ALASKA DEPARTMENT OF FISH AND GAME
JUNEAU, ALASKA

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GAME BIRD REPORT

by

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Volume IX
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-13-R-2, and 3, Work Plan B

(Printed March 1968)

CORRECTION NOTICE

Corrections in Annual Project Segment Reports, W-13-R, for 1967 (Vol. VII) and 1966 (Vol. VIII) are necessary and should be noted as follows:

Vol. VII, page 7. Summer Population Gains should read:

1.	Adults alive in late May	126
2.	Est. loss of adults to August (10 percent)	13
3.	Adults alive in August	113
4.	Nests started	55
5.	Nests hatching	44
6.	Chicks per brood early in August	6.2
7.	Total chicks alive in August	275+
8.	Adults plus chicks in August	385+
9.	Factor of summer gain	3.0-3.1

Vol. VIII, page 13. Mortality, August 1965 to May 1966

Second paragraph should read:

"About 113 adult ptarmigan (59 males, 54 females) were on the area in August 1965. About 57 old birds (27 males, 30 females) were present in the spring of 1966. The indicated mortality is 50 percent (54 percent for cocks, 44 percent for hens). The mortality rate was the same in 1964-65 as in 1965-66 for cocks, but was lower in 1965-66 among females."

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-2 and 3 TITLE: Small Game and Furbearers Investigations

WORK PLAN: B TITLE: Upland Game Birds

JOB NO: 1, 2, 6, 7, and 8

PERIOD COVERED: January 1, 1967 to December 31, 1967

ABSTRACT

The annual small game questionnaire suggested that most species of grouse and ptarmigan were stable at low to moderate levels, or rising from previous low population levels. Hares were thought to be low throughout the state, with some indication of local increases in the Interior. Counts on small areas suggested improved population levels of sharp-tailed grouse and rock ptarmigan in the spring of 1967, lower fall populations of spruce grouse along the Steese Highway, sparse but increasing numbers of this species on the Taylor Highway, and stable populations of spruce grouse on the Kenai study area. Yearlings were twice as numerous as older ptarmigan among hens, and four times as numerous among males, on the rock ptarmigan study area in spring. Clutch sizes were as high as in 1966, predation on nests was relatively low, and chick survival to August was relatively poor. The combination of these factors resulted in production equalling 1966 rates per breeding adult. Banding and checking station data indicated a harvest of 17 percent of resident adult males, 6 percent of resident hens, and 9 percent of locally-reared chicks.

Forty percent of the rock ptarmigan on a five-square-mile area near Eagle Creek were shot in autumn, initiating a study of the effects of that level of exploitation on ptarmigan numbers. The Department cooperated closely with the University of British Columbia and University of Alaska in a study of the growth and behavior of young rock ptarmigan at Eagle Creek.

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OBJECTIVES

To record changes in abundance of upland game throughout Alaska and on selected study areas.

To compile distribution records of Alaskan grouse and ptarmigan.

To discover characteristics of reproduction, mortality, movement and behavior in a selected population of rock and willow ptarmigan.

TECHNIQUES

The statewide game bird and hare population survey card was mailed in November 1967 to approximately 300 potential cooperators, including 10-20 cards each to Sigurd Olson, U. S. Forest Service, and John Burns, Alaska Department of Fish and Game, for distribution in southeast Alaska and Seward Peninsula, respectively. A summary of replies will be sent to cooperators in February, as in previous years.

Counts of grouse and ptarmigan were made on small areas in 1967 as follows:

a) Rock and willow ptarmigan, Eagle Creek (eastcentral Alaska); complete count of territorial males in May. Two secondary areas adjoining the Eagle Creek area to the northwest and southeast were counted in 1967, in conjunction with Job B-8.

b) Willow ptarmigan, Chilkat Pass (northern British Columbia); estimate of territorial cocks on three-fourths square mile by ground count.

c) Sharp-tailed grouse, Tok-Fortymile (eastern Alaska); roadside census of courting birds in May (by Howard Wood). Procedure same as in past years.

d) Spruce grouse, Finger Lakes area, Kenai Peninsula; complete count of displaying males on study area. See report under Job 3, this Work Plan.

e) Spruce grouse, Steese, Taylor, Kenai areas; roadside counts in autumn. See report under Job 3.

Population characteristics of rock ptarmigan were studied intensively on a 15-square-mile area at Eagle Creek, mile 105 Steese Highway, from May 15 to October. Techniques for counting, capturing, and marking were the same as in other years. A checking station was operated daily from August 10 to October 7, 1967, at Eagle Creek Cafe, mile 100 Steese Highway. Birds shot by hunters were examined and various specimens saved, depending on the condition of the birds and the willingness of hunters to spend time at the station. Special effort was made to get data from tagged ptarmigan.

The first season of a three-year study of the effects of removal of 40 percent of the fall population of rock ptarmigan was carried out successfully in August-September 1967. Ptarmigan were shot from flocks encountered on a previously selected area on upper Ptarmigan Creek, three miles west of mile 107 Steese Highway, on August 10, 11, and September 5. Appropriate numbers of each sex and age were collected, based on breeding male counts and estimates of productivity.

