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FEDERAL AID IN WILDLIFE RESTORATION PROJECT W-6-R-2

GAME INVESTIGATIONS OF ALASKA

STATE OF ALASKA

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Volume 2 Report No. I-2

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: I Game Bird Investigations

Job No: 2 Title: Population Characteristics of Rock and Willow Ptarmigan

PERIOD COVERED: July 1, 1960 to June 30, 1961

ABSTRACT:

Ptarmigan were slightly more numerous in Alaska in 1960 than in 1959, as shown by replies to letters mailed to 160 people throughout the State. Most of the 105 respondents thought that ptarmigan populations were at moderate levels. On the Eagle Creek study area in central Alaska, 88 male and 75 female rock ptarmigan (Lagopus mutus) were present in May. Twelve nests containing 98 eggs were found. The 75 pairs of rock ptarmigan produced about 325 chicks that survived into August (5.4 chicks per brood). Marked broods traveled variable distances, but usually did not exceed one-half mile of net movement from June to August. Eleven willow ptarmigan (Lagopus lagopus) and 158 rock ptarmigan were banded, representing (of the latter species) about half of the adult females, 25-30 per cent of the cocks and 15-20 per cent of the young on the study area. Six band returns were obtained from the Eagle Summit area in August and September, 1960. In October, both species began to appear in non-breeding habitats in the Tanana Valley, remaining there in moderate numbers until early March.

OBJECTIVES:

1. To compare the annual numerical increase and decrease

of ptarmigan on selected areas from one year to the next.

2. To discover the means by which productivity and mortality vary.

3. To describe general changes in populations of ptarmigan in various regions of Alaska.

4. To determine the harvestable portion of the fall population of ptarmigan.

TECHNIQUES:

An attempt was made in May 1960 to count all male rock ptarmigan (and as many females as possible) that had established residence on the Eagle Creek study area. The count was used as a basis for computing productivity. Clutch size was determined from 12 nests found on the area. Adult rock ptarmigan were captured with a hand-held hoop net, banded, color-marked and released for studies of brood movements and mortality. Hatching dates were obtained from 10 nests and from 37 broods whose age could be estimated closely by relative development of the chicks' primary feathers. The total number of chicks produced and the probable number of rock ptarmigan on the study area in August were calculated from information available on spring counts, productivity and mortality. Some brood counts were made in other areas of Alaska.

Throughout the fall and winter, observations and collections of rock and willow ptarmigan were made to study behavior, distribution and movements during those seasons. Some information was obtained on the relative abundance of ptarmigan in various parts of Alaska in 1960, by means of a questionnaire mailed to approximately 150 residents.

FINDINGS:

Eagle Creek Study Area

The study area at Eagle Creek, 105 miles northeast of Fairbanks on the Steese Highway, was described in general terms in the report for fiscal year 1960 (ADF&G, Federal Aid Report,

W-6-R-1, Job I-2). Due to a more accurate planimetering of the boundaries, a better estimate of the effect of slope and a slight change in the limits of the area, the extent of the study area is estimated to be 14.5 square miles instead of 25 square miles as reported previously.

Spring Census

Method: Two characteristics make it possible to get a complete count of male rock ptarmigan in May. First, the cocks are easily seen. They retain their white winter feathers even after the hills are predominantly brown; they also spend most of the day on conspicuous, elevated spots (rocks, trees, knolls) where they can see (and be seen) for considerable distances. Second, the males are spaced out, not in flocks, and do not shift about a great deal. As a result, confusion and duplication are minimal.

The census was completed by two men in seven days in 1960 (May 14 and May 20-25). After walking slowly along one slope of a valley, about half-way between the crest of the ridge and the valley bottom, stopping frequently to watch and listen for courting birds, the observers then crossed over to the opposite slope and returned to a point across from where the count was begun. Most counts were made between 2:00 a.m. and 10:00 a.m., as courtship activities generally are carried on more intensively then than later in the day, and the birds are easier to find.

Results: Eighty-two male and 34 female rock ptarmigan were seen in the count in May, 1960. By way of contrast, only 27 cocks and 15 hens were located on the same area in the spring of 1956, when the only previous census was made. The number of hens tallied reflects primarily the amount of time spent on the area, rather than actual numbers present, because they are much harder to see than the cocks, and because the females sometimes are on nests when the count is made. Rock ptarmigan are thought to be monogamous, and it is assumed that nearly all males represent pairs. Usually there are a few "surplus" males (cocks that later prove not to have females) that are included in the census. In 1956 there were five such cocks, or 17 per cent of the total count of males. In 1960, apparently 13 (15 per cent) of the males did not have hens. We do not know how constant this spring-time preponderance of males

is, or what causes the unbalanced sex ratio. Neither do we know the age of the "surplus" males.

