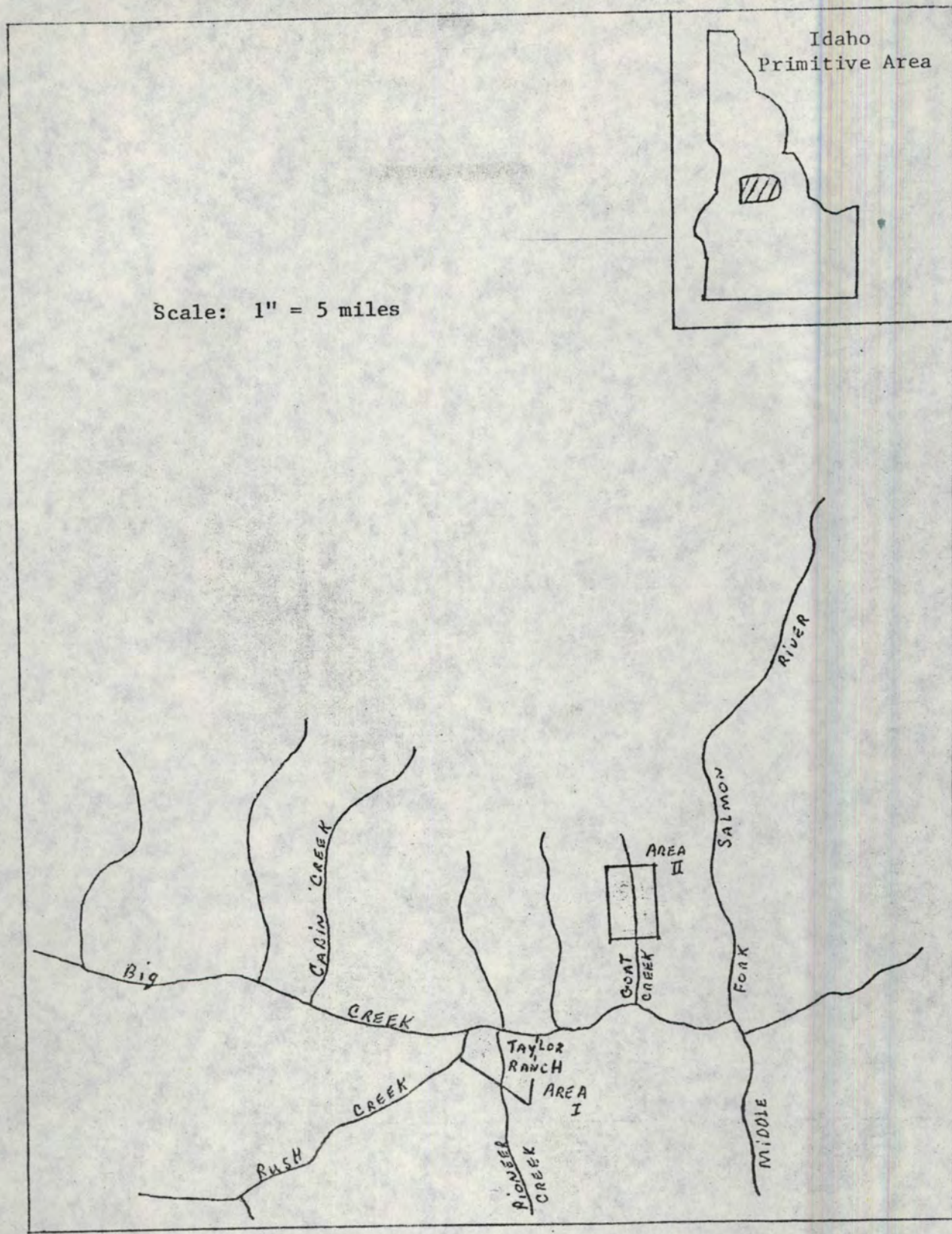


Figure 1. Location of Taylor Ranch and Goat Basin Study Areas within the Idaho Primitive Area.

to the other study area. Transect lines were approximately 300 feet apart and followed the contour of the slope. Transects were run from 8:30 A.M. to mid afternoon and approximately 30 minutes were spent observing and taking notes on each male blue grouse encountered. One male was captured using a thirteen foot snaring pole (Wickel 1967), and leg banded for future identification. The two study areas were searched intensively for nests from June 14th. to June 20th. Lance (1970) reported that female blue grouse nest near the territory of the male with which mated. The regions around previously noted male territories were searched by walking slowly and disturbing the brush with a stick.