Cooperation was given to John Theberge, a Ph.D. student at the University of British Columbia, in his study of the behavior and growth of rock ptarmigan in relation to population changes. Theberge was shown how to locate birds throughout the summer, was assisted in finding nests and broods for aviary studies, and was helped in tagging-recapture studies of chicks. Specimens from the checking station were donated to the UBC study.

Radio-telemetry equipment from Ellison's spruce grouse study was used on rock ptarmigan at Eagle Creek in August and September.

ACKNOWLEDGEMENTS

Phil Headley assisted in all phases of the intensive study of rock ptarmigan at Eagle Creek, counted spruce grouse along the Swanson River-Swan Lakes Roads in October, and assisted in analysis of ptarmigan and grouse crops in November.

Greg Olson assisted Ellison on the Kenai study area in summer, transferring in July to help at the checking station at Eagle Creek. Gary Strong, Kenneth Neiland, Robert Rausch, and Phil Headley helped in the "shoot-out" of ptarmigan on upper Ptarmigan Creek.

Ray Carr, of Daly City, California, gave much valuable advice in the operation of the aviary at the University of Alaska, where one phase of the study of chick vigor was carried out. He also sent bantam hens for use as brooding birds in case of malfunction of the incubator. His voluntary assistance is sincerely appreciated.

Jerry McGowan was hired October 9 as assistant (permanent position) to the grouse and ptarmigan Work Plan. He assisted in crop and gizzard analyses, and initiated winter studies of ruffed grouse in November and December.

John Theberge and Art Lance (UBC) both helped materially in the banding work at Eagle Creek. Lance experimented with the use of radios on rock ptarmigan at Eagle Creek, and his experiences with this equipment will be very valuable in studies planned for 1968.

FINDINGS

Current Abundance of Upland Game

Statewide Survey by Mail

Respondents sent in 271 game bird and hare questionnaire forms in 1967. People in all areas seemed to think ptarmigan populations were stable at moderately low levels (Alaska Peninsula, Gulf of Alaska, and Southeastern) or rising from previous low populations (Brooks Range, West Coast, Kodiak, and Interior). Table 1 summarizes these replies for 1967.

Data for hares are listed below:

	High	Mod.	Low	Index	More	Same	Fewer	Index
Interior (105)	3	18	82	1.95	40	39	21	5.76
Gulf (30)	1	8	21	2.33	10	9	11	4.87

This suggests low and stable populations in southcentral Alaska, and low, slightly increasing levels in the Interior for 1967.

Replies and index values for grouse (Table 2) indicate low to moderate populations of all species in all areas. Respondents felt that grouse were increasing in numbers in southcentral and interior areas, with particularly noticeable improvement in numbers of ruffed grouse. No general trend in blue grouse populations was agreed on by the 27 cooperators from southeast Alaska, although their replies about present levels suggested an increase since 1966.

Table 1. Summary of replies to questionnaire on ptarmigan population levels and trends, 1967.

	No. of Replies				No. of Replies			
	High	Mod.	Low	Index	More	Same	Fewer	Index
Brooks (9)	0	8	2	4.20	4	5	1	6.20
Kodiak (9)	2	5	2	5.00	5	3	1	6.78
Westward (18)	4	10	3	5.23	8	7	2	6.41
Alaska Peninsula (18)	2	13	3	4.79	6	5	6	5.00
Southeastern (21)	2	8	11	3.29	5	11	4	5.20
Gulf (43)	7	26	9	4.81	15	19	9	5.56
Interior (118)	16	66	33	4.41	54	41	14	6.47

Table 2. Summary of replies to questionnaire on grouse populations, 1967.

	Present Abundance				Comparison with 1966			
Species, Area	High	Mod.	Low	Index	More	Same	Fewer	Index
Grouse in general								
Interior	0	19	9	3.71	12	12	2	6.54
South-central	3	17	24	3.09	18	18	6	5.90
Combined	3	36	33	3.33	30	30	8	6.29
Ruffed Grouse								
Interior	6	25	22	3.60	38	13	1	7.85
South-central	1	4	3	4.00	4	1	1	7.00
Combined	7	29	25	3.82	42	14	2	7.76
Spruce Grouse								
Interior	7	39	17	4.37	37	22	4	7.09
South-central	10	35	35	3.75	32	38	10	6.10
Combined	17	74	52	4.02	69	60	14	6.54
Sharp-tailed Grouse								
Interior	5	13	13	4.00	18	10	4	6.75
South-central	0	0	7	1.00	4	2	1	6.71
Combined	5	13	20	3.42	22	12	5	6.74
All Grouse								
Interior	7	45	31	3.84	46	31	5	7.00
South-central	10	45	42	3.69	42	46	11	6.25
Blue Grouse	4	16	7	4.55	8	10	8	5.00

Counts of Sharp-tailed Grouse

Weeden and Wood made three, standard, two-day counts in May along four routes near Tok. Results are summarized below.

	Sharp-tails Seen		
Route	May 6, 7	May 13, 14	May 20, 21
Taylor 56-46	1	0	0
Taylor 26-16	4	2	6
Slana-Tok	0	3	2
Tok south	0	5	4
	5	10	12

Adding the highest tallies per route, I estimate 15 different grouse, minimum, seen in the census. Last year the highest count for a single count (two days) was five birds.

The count area between miles 46 and 56, Taylor Highway, was severely burned in July 1966. This area is one where relatively good dancing grounds were once located; these were deserted in 1967. It will be interesting to watch this route in coming years, to see whether a period of little or no use is followed by a population build-up.