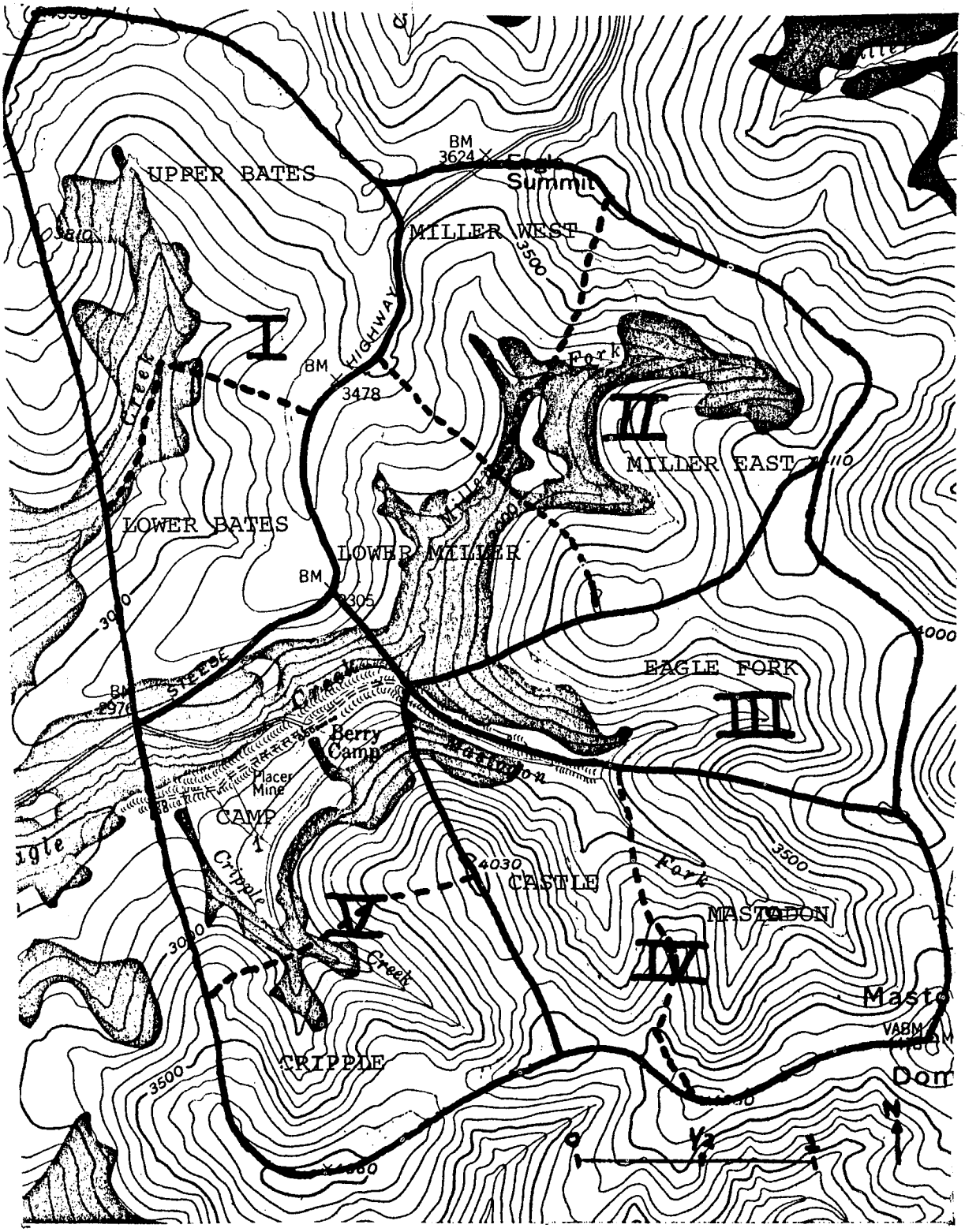
In 1956 and 1960, intensive studies after the census revealed a small number of new birds. A few of these may have moved in after the count, although most probably were present but not counted. The total population in 1956 was 29 cocks and 24 hens; in 1960 there were 88 cocks and 75 hens on the area. Thus, in both years between six and seven per cent of the males actually present in the summer were missed in the spring census.

Distribution of Males: About 3.8 square miles of the study area lies above 3600 ft., but no males were found on territories above that altitude either in 1956 or 1960. Therefore, the area actually used by males in May and June was about 9.7 square miles (all lying between 2600 and 3600 ft.), or one male for each 71 acres in 1960 and one cock in 212 acres in 1956. Broods, molting males and fall flocks used areas above 3600 ft. quite commonly.

To compare the local distribution of males in 1956 and 1960, two maps were made of the area, and the position of each cock was recorded on the maps. For convenience, each territory was represented by a single dot placed on the map in the spot used most often by each male. One map was divided into a grid with squares about 1/3 mile on a side. In 1956, the 27 known males occupied 26 such squares; the 85 males found in the spring of 1960 occupied 48 squares. The higher population in 1960 led to an increase in area used (22 more squares than in 1956, and 32 squares used that were not used in 1956) and an increase in the maximum number per square (six in 1960, two in 1956). However, 11 squares were occupied in 1956 that were not used in 1960, indicating a shift in locality of part of the breeding population.

A more versatile subdivision of the area, based on topography, was made on the second map (Figure 1). The Eagle Creek study area was divided into five main drainage units, and four of the units were subdivided once or twice. When territories (represented by a point) were plotted on the map, the distributional pattern of males in 1960 was seen to differ from that in 1956, as shown by the following listing:

Figure 1. Topographic map of Eagle Summit study area, showing major and secondary subdivisions.



	Area	Count in 1956	Count in 1960
I	Upper Bates	3	8
	Lower Bates	2	10
II	Miller West	1	3
	Miller East	2	8
	Lower Miller	5	11
III	Eagle Fork	1	7
IV	Mastodon	0	6
	Castle	1	7
V	Cripple	3	10
	Camp	9	15
		27	85

Although all 10 areas showed an increase in numbers of ptarmigan present in 1960, the greatest changes were in area III and adjacent area IV. Twenty males were counted there in 1960, in contrast to two seen in 1956. I do not believe that rock ptarmigan are so faithful in returning to specific breeding places that this ten-fold change was due to increased survival of birds reared on these areas. Rather, the marked change in numbers probably resulted from a general increase in ptarmigan populations and a "chance" increase in numbers of males that settled there and not somewhere else on the area.