Ten brood hens were captured, within the first week after bringing off a brood, using the snaring pole mentioned above. These hens were leg banded and also marked with 2 inch by 6 inch color coded herculite ponchos for easy identification without recapture. The ponchos were placed over the head and held down on the birds' shoulders by the neck feathers. During the marking process grouse were held in a denim straight jacket to prevent excessive feather loss. Data collected at the time of capture included weight, comb size and aggressiveness in defense of their chicks. Weights of captured hens were determined using a pesola 0 - 2500 gram spring scale with 50 gram increments. Weights less than 50 grams were estimated. The comb of yellow feathers above the eyes of the brood hens were ranked on a relative basis as being small, medium or large. Aggressiveness was determined by assigning a preselected number of points for various aggressive behavior patterns such as clucking,

hissing, raising neck feathers, engorging eye combs and false attacks. Point totals were then added and placed in the categories slight, average and very.

Movements of marked broods were determined by systematically searching for broods in the two study areas, and marking with a flagged stake the location of marked brood observations. These locations were plotted on maps. Lines were drawn connecting the plotted points but obviously do not represent short term direction of movement or time involved. Vegetation in a six foot radius about brood observations was classed as predominantly grass/forb or shrub/tree to determine if one or the other vegetation type is preferred during different times of day or summer.

Throughout the study blue grouse behavior patterns were recorded for adult males, females and chicks. An attempt was made to remain as inconspicuous as possible while observing but often my presence was detected.

An estimate of net productivity in late summer was obtained by making a visual count of the number of chicks in marked broods. This census was restricted to marked broods to prevent duplicate counts on large or small broods which would affect the average brood size. The census was conducted from July 25th to August 18th. The chicks were nearly as large as the hen at this time and quite easily counted when flushed.



Relative abundance of grasshoppers in the five meadows on the study area was determined during the week of July 25th to July 31st. All sampling was done on clear warm days from 11:00 A.M. to 1:00 P.M. Grasshoppers (hopping and/or flying insects approximately 3mm. to 3cm. in length) were counted by running a hand through the vegetation in a 5 foot by 1 foot plot and noting the number of grasshoppers stirred up.

## RESULTS

The results of this study are based on seventy-three observations of broods, twenty-one observations of adult males and three observations of lone adult females in the two study areas. Thirty-four of the brood observations were resightings of marked broods. Many other blue grouse were seen outside the study areas but data from these sightings were used only to compare grouse activity in other locations.

Mating and Nesting Activity The mating period was in progress by May 31st. as evidenced by four sightings of males vigorously hooting and displaying. During the next two weeks, lone female blue grouse were seen approaching displaying males on two occasions. Most newly hatched broods (11 out of 13) appeared during the week of June 21st. to June 27th., suggesting that the majority of the females mated around May 14th. (given a twenty-six day incubation period (Zwickel 1965), nine days of laying one egg per day (Caswell 1954), and a seven day period between mating and laying the first egg (Lance 1970). Even so, two male blue grouse were seen hooting and displaying as late as July 25th. and one as late as August 12th. This late hooting has also been reported by Fowle (1960) and Mussehl (1960). Fowle (1960) reported that the males disappeared from their hooting

territories in early to mid July. The number of males observed displaying began to decrease after June 5th. with almost none being seen on days of rain or heavy overcast.