Counts of Ptarmigan

Eagle Creek: The count of males was done May 19, 20, 22, 24. Ninety-five male rock ptarmigan were seen on the 15-square-mile area, and three more were observed in the three days following the census. During the count, 54 hens were seen. Three male and two female willow ptarmigan were seen on the area during the count. Last year 80 male rock ptarmigan were found on the 15 square miles.

Secondary areas: Two new areas close to Eagle Summit were counted in 1967. One (Figure 1) comprised about five square miles of ptarmigan habitat on upper Ptarmigan Creek. Fifty-seven male and 27 female rock ptarmigan were counted there on May 18 and May 21. Densities per square mile on the Ptarmigan Creek area (11.4 males per square mile) were considerably higher than at Eagle Creek (6.5 males per square mile).

The second area (Figure 2) comprises four square miles in upper Golddust Creek. It was censused May 26, under poor weather conditions (fog, snow, rain). Due to these unfavorable conditions, only slightly over half of the area was covered. Thirty-six male and 16 female rock ptarmigan were seen, or 14.4 males per square mile.

About half as many females as males were seen on each of the three areas (Ptarmigan Creek 47 percent, Golddust Creek 45 percent, Eagle Creek 55 percent). Judging from experience over the past eight years at Eagle Creek, there must have been a male: female ratio of close to 1 : 1 in the breeding populations in all three areas.

Chilkat Pass: The entire three-fourths-square-mile area at mile 75 Haines Road was counted May 31 and June 1. Thirty-one male and 11 female willow ptarmigan were seen, suggesting a decline from 1966. If a decline did occur, it is the first time since counts began in 1957 that the trend in populations of willow ptarmigan in Chilkat Pass has been different from the trend among rock ptarmigan at Eagle Creek.

Little snow was present in Chilkat Pass when the census was made in 1967. The ptarmigan were very quiet, although not hard to find. Little courtship activity was observed. Males flushed rarely were challenged by other males as they flew away.

Counts of Spruce Grouse

Results of a spring census near Kenai and three roadside counts of spruce grouse in fall are given in this report under Job B-3.