Nesting Information

Nests of ptarmigan are hard to find. In 1960, two men and a Labrador retriever hunted an average of three hours a day for at least three weeks, and located 10 nests. Several things are responsible: dogs apparently cannot smell female ptarmigan on nests except at very short distances, and cannot scent preincubation clutches at all; the eggs and hens blend well with the surrounding vegetation; the hens will not flush until nearly stepped upon; there are relatively few nests per square mile in most places and in most years; ptarmigan nest in a variety of situations, so that almost every square foot of ground in a territory is a potential nesting place. The only reason for continuing to spend time looking for nests is that we do not know to what extent clutch size may vary

(although there is evidence that average clutch sizes vary annually) or what contribution a variable clutch size may make to changes in total population.

The clutch size and success of 12 nests of rock ptarmigan found on the study area in 1960 are summarized in Table 1. No nests were found before incubation had begun. The hatching dates of most nests were known (all successful ones hatched between June 15-24), so that approximate dates for the beginning of laying could be calculated. The assumed 21-day incubation period and the clutch-size-plus-one laying period were taken from published information on ptarmigan. It is obvious that many hens were completing their clutches when the spring counts were made, which is partly responsible for the low number of females seen.

Clutch Sizes: A summary of clutch sizes in nests found in 1956 and 1960 is given in Table 2.

Probably because of the small sample sizes, statistical tests did not demonstrate differences between the two years. Yet both the frequency distributions of clutch sizes and the average number of eggs per nest hint that some biologically meaningful differences did exist. Unfortunately, it will never be possible to get a satisfactory sample of nests. Nevertheless, it seems wise to continue looking for nests each year, as it may be useful to have some idea of clutch size when comparisons of brood sizes (of which adequate numbers can be obtained) are made between years.

Another indication that hens lay more eggs some years than others was found in 1959 during a check of brood sizes. No nests were found that year. However, 13 broods counted in late July and early August had an average of 7.5 young per brood. Studies in 1956 and 1960 indicated a loss by August of between 25 and 35 per cent of the chicks that hatch. Applying those rates of mortality to the 1959 data, we find that the clutch size that year may have averaged between 9.4 and 10.1 eggs. Of course, the actual loss of chicks in 1959 could have been less, or more, than 25-35 per cent.

Clocker Droppings: In 1960, it was discovered that hens deposited "clocker" droppings in fairly restricted places quite close to the nest. These droppings can be distinguished

Table 1. Summary of Information from 12 Nests of Rock Ptarmigan, 1960

Nest No.	No. of Eggs	Date Hatched	Approx. Date[1] Laying Began
1	8	(Destroyed)	
2	7	7 eggs June 22	May 24
3	9	8 eggs June 19	May 21
4	8	8 eggs June 17-20	May 19-21
5	9	9 eggs June 15-18	May 17-20
6	7	6 eggs June 17-21	May 19-23
7	8	8 eggs before June 19	before May 20
8	10	10 eggs June 24	May 24
9	8	8 eggs before June 21	before May 22
10	8	8 eggs June 22	May 23
11	8	(Hen killed)	
12	8	8 eggs June 19	May 22

Total: 98 (80 hatched, 2 left in successful nests, 8 deserted, 8 destroyed)
Average: 8.2
(1) Calculated from an assumed incubation period of 21 days, and an assumed laying period equal to clutch size-plus-one.

Table 2. Clutch Sizes in Rock Ptarmigan Nests, 1956 and 1960

Year	Clutch Size 5	6	7	8	9	10	Total	Average
1956	2	3	4				9	6.2
1960			2	7	2	1	12	8.2
Total							21	

easily from ordinary droppings by their large size, loose texture and different color. As hens sometimes adopt a fairly consistent schedule of daily incubation and feeding periods, and as they defecate only when off the nest, the deposition of the droppings likewise assumes some periodicity; hence the name. Clockers were found near seven of the 12 nests in 1960; in four cases no clocker droppings could be found, and in one instance no search was made. In those cases where clocker droppings were seen, from two to 20 droppings were found, mostly between five and 50 feet from the nest. Only a few were found less than three feet from the nest. Four droppings from one hen were 100 yards from the nest, in a place to which she flew to feed with the cock. All of the other droppings found in this case were within 20 feet of the nest. Perhaps nest hunting will be more fruitful in subsequent years if clocker droppings are used as clues to the location of the clutch.

Brood Studies

The studies of broods of ptarmigan were made possible by the capture and marking of adult hens on nests or with young. In most cases the hens were captured as they tried to distract my attention from their very young chicks. I used a hand-held hoop net, 36 inches in diameter and with a handle 9 feet long, constructed of aluminum tubing. The cries of captive chicks (or whistled imitations thereof) decoyed the more wary hens. Once caught, the adult was banded and colored on the wings with one or several colors, using Carter's Marks-a-Lot felt pen ink. The colors remained visible, with some fading, until the wing feathers were shed in August. Forty-seven adult females were marked in this way in 1960 at Eagle Creek.

Hatching Dates: By capturing chicks and estimating their age from the development of their primaries (see page 38), it was possible to get approximate hatching dates from 37 broods at Eagle Creek this year. All of these broods hatched between June 13-25. Twenty-six (70 per cent) hatched before June 21. The schedule of breeding activities was almost the same in 1956. All of the ptarmigan in the area apparently began nesting between May 14-26, as suggested by data on nests and broods.