All male territories observed were on the Pseudotsuga menziesii/Physocarpus malvaceous slopes above the meadows and deciduous thickets in the canyon bottoms. The portion of these slopes where the highest densities of male territories occurred was between 765 feet and 1165 feet above the canyon bottom in Area I and 440 feet to 1040 feet in Area II. Canopy coverage and understory vegetation was dense enough to give an animal the size of a grouse low visibility on these slopes. Bendell and Elliot (1966) reported hooting male blue grouse showed a strong preference for open habitat. Possibly to counteract the denser habitat, the males I observed were usually seen displaying from on top of rock outcrops, logs or at least on heavily used game trails.

The male display was typically a slow strut with tail raised and fanned, neck feathers parted showing a bright red skin patch surrounded by white feathers and an enlarged yellow eye comb which would turn blazing red when the bird was excited (Figure 2). A five and rarely six syllable hoot accompanied this display which was also performed while standing motionless. On one observed occasion a female approached a displaying male and when the male spotted the female at about 15 feet, he rushed towards her giving out a short, piercing "foghorn" sound terminated by a sharp whistle. This is the "love note" described by Caswell (1954). If the female moved away the male followed with the "foghorn" and whistle, often to have the female disappear into the underbrush without mating. During these encounters, the males' comb

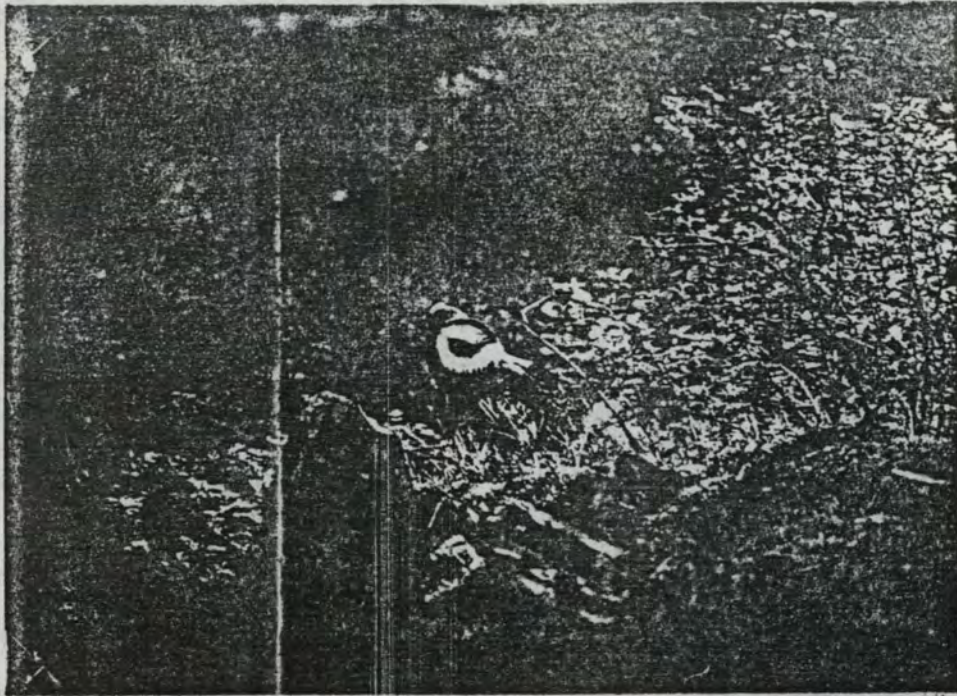


Figure 2. Male blue grouse in typical mating season display with enlarged eye combs and neck patch.