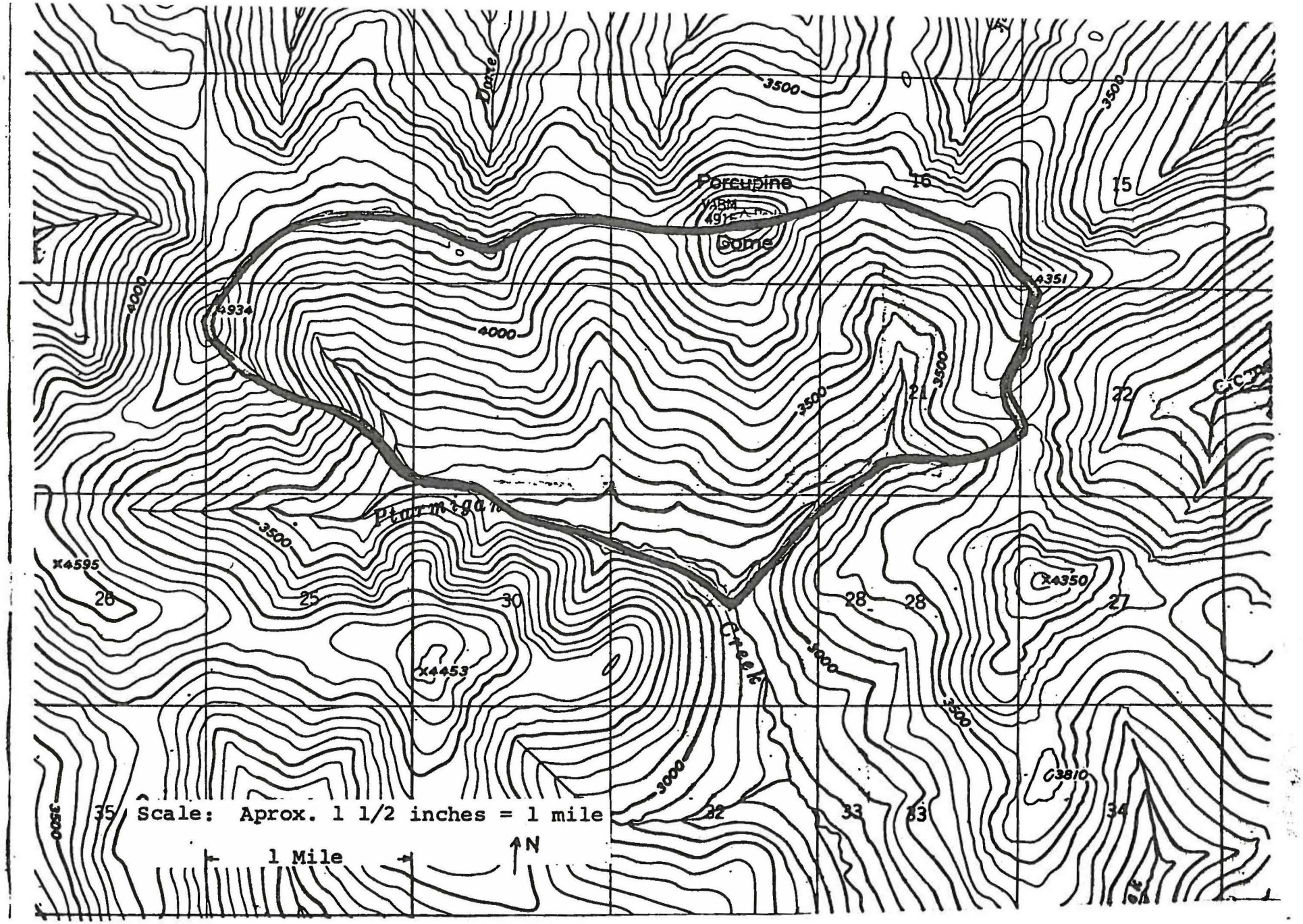


Figure 1. Ptarmigan Creek Count Area.
4350' hill in section 27 forms NW corner of Eagle Creek area.

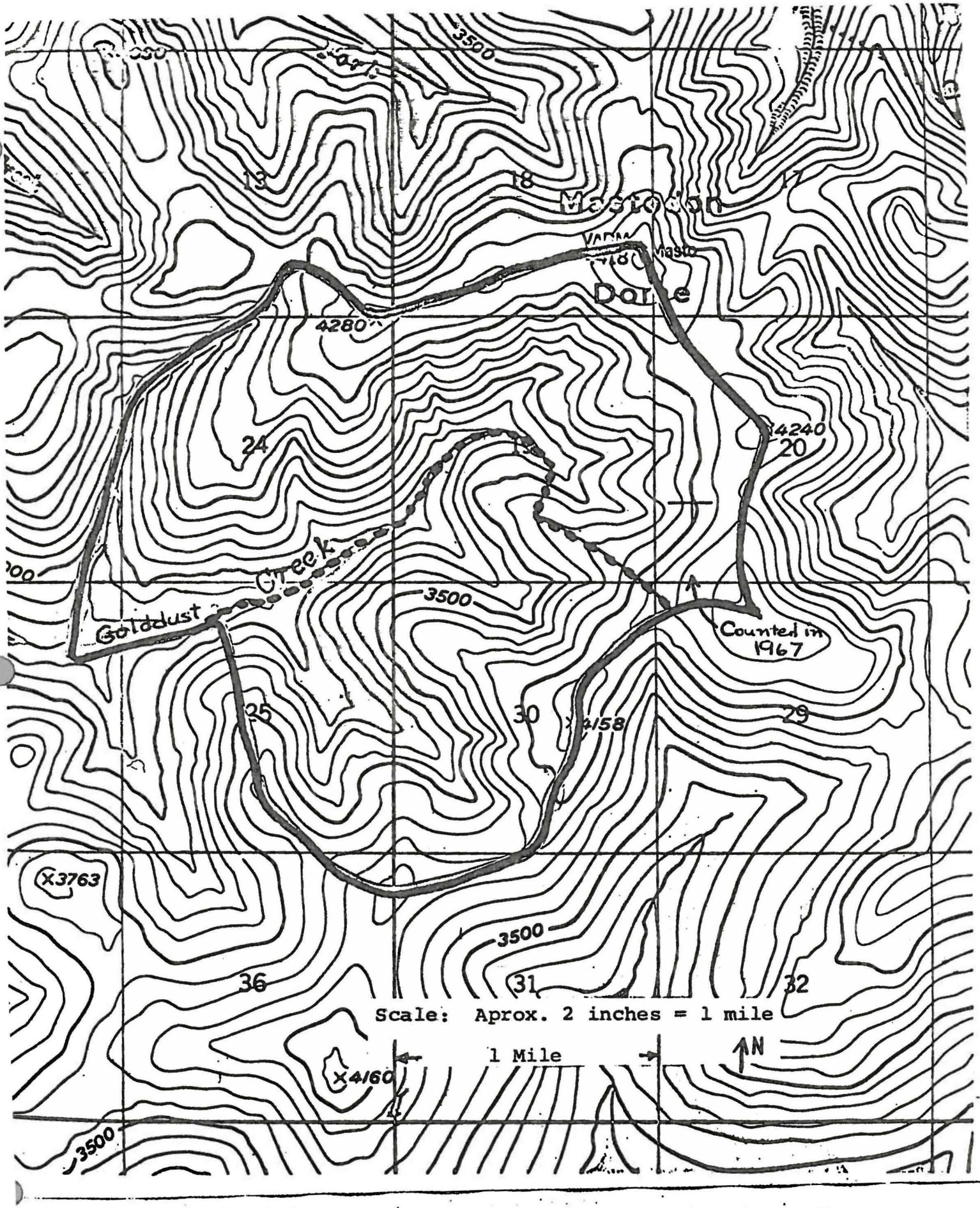


Figure 2. Golddust Creek Count Area.
Mastodon Dome forms SE corner of Eagle Creek area.

Population Characteristics of Rock Ptarmigan at Eagle Creek

(B-2)

Age of Breeding Birds

The ratio of yearlings to older females over the whole season was 43 : 27 or 1.59 : 1.00. Before June 21 we caught a higher proportion of yearlings (12: 5, or 2.40 : 1.00) than later. Among 62 hens with chicks, 37 were yearlings (37 : 25, or 1.48 : 1.00). The yearling to adult ratio among females in 1967, which reflects breeding success and "natural" mortality in 1966-67, was close to the overall estimated ratio (1.85 : 1.00) among breeding hens in 1966.