Movements: Once individually-marked hens were available for study, we were able to get some idea of the general pattern of movement of rock ptarmigan broods. Three main difficulties, as yet unsolved, were met: 1) How much did human activity contribute to the movements observed? 2) When two observations of a brood were made at long intervals (a week to a month), where had the brood been in the meantime? 3) How many of the families moved out of the study area, beyond our surveillance? It seems likely that the effect of close study would be to increase the travels of the broods. Ptarmigan broods are so hard to find that they usually are disturbed by the time they are discovered. Also, it was necessary to make the birds fly to get a complete, accurate count of the chicks. As a result, the broods that provide the greatest quantity of data on movements are those that were disturbed most often. In regard to the second difficulty, it should be kept in mind that the only measurements of movement obtained were straight-line, point-to-point distances - and broods do not really move that way. Thus, the longer the interval between sightings, the less meaningful (in one sense) are the data. Finally, it is clear that a bias is present because some broods were seen only once; we know neither where they came from (usually) nor where they went. Frequently, these families are the ones that moved the farthest, and went out of the study area during their wanderings.

The information on distances moved by various broods was divided into two categories: "short-term movements," including observations spread over more than one, but less than 20 days (see Table 3), and "net seasonal movements," or the distance between observations made at 20-day intervals or longer (Table 4). The division between the two categories is purely arbitrary. Observations of the same brood made in less than 24 hours were discounted because of the factor of disturbance.

The variation in the performance of individual broods is so great that it is hard to pick out a general pattern. The greatest measured net movement was about 7800 feet, by brood number 1, over a period of 28 days. Brood number 17 moved the longest distance in the shortest time: approximately one-half mile in one day. The chicks of this brood could not fly at

Table 3. Short-term Movements[1] of 18 Broods of Rock Ptarmigan at Eagle Creek, 1960

Brood No.	Approximate Distance Moved (Feet)	Days Between First and Last Observation	Date of Last Observation
2	600	4	June 24
25	450	2	June 28
10	1800	10	July 2
11	1150	10	July 2
16	1700	9	July 2
22	900	8	July 2
18	1800	8	July 2
26	150	8	July 5
27	100	8	July 5
28	120	8	July 6
24	50	10	July 6
9	1450	15	July 7
22	150	11	July 13
11	2600	12	July 14
36	4150	5	July 14
44	650	9	July 15
22	1500	6	July 20
39	750	11	July 25
66	650	2	August 6
65	700	8	August 13
68	1650	4	August 22

(1) "Short-term movement" is the distance between the first and last observation of a brood when the period covered is less than 20 days and more than one day.

Table 4. Net Seasonal Movements of 11 Broods of Rock Ptarmigan at Eagle Creek, 1960

Brood Number	Approximate Net Distance (Feet) (1)	Days From First To Last Observation	Date of Last Observation
11	1700	22	July 14
1	7800	28	July 15
22	1300	26	July 20
6	1500	30	July 21
29	200	37	August 4
46	2750	20	August 4
7	200	45	August 5
44	4250	33	August 8
52	50	28	August 13
35	1100	39	August 14
8	1700	61	August 22

(1) "Net Distance" is defined as the distance between the first and last observation of an identifiable brood, when two or more sightings were made over a period exceeding 20 days.

that time. In contrast, several broods were seen in places less than 100 yards apart over periods of a month or longer.

From the information in Tables 3 and 4, and from other observations, it seems safe to make the following comments on the movements of rock ptarmigan broods:

1) The nest site does not attract families after hatching. In fact, hens may make an effort to lead the young away from the nest a few hours after they hatch.

2) The territory has little meaning to the hen and chicks. By hatching time there is almost no evidence of territorial behavior in cocks, and many have left the territory entirely.

3) If suitable food, good feeding conditions and concealing vegetation are present in the vicinity, the brood may stay close to the nesting site for weeks after hatching. Perhaps the hen's urge to stay in familiar areas is important here.

4) Some broods will wander considerable distances, passing quickly through areas that to all appearances would be suitable for them. Those same areas frequently harbor broods all summer, a further indication of their suitability.

5) The only over-all directional tendency noted at Eagle Creek was a shift of most (but not all) broods to places higher than the territory or nest from which they came. By late July, the most heavily-used areas were moist, sedgy saddles on ridges and between hills, usually above 3500 feet.

6) Most broods did not move more than one-half mile (net distance from late June to the first part of August).

Mortality: We tried to get three basic facts whenever we found a brood: 1) identity of the family, 2) number of young, and 3) age of the chicks. By this method, we hoped to show the actual loss of chicks in specific broods and the overall loss among many broods at given intervals of time after

hatching. The estimates of mortality begin when the chicks are about two weeks old, as it is very hard to find all of the chicks in younger broods. A trained Labrador retriever was used to locate and flush the chicks. Only counts felt to be complete are discussed here. The term "loss" is used synonymously with "mortality," as very little loss was discovered that did not result from or lead to the death of the chicks.

More young rock ptarmigan seem to be lost in the first two weeks of life (Table 5) than at any other time up to the hunting season (August 20). At Eagle Creek, where 12 nests averaged 8.2 eggs, about 1.5 chicks died per brood up to July 10. During the following month only one chick disappeared, on the average, from each family. I cannot explain the differences among the three areas from which data were obtained. All areas are within eight miles of each other, with similar topography and vegetation. The low counts at Eagle Creek in late July probably are due to the small sample and the fact that several broods were flushed without the aid of a dog.

There are several known or possible causes of the loss of chicks. Four juvenile rock ptarmigan were killed by predators and later found by us. Six young were stepped on while we searched for the members of very young broods; a few more might have died this way. Two were killed by an overanxious retriever. The accidental separation of chicks from broods, weasel predation, weather and other factors might have caused mortality unknown to us. It seems to be a general characteristic of mortality among young birds that deaths rarely occur in a way spectacular enough to be noticed; all we see is the end result of a sporadic, unnoticed attrition that lowers the average size of the broods.