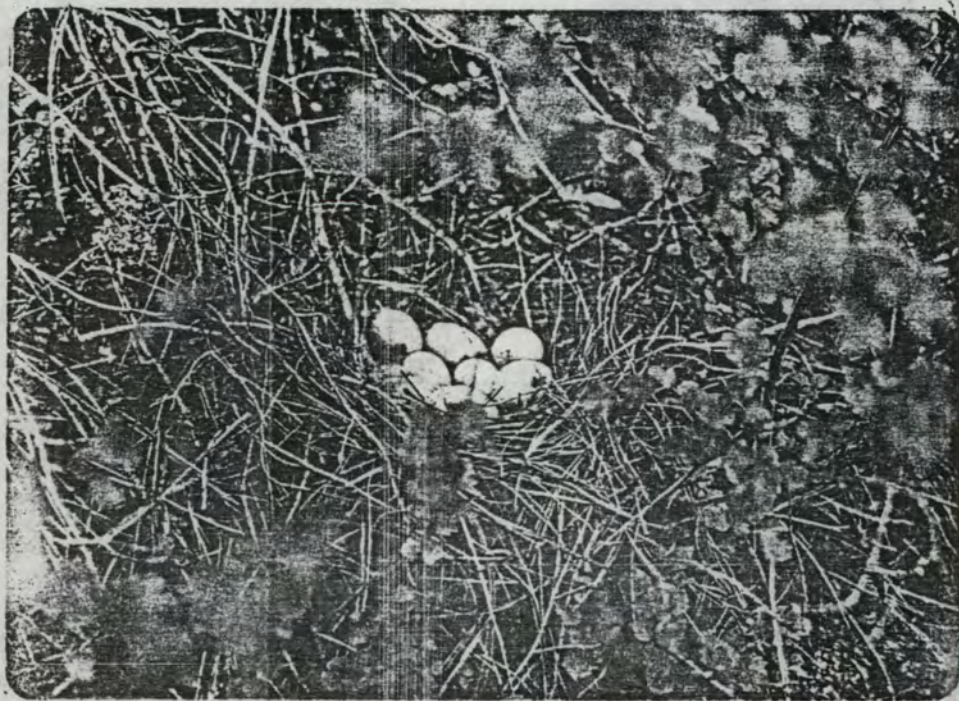


Figure 3. Blue grouse nest composed of a depression lined with Pinus ponderosa needles.

remained blazing red. Once the female had left, the males' comb returned to its yellow color and the male continued hooting and displaying.

Although yearling males do not participate in the mating activity, I observed them on three occasions passively occupying the territory of displaying males. This agrees with the reports of Lance (1970). Male territories were not uniformly distributed over the study area. Along many transects and sections of transects no male grouse were ever seen or heard hooting. In contrast on one one-hundred yard section of transect four males were seen displaying regularly. This section of transect was on a relatively open northeast facing slope in a Pseudotsuga menziesii/Physocarpus malvaceus habitat type.

Female blue grouse were quite reluctant to flush from nests and with their protective coloration were hidden well in the underbrush. Little success was had in finding nest sites. Heebner (1956) reviewed other published data on the subject and reported eight eggs to be an average clutch size for blue grouse. The one nest found during this study contained nine eggs and was located on a slope approximately 500 feet in elevation above the meadows of Area II. The nest consisted of a depression in the ground lined with Pinus ponderosa needles (Figure 3). Throughout the summer no exceptionally large or small chicks were seen, indicating a rather short hatching period for this population, and limited reneating.

Brood Hen Characteristics The average brood hen weight during the first week after the hatch was 736 grams ( $n = 10$ ). Caswell (1954) studied blue grouse in the Cutty Mountains of West Central Idaho and reported an average hen weight of 1044 grams for hens captured from September to April. This would represent a 30% weight loss for hens during the mating and

incubation period, all other factors being similar. The seven hens captured in Area I were, without exception, more aggressive in defense of their young than the three captured in Area II (Table 1). Relative comb size for these ten hens ranged from small to large with the majority being medium.

Brood Movements Earlier studies have shown blue grouse to have an upward fall migration to spruce-fir wintering range and a downward spring migration to lower elevation summer ranges. As mentioned earlier the majority of displaying males and presumably nesting females were seen from 440 feet to 1165 feet above the canyon bottoms. As also mentioned earlier this was a Pseudotsuga menziesii/Physocarpus malvaceus habitat type which is between the winter range and canyon bottoms. All ten marked broods contained chicks approximately 1 to 7 days old and were captured either in the meadows at canyon bottom or on the Agropyron spicatum - scattered Pseudotsuga menziesii slopes less than 200 feet above canyon bottom. This indicates that at least some broods are hatched near male territories higher up the slopes and move down into the meadows and deciduous thickets during the first few days after being hatched. Blackford (1963) also reported a second downward migration. The lower meadows more closely resemble the open bunchgrass slopes described by Zwickel (1973) and Mussehl (1963) as blue grouse brood habitat than the Pseudotsuga menziesii/Physocarpus malvaceus slopes where most of the mating seemed to take place.