Thirty-one of 38 cocks caught at Eagle Creek before August 1 were yearlings. This high ratio (4.43 : 1.00) reflects the exceptionally high harvest of adult males in autumn 1966. The hypothesis is that the shot birds were replaced by yearlings from the Eagle Creek Area and adjacent breeding grounds.

Sex Ratios of Breeding Stock

As usual, no direct count of females was possible in 1967. However, at least one hen was eventually seen in the territory of nearly every cock, and at least ten percent of the males had two hens at the beginning of incubation. Thus, there was at least one female for every male, and the true ratio might have been as high as 105 : 100 (F : M) in spring.

Nesting

The earliest eggs were laid about May 18, 1967, estimating from the earliest known hatch (June 19).

Twenty-one nests were found on the study area. Seventeen of these gave information on clutch size. One contained seven eggs, seven contained eight eggs, four contained nine eggs, four had ten eggs, and one had 11 eggs. The mean clutch (151 eggs in 17 nests, 8.9 per clutch) was as high as in 1966. Seven of the nests were of hens two years old or older; these averaged 8.7 eggs. Eight yearling hens laid 72 eggs, or 9.0 per clutch.

A number of nests were found close to the Eagle Creek area this year during work relating to the UBC study of chick vigor. Old hens were found on three nests containing eight, eight, and seven eggs. Yearlings had laid 73 eggs in nine nests, or 8.1 per nest. The difference in clutch size between yearlings on the area and off the area is not significant at the 95 percent level ($t = 1.86$, $DF = 15$), but is significant at the 90 percent level. The mean for all adult hens (on or off area) was 8.4, not significantly different from the mean for all yearlings, 8.5 eggs.

Hatching dates of ten nests were known. The earliest and latest hatched June 19 and June 25; the mean date was June 22. Backdating to the hatching time of 24 broods, I found earliest, latest, and mean hatching dates of this group to be June 19, June 29, and June 22, respectively. These data are shown in Figure 3.

Two of the 21 nests found at Eagle Creek should not be included in the analysis of overall nest success, as they were found when hens on pipping eggs answered my imitation of a chick's call. This technique obviously biases the sample to successful nest. Of the other 19, 15 hatched (80 percent). All but three eggs hatched in successful nests, which contained 132 eggs in total; this is a hatching success of 97.7 percent.

Losses of Chicks

Between July 8 and July 17 we obtained complete counts from 17 broods at Eagle Creek. These averaged 6.4 chicks, showing a 28 percent loss of chicks in the first three weeks of life. Early in August 25 broods totalled 133 chicks, or 5.3 per brood. The total mortality from hatching to August 5 is estimated at 40 percent. This is the highest chick loss observed at Eagle Creek since 1960. Last year's losses were about 33 percent to mid-August.

This calculation neglects possible losses of complete broods. We observed two cases in 1967 when this might have happened. An adult hen incubated and hatched 11 eggs (R13-67), with hatching occurring sometime after June 23. This hen was seen near the nest twice thereafter, but no chicks were ever found. Similarly, the 10 eggs in nest R14-67, laid by a yearling hen, hatched sometime after June 20. The hen was flushed twice from the vicinity of the nest in the next two weeks; no chicks were found, and the behavior of the hen suggested that she had no chicks. We do not know that the chicks died in these two cases. They could have been

hidden in the case of R13-67, or chicks from either brood could have joined another brood. Nevertheless, chances are good that these chicks died shortly after hatching.

Examples of this sort have been observed rarely at Eagle Creek--usually one or two times a year, or not at all.

Summer Gaines in Population

The number of ptarmigan alive in August per bird alive in spring is estimated below:

1.	Adults alive in May	200
2.	Estimated loss of adults in summer (10 percent)	20
3.	Adults alive in August	180
4.	Nests started	100
5.	Nests hatching	80
6.	Chicks per brood in early August	5.3
7.	Total chicks alive in August	424
8.	Adults plus chicks in August	604
9.	Summer gain $\frac{(\#8)}{(\#1)}$	3.0