The data for Eagle Creek after July 31 (listed in Table 5) include a number of counts of broods that originated off the area. If only counts of indigenous families are included (nine broods are known), the average number of chicks is 5.4 instead of 5.9. This may result from the smaller sample size of immigrant broods, or it may indicate that our intensive activities caused a noticable loss of chicks. Whatever the reason, it may be best to use the conservative figure

Table 5. Counts of Broods of Rock Ptarmigan at Eagle Creek, Yankee Creek and Harrison Summit, 1960.

Area, Date, and Age of Young	Number of Chicks Per Brood										Number of Counts	Average Number of Chicks
	2	3	4	5	6	7	8	9	10	11		
Eagle Creek, before July 10 Chicks 2-3 weeks old				3	5	3	2		2		15	6.8
Eagle Creek, July 11-20 Chicks 3-4 weeks old			2	5	6	6	5	1	1		26	6.5
Yankee Creek, July 12 Chicks less than one month old				1		3	3	3	1		11	7.8
Harrison Summit, July 19 Chicks less than one month old			2	5	3	3	1				14	5.7
Eagle Creek, July 21-31* Chicks 4-6 weeks old	1	1		4	2	1		1			10	5.3
Eagle Creek, after July 31 Chicks more than 5 weeks old	1	1		4	7	2	1	2		1	19	5.9

*Investigators not on area during most of this period. Counts made mostly without aid of dog.

(5.4) for calculating productivity.

Development of Primaries: The age of young ptarmigan can be determined quite accurately (± one day) up to one month or so by means of the relative development of primaries. The method has been worked out for willow ptarmigan [Westerskov, K. 1956. Age determination and dating nesting events in the willow ptarmigan. J. Wildl. Mgt. 20 (3): 274-279.] but not, in North America, for rock ptarmigan. Our data on feather development are not complete, because we were reluctant to collect chicks at Eagle Creek, and because it was impossible to get chicks of known age elsewhere. The general pattern of primary molt and development are known well enough to be sketched here, however.

Young rock ptarmigan have only a slight external trace of primaries at hatching. Subsequent growth is rapid. The first primaries to appear are P1-P8, counting distally. I do not know the order of their growth, as they all seem to appear simutaneously. The longest primary in the first (juvenile) set is P7, with P8 considerably shorter. This gives the wing a shape much like that of adults, where P8 and P9 are long, and P10 short. Chicks can fly (weakly) when their primaries are only two inches long, at an age of about 10 days. The primaries of this first set, which are all brown, continue to grow throughout the first three weeks of life, until the longest are three inches or more in length. At about 18-20 days, P1 of the initial, brown set is dropped, and a white one begins to grow in its place. P2 and P3 are dropped in a few days. At this time, P9 and P10 begin to show for the first time: they are both white. The rest of the primaries are replaced by white ones in sequence, from P4-P8. The last brown primary, P8, is dropped when the bird is about seven or eight weeks old. The completed set of white primaries is kept by the bird until July or August of the following year.

The tail coverts of juvenile rock ptarmigan begin to grow about the 10th or 11th day after hatching, and serve - rather inefficiently - as a tail for the first two months of life. At about the time that P6 (juvenile) is dropped and replaced by P6 of the first white set (35± days?), the true rectrices begin to grow. The rectrices probably do not take

over their full function in flight until the bird is two months old or so.

The Form of P9: Various people have proposed that the ninth primary can be used to separate ptarmigan more than one from those less than one year old. Most young ptarmigan have a pointed P9, with speckles or blotches of brown on the vane; adults allegedly have rounded, clear-white ninth primaries. Preliminary studies last year showed that 158 of 164 known immature rock ptarmigan examined (96 per cent) possessed the juvenile color characteristic, but that 11 of 33 adults also had colored ninth primaries supposedly typical of young. All of the young ptarmigan handled in 1960 were studied to test the character further. Of 86 young birds seen, 71 (82 per cent) had colored and pointed P9. Twelve more had dark areas on P9, but the feathers either were definitely rounded or of intermediate shape. Considering only color, 83 (96 per cent) had dark areas on P9. Only six adults were examined that had completed their post-nuptial molt; four males had light P9, two hens had dark P9. All adults had rounded ninth primaries except for one male. Thus, the general conclusion reached last year - that the color and shape of ninth primaries are not reliable indicators of age - was borne out this year.

Two facts, as yet only of academic interest, seem to bear on the problem of the color of P9. First, males of any age tend to have less dark coloration on the ninth primaries than females. This injects a bias in samples with uneven sex ratios. Second, some evidence is accumulating that siblings tend to have similar patterns of color on P9. One of the possible "types" is the lack of color on the first white P9 of juveniles. When samples are taken, therefore, a bias results equally when members of such "non-conformist" broods are included or omitted from the sample.

Adult Mortality

Four adult cocks, four adult hens and one adult of undetermined sex were found dead and freshly killed on the study area in the spring and summer of 1960. About 88 males and 75 females were present in May and June; the nine known deaths represent only 5.5 per cent of the known adult population.

Other deaths doubtlessly went undetected. All of the known mortality occurred in May or very early June, when the males were defending territories and the hens were laying or incubating eggs. It is easier to find dead adults at that time of year than later, because at least some of the body feathers are white, and show up against the brown, undeveloped vegetation.

The remains of nine rock ptarmigan killed in the late fall of 1959 or winter of 1959-60 were found on the study area. In contrast, 69 remains were found in the same area in 1956, apparently from fall and winter kills in 1955-56. 1955 was known locally as the year in which a tremendous drop in numbers of rock ptarmigan occurred. The numbers of the species were increasing in 1959-60. It will be of interest to see whether a relationship exists in future years between population changes and apparent winter mortality.