Brood I # 1 was marked in a small meadow 600 feet by 120 feet, approximately one half mile (air distance) from the major part of Study Area I. On two occasions, within a week after marking, this brood

was observed in the same meadow. A month later this brood had moved to the main meadow of Area I (one-half mile air distance) and stayed at least till August 21st. The meadow this brood occupied originally was never seen to contain another brood either before, or after I # 1 abandoned it. The main meadow of Area I to which I # 1 moved had two other marked broods (I #3 and I #4) with which I # 1 was often seen intermingled after its arrival (Figure 4). Mussehl (1963) reported that one-half mile was the average maximum diameter of a brood range and that brood movement is an overall function of the quality and distribution of the habitat. Why did I # 1 move this distance to an already congested meadow when its original meadow was never seen to be used by any other brood? Two of the reasons may be: (1) the grasses of I # 1's original meadow dried out while the meadow to which it moved was irrigated and stayed green all summer, (2) grasshoppers samples were taken in the two meadows, the hay meadow to which I # 1 moved had a significantly higher number of grasshoppers per sample (95% confidence level) than the brood's original meadow (Table 2).

Vegetation types (grass/forb vs. shrub/tree) in which broods were observed showed some differences between morning and afternoon, and early summer (June 21st. - July 21st.) and late summer (July 22nd. - August 21st.) Chi<sup>2</sup> tests were used to determine significance. No significant difference existed between the use of grass/forb and shrub/tree vegetation types in the morning versus afternoon either in early summer or in late summer (P = .10). A significant difference (P = .10) did exist in early summer between the use of grass/forb and shrub/tree types showing a preference for a grass/forb vegetation type. A significant difference (P = .10)