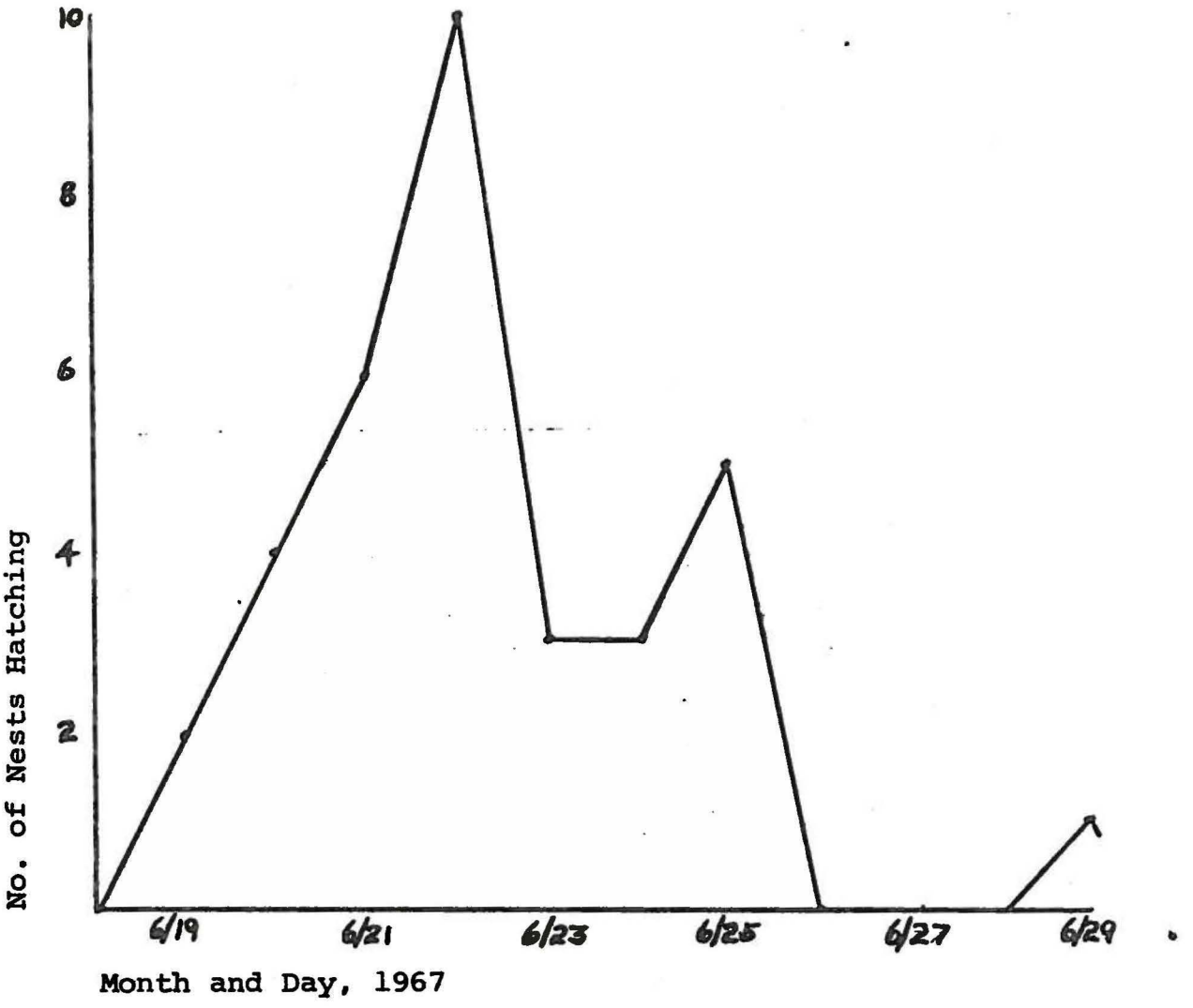
Nesting success was slightly better in 1967 than in 1966, but this was compensated for by the poorer survival of chicks to August 1967. The factor of summer population gain was the same in 1966 and 1967.

Comparison of Breeding by Yearling and Older Hens

Clutches laid by old hens at Eagle Creek in 1967 were slightly smaller than clutches from yearlings (8.7 per nest for seven older birds, compared with 9.0 eggs per nest for eight yearlings) but not significantly so.

The number of nests hatching on given days is listed below for hens whose age was known:

Hatching dates of 34 nests and broods of rock ptarmigan at Eagle Creek, 1967.



Hatching

Date	Adults	Yearlings
June 19	0	1
20	1	3
21	4	1
22	5	5
23	1	2
24	1	2
25	0	4
29	0	1
	12	19

These data suggest that yearlings nested over a longer period than adults, and perhaps did not nest quite as early. However, the difference is debatable, and may not be meaningful.

It is hard to tell whether an age-related difference in hatching success occurred in 1967. We caught very few hens that did not have broods. Of 47 yearlings caught or observed in July and August, 44 had chicks; of 29 adults, 28 had chicks. Little effort was made to find and catch broodless birds this year, due to the emphasis on tagging and recapturing chicks.

As mentioned earlier, the yearling-to-old hen ratio was 2.40 : 1.00 among 17 birds caught before June 21, and 1.48 : 1.00 during the brood season. Possibly this indicates a better nesting success among old hens than young ones, but it also could reflect some sort of trapping bias. For example, if old hens nested sooner, early-season trapping might yield a disproportionate number of yearlings simply because they were not yet incubating. This factor probably isn't important, as the difference (if any) in nesting schedule of the two age groups was slight. More important, experienced hens might be more wary than young hens before chicks hatch, with parental instinct obliterating this difference later.

We saw 25 yearling hens with broods totalling 140 chicks in July 1967. Nineteen older hens had 122 chicks that month. The means (5.6 chicks for yearlings, 6.4 chicks for older hens)

are not significantly different (+ = 1.35, 42DF), but mainly due to variation attributable to two observations of adult-led broods of one and twelve chicks, respectively. Excluding these does not change the mean for adults, but does cause the difference between means for adults and young to be statistically significant.

In summary, slight differences in breeding occurred in clutch size (adults smaller), hatching schedule (yearlings later), hatching success (adults better), and brood survival to August (adults better). However, no striking or statistically significant differences could be demonstrated in any of these elements of reproductive performance.