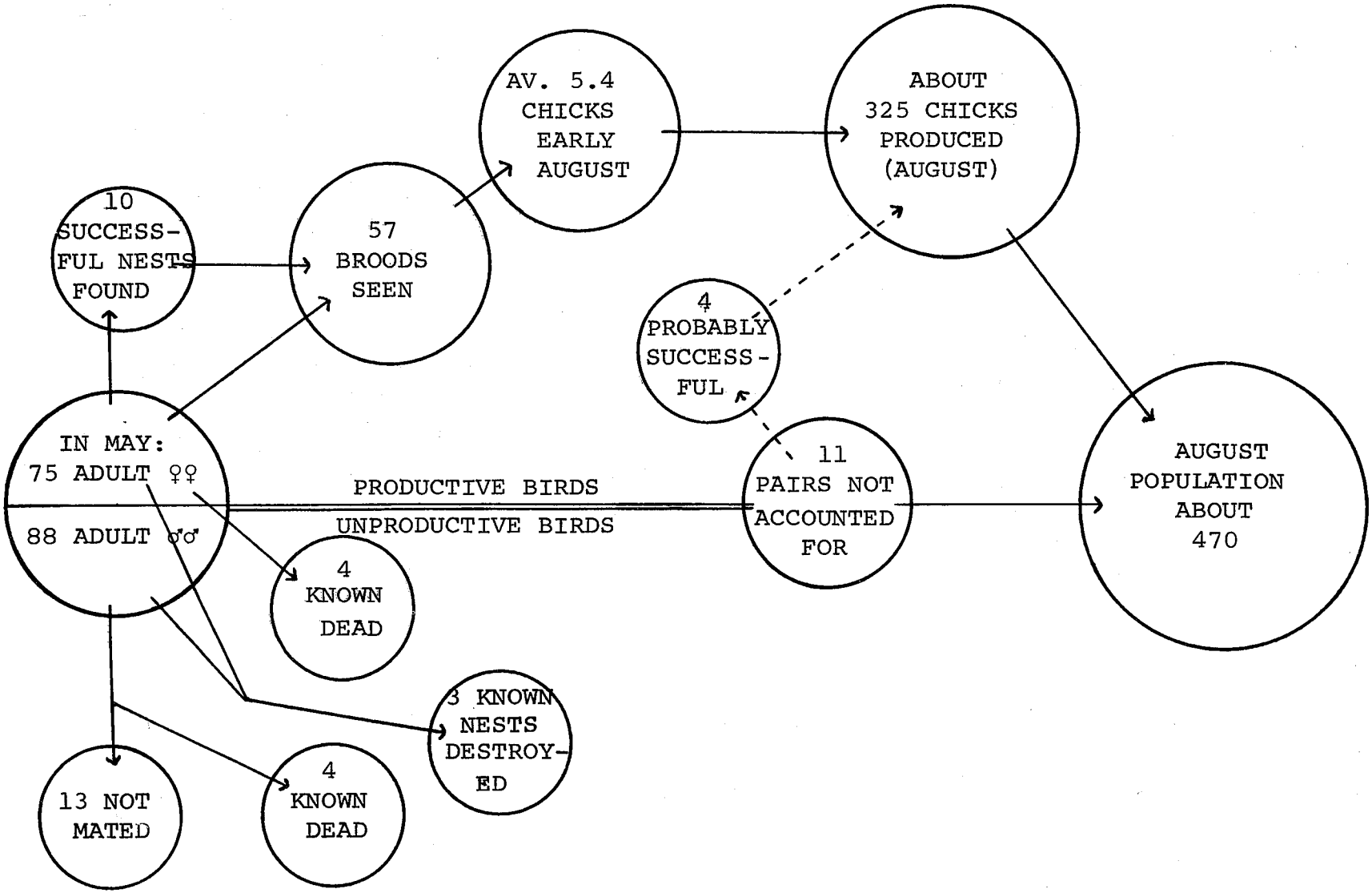
Breeding Success

The information needed to estimate productivity has been given in this report. I have summarized the information in Figure 2. The initial spring population of 163 birds contained about 13 unpaired males. The population density, therefore, was about 11 adults per square mile, or about 5 pairs per square mile. By August, with a gain of about 325 chicks and a loss of nearly 20 adults, the density had risen to 33 birds per square mile. In 1956 there were only 53 adults on the area in spring (four per square mile) and about 130 individuals (nine per square mile) in August.

Banding Studies

In July of 1953, three members of the Alaska Cooperative Wildlife Research Unit banded 301 young and 12 adult rock ptarmigan near Eagle Summit, Steese Highway. This was the first attempt to band ptarmigan in numbers in Alaska, and it still stands as the most successful single banding operation with this genus in western North America. Only 17 birds of this group were reported later: 10 immatures were shot in August and September, 1953 (most within a mile or two of the place where they were banded), and two birds banded as adults and five banded as young were shot in 1954 (also close to the

Figure 2. Summary of Productivity of Rock Ptarmigan at Eagle Creek in 1960.



banding place). Unfortunately, the studies were not continued. In 1956, five adult female rock ptarmigan, one adult hen and one adult cock willow ptarmigan were banded at Eagel Creek. Both willow ptarmigan were shot locally in September and October that year. None of the rock ptarmigan have ever been reported.

To my knowledge only one other serious effort was made prior to the present study to band ptarmigan in western North America. In the summer of 1957, I caught, banded and released 47 adult and 23 young willow ptarmigan in Chilkat Pass, British Columbia. Most were from a 3/4 square mile study area. In June and early July of 1958, six of the adults and one of the young were recaptured on the study area a maximum of 300 yards from the point of banding.