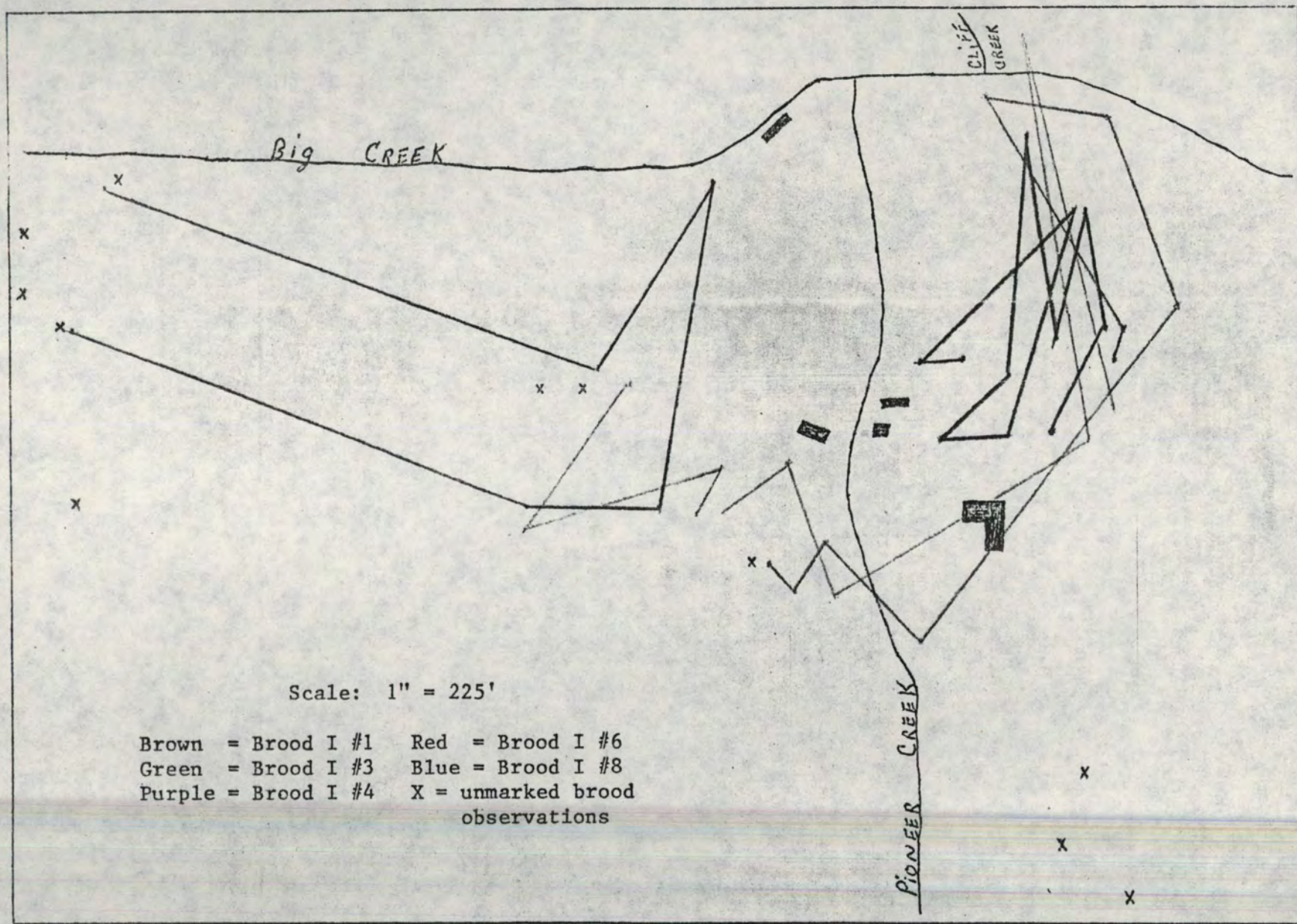


Figure 4. Movements of five marked broods in Area I.

also existed between the number of brood observations in the shrub/tree type during early summer afternoons and late summer afternoons. This difference indicates increased use of a shrub/tree type vegetation during the afternoon in late summer (Table 3). Mussehl (1960) has reported similar findings.

Zwickel (1973) reported that young blue grouse broods are rarely found in close association. Zwickel suggests that the spacing of broods may act as a population regulating mechanism. In Study Area I, five marked broods and a minimum of three unmarked broods were observed frequenting a meadow/deciduous brush zone 2,100 feet long and 1,100 feet at the widest section (Figure 4). In Area II, three marked broods (one lost all chicks) and a minimum of five unmarked broods were observed frequenting a meadow/deciduous brush complex 2,700 feet long and 1,050 feet at the widest section. Sixty-four single brood observations were obtained and nine incidences of two broods in close association were recorded. Close association of broods was defined as two broods being so close together that the chicks from the two broods were intermingled or close enough to be visibly and/or audibly aware of each others presence (never more than 100 feet). A case in point was Area I broods numbers 6 and 7. The hens from the two broods were marked on June 29th. and were within five feet of each other when first sighted. The two hens were captured one after the other. Although the number of chicks involved and the actions of the two hens indicated that two broods were present the chicks were so intermingled that it was impossible to tell which chicks belonged to which hen.



Behavior Many of the components of blue grouse behavior are exhibited by male, female and juvenile birds while performing very different functions. The most noticeable and interesting was the mechanical similarity of the male mating display, the female protective display and the juvenile excited display. Juveniles were first seen exhibiting the behavior about the time they had developed a full complement of blue tail feathers; approximately  $1\frac{1}{2}$  - 2 months of age. With slight modification of the male mating display described previously, the brood females (to varying degrees) would engage a yellow eye comb, raise and fan their tail feathers, and display a red neck patch, while protecting their young. This female display was often accompanied by a parted bill hiss and always by clucking and other calls. Once chicks had reached one and a half months of age they occasionally fanned their tails, raised their neck feathers and clucked excitedly when disturbed. This juvenile behavior may be an ontogenic stage in behavior which is fully developed in both the adult male and female, although in its final form serving different functions.