Banding Results

Banding efforts yielded 36 adult males, 52 adult females, and 267 chicks at Eagle Summit in 1967. These were all newly-handled birds. In addition, we caught 21 hens and five cocks banded in past years. The ages of these recaptured birds follows:

Age in 1967	No. Females	No. Males
Yearling	3	2
2 years	10	1
2+ years	2	0
3 years	1	0
3+ years	3	1
4 years	0	0
4+ years	1	0
5 years	1	1
	21	5

Last year, 15 out of 43 cocks were recaptures. The lower proportion of banded cocks in the 1967 breeding population (one out of eight, vs. one out of five in 1966) probably was due to the heavy removal of banded males in 1966 by hunters. More hens with bands were caught proportionately, in 1967 (one out of four) than in 1966 (one out of six), perhaps because survival or philopatry among chicks hatched in 1965 (which made up about half of the 1967 recaptures) was better than among 1964 chicks (of which only two were recaptured in 1966).

Band Returns and Hunting Pressure

Forty-three bands were returned by hunters in 1967, 29 of which were collected at the checking station at Eagle Creek. Adult males comprised eight of the 43; there were ten bands returned from adult females. One band was from an adult of unknown sex. The 24 chicks were as follows: three females, nine males, and 12 of unknown sex.

Six of the eight old males had been banded in 1967, at Eagle Creek, or 16.7 percent of the adult cocks banded this year. Only three of the adult hens were banded in 1967 (5.9 percent year-of-banding return). The 24 chicks represent 9.0 percent of the number banded.

One adult female banded in 1965 at Eagle Creek was shot on Harrison Summit on September 23, 1967, close to ten miles from the place of banding. One male was banded and shot at Harrison Summit this year; all other returns were of ptarmigan banded and shot in the Eagle Creek area.

As there were about 30 adult hens carrying old bands at Eagle Summit in the summer of 1967 (21 caught, nine others estimated), the rate of return of previously banded birds (seven of 30, or 23.3 percent) seems significantly higher than the return of hens banded for the first time in 1967. Perhaps it is significant that only three of the seven previously-banded females that were shot in 1967 were also caught this year in banding operations. Two explanations occur to me, with no evidence available to give a first choice: 1) that more banded hens were in the population than estimated, or 2) that hunters took banded hens that lived outside the boundaries of the study area in 1967, and so were not seen during our summer work.

Hunting pressure and overall harvest: Data given above provide a rough idea of hunting pressure--namely, 9 percent of resident chicks shot, 17 percent of resident cocks, and six percent of resident hens. This is comparable to the average rate of return for other years. The exceptionally high harvest of cocks (50 percent) and hens (15 percent) of 1966 was not repeated in 1967. The intensified effort made in 1967, mainly by means of a checking station, to record all banded birds harvested did not result in an unusually high rate of return. This suggests that publicity and field checks in other years actually brought to light almost all band returns by hunters--or that the efforts at the checking station in 1967 were in vain. I hope the first suggestion is true!

If the above rates of harvest on resident ptarmigan are applied to the estimated total resident population (see section on summer gain), one would calculate that 75 resident ptarmigan were shot in 1967. The known kill is much higher; 163 rock ptarmigan reported by hunters as coming from Eagle Summit-Eagle Creek were checked at the station at mile 100 Steese Highway Very few hunters hunt beyond the study area boundaries, although some birds were shot outside the area between mile 107 and 110. The "extra" kill comes from birds reared off the study area that come to the plot in September. The resulting dilution of residents with non-resident ptarmigan is illustrated by the reduced proportion of banded birds taken later in autumn. In 1967, 17 of 58 ptarmigan checked at the station between August 10 and September 7 were banded (1 per 3.4 shot). Between September 8 and October 9, only 12 of 105 (1 per 8.8 shot) were banded.

Age of ptarmigan examined at the checking station: Age ratios of rock ptarmigan shot by hunters varied throughout the season. The change (see tally below) included a sharp increase in proportion of adults in mid-September and a noticeable decline in proportion of adults later. The samples are big enough that these differences may be significant.

Date	Adults	Juveniles	Ratio
8/25 - 9/7	17	44	1.00 : 2.59
9/8 - 9/28	29	33	1.00 : 1.14
9/22 - 10/9	16	28	1.00 : 1.75
All	62	105	1.00 : 1.70

The ratio in late August and early September is very close to what would be expected from a random sampling of the population, which in 1967 contained about one adult per 2.4 chicks in August. The sharp rise in adults in mid-September very likely reflects an increased vulnerability of this age group, especially males, which are displaying vigorously. The late season ratio may be a fair estimate of population composition in the high country, since many juvenile hens (and some adults) migrate to lower elevations early in October, and since the natural mortality of juveniles probably exceeds that of adults throughout the fall as it does in winter.

Live Weight of Adults

The whole body weights (including crop and contents) of adults trapped or shot on or near the Eagle Creek area are listed in Table 3. Males were somewhat smaller in May than in early spring last year, but weights throughout the rest of the summer and fall were similar in the two years. The high proportion of first-year males in the 1967 sample could easily have caused the initial smaller weight. Hens seemed to be remarkably similar in weight both years.