It is clear that many new things could be learned about the lives of ptarmigan from banding studies carried out at the same place over a period of years. For example, ptarmigan are thought to be monogamous, but there is no information on the length of time the pair bond lasts. We do not know whether any rock ptarmigan habitually return to the same breeding area after the wanderings of the fall and winter, nor do we know whether one sex or age group tends to be more philopatric than others. There is no information on how far ptarmigan travel from September to May. Most important to the present study, we know nothing about mortality rates, population turnover or longevity. We hope that the banding studies begun in 1960 will yield some information on all of those subjects.

Methods: It seems of first importance to band ptarmigan about which the most is known: adults residing on the study area in summer, and their progeny. The birds are scattered widely in summer, so mass-trapping techniques can not be used effectively. Fortunately, ptarmigan are sufficiently unwary in summer to be caught in hand-held or hand-thrown nets at distances up to 30 feet. We used a long-handled, aluminum-tubing net, as described on page 31. The netting was a double thickness of 1-1/2 inch gill net (unstretched measure). Usually it was possible to place the net very slowly over a sitting or standing ptarmigan and capture it without a struggle. The net did not seem to alarm most birds until

they had some experience with it, but a bird missed on the first attempt frequently could not be caught at all.

Young rock ptarmigan from 15-20 days old were tagged with numbered aluminum wing tags similar to those used on domestic chickens. When the legs of the chicks were large enough to hold a band, they were banded with No. 5 red aluminum leg bands obtained from the National Band and Tag Company, Newport, Kentucky. Willow ptarmigan were banded with silver aluminum bands.

Results: Eleven willow ptarmigan (seven of them immature birds) and 158 rock ptarmigan were banded in June, July and August 1960. Banding schedules giving information on each bird are filed at the Alaska Dept. of Fish & Game headquarters, Subport Building, Juneau. One of the immature rock ptarmigan was banded at Yankee Creek, about five air miles northwest of the study area; four young were captured at 12-mile Summit, mile 86 Steese Highway (about 15-18 air miles from Eagle Creek); 11 young and one adult were banded on Harrison Summit, six air miles from the study area; three other young were captured less than a mile from the study area. The adult cocks banded (24) represent about 25-30 per cent of those residing on the area. Because some of the adult hens (47 banded) and chicks (67 banded) caught on the study area came from outside of the boundaries, it is hard to give a comparable figure for those classes. However, at least half of the adult females that had nested on the area, and from 15-20 per cent of the young they raised, probably were banded.

The Steese Highway closed officially on October 14 in 1960, so that the effective season for ptarmigan hunting at Eagle Creek was only two months (from August 20) in spite of the general open season until April 15. In that two month period, hunters reported six bands. The returns are listed below (all dates in 1960):

1) Willow ptarmigan, band #5. Banded July 15, shot 300 yards away on September 23.

2) Rock ptarmigan:

   a) Immature, wing tag #24; banded July 6, shot on

study area August 27.

b) Adult male, band #3; banded on June 8, shot 300-500 yards away on September 25.

c) Adult male, band #8; banded June 14, shot 1/2 mile away on September 24.

d) Immature, band #82; banded July 20, shot at same location on August 27.

e) Immature, band #117; banded August 8, shot about 200 yards away on September 19.

As about 30 per cent of the resident rock ptarmigan and their progeny were banded on the study area (calculated from a total population in early August of 65 hens, 80 males and 325 young), a rough computation indicates that about 17 of the 470 birds supposedly on the area were shot by hunters. Actually, one group of hunters shot 19 in one day; bag-check data show that from 75-100 ptarmigan actually were shot on or near the area. Some of the things responsible for the low band return may be 1) a pre-season loss of banded birds through mortality or movement away from the road; 2) a dilution of the proportion of banded birds by the ingress of new, unbanded ones; 3) a disproportionately large harvest of young, of which only 67 were banded; 4) unreported bands. Whatever is responsible, it seems clear that it will be difficult to gauge hunting pressure from band returns in this area.

The fact that the band returns were obtained less than a half-mile from the point of banding, means little in terms of movement of the birds. Because most of the banding and most of the hunting was done less than a mile from the road, any birds that moved further than that probably had little chance of being shot.

Flocking and Fall Movements

At some time in June, the former need of breeding ptarmigan for semi-isolation (expressed as territorial and pairing behavior) begins to wane. By the time the chicks are a few weeks old, broods can be found in close

association; at the same time, cocks may congregate in small groups during the post-nuptial molt. These actions suggest that the social tendency of ptarmigan begins to assert itself to a slight degree in mid-summer. However, even though the birds might be ready to accept group life, some external stimulus is needed before flocks will form. I do not know what the stimulus is, but it seems to act at various times throughout August. The largest flocks at this time occur immediately after early snow storms. The first flocks (groups of birds not belonging to the same family and not clearly composed of two separate broods) were seen in 1960 as follows: August 5 (12), August 17 (14,12,11), August 19 (10), August 22 (13♀), August 23 (68♀), August 24 (22), August 25 (50, 17). By early September, with snow covering the ground lightly, almost all resident birds were in flocks. There were large flocks on the study area from mid-September until I left on September 28; 100 or more were seen together on September 20, 70 or more on September 22, 150 on September 23, and groups of 50-60 and 200♀ on September 24. By September 28 the scene was quite wintery at Eagle Creek. Snow covered all of the higher country to a depth of eight inches, with many deep drifts, and little bare ground was present anywhere. Daytime temperatures ranged from 20-35°F.