Two additional activities, preening and an exaggerated pecking motion, were performed by both adult males and females. Both the preening and exaggerated pecking behavior were observed at times when the bird seemed visibly anxious about my presence.

The relationship between hen and chicks changes from one of extreme dependance while chicks are still being brooded to one of loose association by summer's end. Prior to the chicks being able to fly it was they who gave the first alarm when the brood was approached. The hen remained hidden as did the chicks but it was usually a chick which broke from cover wailing. This brought the hen out of hiding to perform the

protective display previously described.

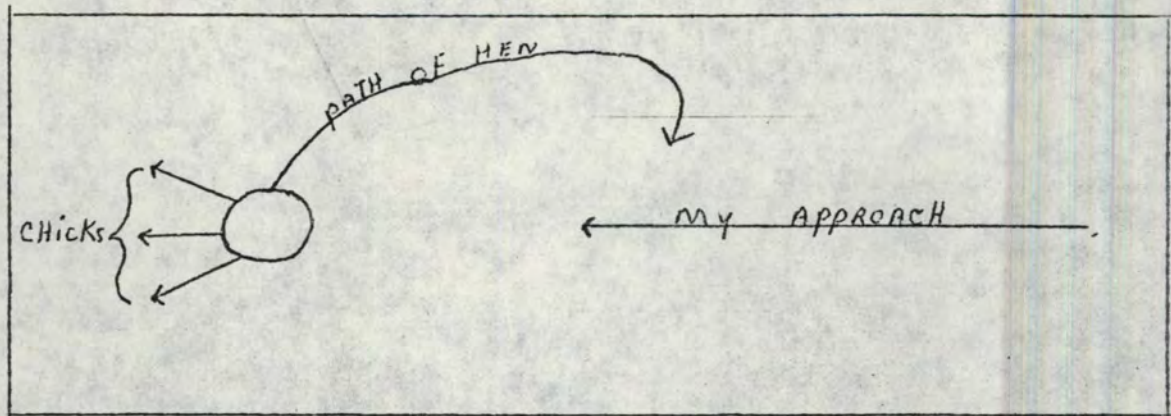


Figure 5. Diagram of a typical brood encounter and resulting movement.

The circling attack of the hen is similar to the circling charge of the male when courting a female, reported by Caswell (1954). Once the chicks were capable of flight the hens no longer challenged. At this stage it was usually the hen who gave the first alarm by flying or running. Immediately after flushing the regrouping process began, as indicated by vocalization of the hen and chicks. The chicks call was a high pitched wailing while the hen clucked and made several cat-like sounds from some vantage point - usually a tree branch or rock.

On two occasions in late July, males were seen displaying within 5 feet of females with  $1\frac{1}{2}$  - 2 month old chicks. Zwickel (1972) and Caswell (1954) have also reported observing this occurrence. Zwickel (1965) documented two cases of renesting after the loss of a first clutch but there are no accounts of wild blue grouse raising more than one clutch per year.

Population Productivity Lance (1970) reported a limited recruitment of the large number of chicks from the previous year into the spring blue grouse breeding population. The results of the current study tend to

support the findings of Zwickel (1972) and Bendell (1955) which show a high mortality rate for chicks during the first summer and low numbers of young entering the population each fall (Table 4).

The blue grouse broods began moving off the summer range studied in mid-August as evidenced by fewer sightings of broods in the meadows and on the lower slopes. The average brood size in late summer was 2.0 chicks per brood ( $n = 6$ , Range = 0 - 4). The one not found during the current study contained nine eggs as stated previously. Work done by Heebner (1956) in an adjacent area of West central Idaho yielded an average blue grouse clutch size of eight eggs per clutch. Depending on which clutch size is used in the calculation, the first summer chick survival rate ranges from 22.2% to 25%.