Closely related to the increasing sociability among rock ptarmigan is a behavioral change to increased mobility. Some wandering takes place in July, but the distances moved are not great. Almost all of the movement is done on foot. As flocks begin to form, the birds become more willing to fly. By mid-September, ptarmigan need very little stimulus to take flight - the appearance of a hawk or car or person or raven, or even the "arguments" among members of the flock all might send the group sailing away - and when they fly, they frequently cover distances of more than one mile. From the size of the flocks alone, one can infer that some of its members, at least, must have traveled more than a mile, considering the size of the area required to produce that many ptarmigan.

One result of the behavioral changes just discussed (increased sociability and mobility) is that ptarmigan begin to appear in areas where they do not breed. Rock ptarmigan were seen in mid-October, 1960, on several hills (Ester Dome,

Cleary Summit) near Fairbanks, at least eight miles from the closest known breeding areas. In the fall of 1959, the same phenomenon occurred, with the first record of ptarmigan in non-breeding areas being on October 19. Rock ptarmigan were most abundant in both years (outside of their breeding places) on hilltops that approach timberline, where the country is open, with only occasional patches of shrubs or scrubby spruce visible above the snow. Scattered occurrences of the species were recorded in late October and early November in 1959 and 1960 on tailing piles in places mined extensively by dredges about 10-30 years ago; the winter aspect of the environment in such places is similar in many ways to the tundra, even though 2000 feet of elevation separate the two habitats.

Many more ptarmigan appeared in November 1960 than in the previous fall in the Tanana Valley. Almost every day, one or more persons would mention seeing ptarmigan or ptarmigan tracks in the greater Fairbanks area. The majority of the ptarmigan apparently were willow ptarmigan (although most people reported them simply as "ptarmigan"), but a few rock ptarmigan were seen as well. In general, rock ptarmigan were the more common species on the higher ridges, and willow ptarmigan more abundant in lower areas. Throughout the fall, the ptarmigan were in small aggregations of two to 15 individuals, and they seemed quite nomadic. Flocks would appear along a roadside in the afternoon gloom, like small, white figments of the imagination; in the morning only their tracks and frozen droppings would give proof of their passage. Perhaps through constant disturbance, the birds seemed more wary in October and November than earlier in the year.

As rock ptarmigan were present in the Eagle Creek area in November 1959, and late March 1960, it seems certain that not all ptarmigan move out of tundra breeding areas in the winter. We do not know what portion of the population takes part in this movement, nor what accounts for the difference in numbers seen in the wooded valleys and hills in different years.

Apparently there is some tendency for male and female willow ptarmigan of central Alaska to spend the winter in separate areas. On two trips to Murphy Dome and one to Cleary Summit (both are hills within 20 miles of Fairbanks)

in December, 1960, we collected and autopsied 22 willow ptarmigan. One was an immature male, but the rest were females (both adult and young-of-the-year). No flocks of males were located, and it is possible that cocks remain in winter at higher altitudes than females, and perhaps near the breeding grounds. If so, the harvest of hens might be greater than of cocks, as most ptarmigan hunting from November to April in interior Alaska is done at low elevations, in places where ptarmigan come close to roads.

Statewide Population Trends

Early in 1961, 160 game bird questionnaires were mailed to sportsmen, guides, professional biologists and others throughout Alaska. No attempt was made to sample specific groups of people or regions on a statistical basis; cards were sent to anyone known to us who might be able to give a reasonable estimate of numbers of game birds in a given area. Two basic questions were asked: 1) Were ptarmigan (and grouse) populations at high, moderate or low levels? 2) Were there more, the same number or fewer than in 1959? Up to April 4, 1961, 105 replies had been received. The answers are given in Table 6.

Apparently, the State as a whole had moderate to low populations of ptarmigan, considering all species together. Rock ptarmigan may be at slightly higher levels (relatively) than other species, according to the replies to the questionnaire, but the difference may not be statistically significant. As to trends in numbers, most people thought rock ptarmigan were the same as in 1959, but that willow ptarmigan were increasing.

As this is the first year of the survey, we cannot use the data to the fullest extent. The results of next year's questionnaire, when compared with this year's, should be more meaningful. It is hoped that enough people can be questioned to yield at least 200 replies in 1961, which should be enough to begin a more detailed comparison by regions of the State.

RECOMMENDATIONS:

This study of ptarmigan populations should be continued,

Table 6. Response to game bird questionnaire, section on ptarmigan, 1960.

SPECIES	POPULATION IN 1960			COMPARED TO 1959		
	HIGH	MOD.	LOW	MORE	SAME	FEWER
Ptarmigan (General) (1)	5	25	23	18	19	11
Rock	3	17	7	4	14	5
Willow	7	25	16	21	13	7
White-tailed		4	4		5	
TOTAL	15	71	50	43	51	23

(1) This column used when observer could not identify or separate each species.

with essentially the same techniques, through fiscal year 1961. It is only by gathering census data, banding returns and other information for a number of consecutive years that we can achieve the objectives of the program. I recommend maintaining Eagle Creek as the area of most intensive study, with complementary field work being done at Mount Fairplay, Denali Road, Harrison Summit, Yankee Creek and Twelve-mile Summit. Banding of resident rock ptarmigan at Eagle Summit should have high priority.

Because of the possible effect of fall hunting on locally-reared ptarmigan, more frequent checks should be made in 1961 of hunters in the vicinity of Eagle Creek. Adequate publicity should be given to the banding program to ensure that hunters look for bands on ptarmigan they kill.

If possible, winter field studies shouldbe intensified, especially in the Eagle Creek area. The benefits to be gained from additional banding opportunities, from observations of important behavior patterns, and from records of mortality, far outweigh the logistic difficulties of winter work in isolated areas.

It is recommended that the mailed-questionnaire survey be extended in coverage to include larger numbers of recipients, especially in regions that are not visited often by Department of Fish and Game personnel.

SUBMITTED BY:

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September 19, 1961

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