During the course of the summer, two lone female blue grouse were observed on the study areas. A comparison of these lone females with the brood females, both marked and unmarked, yields 91% of the hens producing broods. Zwickel (1972) reported that the movements of lone hens were quite different from those of brood hens, resulting in a lower proportion of lone hens on the brood range than actually exists in the population. The results of the current study are subject to this error.

#### DISCUSSION AND CONCLUSIONS

The region in which males were observed displaying was a densely vegetated Pseudotsuga menziesii/Physocarpus malvaceus habitat type. Within this habitat type displaying males made heavy use of elevated positions such as rock outcrops and logs but were rarely seen displaying from a tree. The more open sections of this habitat also seemed to contain higher densities of displaying males. The hooting of the males

may act as an audible stimuli which brings prospective hens into the near vicinity of males. At close range the bright contrasting colors of the males' display may be of more significance as a stimulus to the hen. The complementarity of these two stimuli is probably very important to a ground breeding bird such as the blue grouse in dense cover.

Nesting female blue grouse hold tightly to nests and the methods used in the current study for finding nests were quite unproductive. A trained bird dog would undoubtedly be a valuable aid in finding nests.

The difference noted in the aggressiveness of brood hens between Study Areas I and II was pronounced. It is possible that this difference is the result of sampling error. Another plausible explanation may be the prior experience of Taylor Ranch area hens involving nonviolent human encounters.

The summer brood ranges studied by Zwickel (1973) and Mussehl (1963) were of the lower elevation foothills type. Vegetation consisted of bunchgrass and scattered shrubs and trees. During the current study the highest brood concentrations were observed in the bunchgrass meadows and deciduous thickets in the canyon bottoms. The meadows and thickets were quite restricted due to the sharp nature of the lower canyon walls. I feel the topography of the lower Big Creek drainage has a pronounced effect on the summer brood distribution of the blue grouse population.

Average clutch sizes of 8 - 9 eggs per clutch give the blue grouse population a high potential rate of increase. The potential is reduced as a result of the low survival rate of chicks during the first summer which resulted in an average of only two chicks per brood entering the fall population. Primary factors influencing chick mortality were not

established during the study. Future research on this subject might include the effects of brood densities on predation and intraspecific competition.

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Table 1. Comparison of hen characteristics during the first week after hatch and number of chicks surviving to late summer.

Brood #	Weight of hen after incubation period	Hen comb size	Hen aggressiveness	Number of chicks at summer's end
I # 1	700 grams	small	average	4
I # 2	775 grams	large	very	-
I # 3	825 grams	large	very	1
I # 4	750 grams	medium	average	1
I # 5	725 grams	medium	slight	-
I # 6	725 grams	large	very	4
I # 7	710 grams	medium	very	-
II # 1	750 grams	medium	slight	2
II # 2	650 grams	medium	slight	0
II # 3	750 grams	medium	slight	-

Table 2. Results of grasshopper samples taken in meadows used by blue grouse brood I # 1.

Location	Sample size	Average grasshoppers per sample	Standard deviation
Area I hay meadow	21	10.40	4.52
Area I # 1's original meadow	40	.775	.86

Table 3. Relationship between time of day and summer; and vegetation types in which broods were observed.

Time of Day	Grass/Forb type	Shrub/Tree type
Early Summer (June 21 - July 21)		
Morning	70.6%	29.4%
Afternoon	72.7%	27.3%
Late Summer (July 22 - August 21)		
Morning	61.3%	38.7%
Afternoon	50.5%	50.5%



Table 4. Comparison of some average late summer brood sizes reported by several researchers.

Researcher	Average chicks/brood	Publication
Current Study Data	2.0	
Zwickel, Fred	2.2	Journal of Wildlife Management, 1972
Hartkorn, Fred	3.3	Montana Wildlife, 1957
Bendell, James	2.3	Canadian Journal of Wildlife, 1955
Caswell, Edwin	3.51	Master thesis, University of Idaho, 1954
Heebner, Gordon	4.6	Master thesis, University of Idaho, 1956