Mortality, August 1966 to May 1967

If there was one male, two years old or older, per 4.43 yearlings at Eagle Creek in late May 1967, the total number of old males on the study area was 18. Survival from August 1966 to May 1967 is 18/72 or 25 percent. This reflects all sources of mortality, including hunting; in 1966, losses of adult cocks due to hunting were about 50 percent. As I have mentioned, males killed by hunters in fall apparently are replaced by first-year cocks, so that the effect of the harvest is still visible in spring.

Using the same method for hens, I calculate the survival of adult females from August 1966 to May 1967 to be approximately 50 percent. As hunting removed only 15-20 percent of older hens in the fall of 1966, most of the losses in this age and sex were due to other (unknown) factors.

If there were 320 chicks alive at Eagle Creek in mid-August 1966, and the 1967 breeding population contained 66 female and 80 male yearlings, the survival of chicks during the fall and winter of 1966-67 was 46 percent. The survival of yearling males, assuming equal numbers of each sex among chicks in 1966, was higher (50 percent) than the survival of yearling females (41 percent). Hunting had the effect of artificially improving the apparent survival of yearling males, because of net immigration due to removal of old cocks.

As usual, records were kept of ptarmigan found dead at Eagle Creek in 1967. Avian predators killed 14 of those found, including two from the fall of 1966, one from the spring of 1967, and 11 from the winter of 1966-67. Five ptarmigan were found that apparently were killed by canine or musteline predators. One male was killed by a car in late May. The total, 20, is almost exactly the same as were found in 1966 (21). Two of the birds had been banded.

Table 3. Whole weights of rock ptarmigan at Eagle Creek, 1967.

Period	Males		Females	
	Av. Wt. (g.)	No.	Av. Wt. (g.)	No.
May 21-30	396	8	476	7
May 31-June 9	401	4	440	5
June 10-19	414	12	420	12
June 20-29	422	3	372	33
June 30-July 9	443	7	373	20
July 10-19	439	4	373	23
July 20-29	425,460	2	390	4
July 30-August 8	---	0	---	0
August 9-18	465	3	397	12
August 19-28	413	6	437	4
August 29-Sept. 7	473	20	419	10
Sept. 8-17	---	0	---	0
Sept. 18-27	462	4	405	7
Sept. 28-October 7	442	11	436,447	2
October 8-17	446	9	452,486	2

Inventory of Accessible Hunting Sites

(B-6)

No field work was done on this job in 1967, as manpower was not available. Preliminary work on standard data forms was done in cooperation with Somerville, ADF&G Lands section. Jerry McGowan, hired October 9, 1967, will carry out planned studies in 1968 on the Kenai Peninsula.

Growth and Survival of Ptarmigan Chicks

(B-7)

This is a cooperative study by the University of British Columbia (which provides the principal investigator, his assistant, and their field expenses), University of Alaska (providing aviary space, aviary equipment, maintenance of aviary, and technical advice), and the Alaska Department of Fish and Game. ADF&G provides field assistance in collecting eggs, chicks, and growth data; provides technical advice on field operations; and provides background data on populations.

In 1967 Weeden, Headley, and Olson helped the UBC student (John Theberge) find nests, tag chicks, and measure condition and growth of adults and chicks. Ellison loaned radio telemetry equipment late in July and helped the UBC crew to learn how to operate it.

Theberge is writing reports on results of aviary and field work in 1967. These reports are not now available for summary. I will give a brief assessment of the progress made and problems encountered in 1967.

The essential feature of the study is a dual comparison of chick characteristics: a) between aviary and wild chicks within one year, and b) between field chicks in successive years. The main goal of this first year, therefore, was to establish base lines of growth rate, behavior, and survival, for later comparisons and relating to population performance.

The aviary work was hampered by loss of eggs due to equipment malfunction. Enough eggs were hatched, and enough very young wild chicks were captured and reared, to establish growth curves, behavioral characteristics in response to experimental conditions, and survival rates. One feature resulting

from this work was the amount of variation in growth and behavioral characteristics among individuals. The same variation seemed to occur in the wild for growth rates; the other factors could not be tested. Considerable mortality occurred in the aviary, practically all in the first three weeks after hatching. Handling was likely responsible for some, but certainly not all, of this mortality.

It proved to be nearly impossible to get good behavioral data on ptarmigan chicks in the wild because of the behavior of broods when disturbed and the lush vegetation where broods lived. Tag-recapture work was more successful, and resulted in fairly reliable individual growth curves (few) and composite curves. Weight, foot length, wing length, and primary development were the main characters measured.

In 1968 Theberge hopes to improve aviary survival by using a full-time aviary keeper, which ADF&G will provide. Growth studies in the wild will be continued, and new approaches involving assessment of adult condition in spring, and vigor of chicks in autumn, will be begun if feasible. The basic division of responsibilities among the three institutions in 1968 will be as in 1967. The project will be concluded in the fall of 1969.

Exploitability of Ptarmigan Populations

(B-8)

The investigations at Eagle Creek allow some evaluation of hunting pressure in relation to ptarmigan populations, but the percentage of the fall population removed is uncontrolled. Levels of removal experienced in the last eight years do not appear to have affected subsequent numbers of ptarmigan, so the main need now is to watch what happens under known, high levels of exploitation.

This type of experiment was begun near Eagle Summit in 1967. Two areas, one of five square miles, the other of four square miles, were counted in May (see section on Counts on Small Areas, this report). The larger area, called Area A (Ptarmigan Creek) was covered completely; it had about 57 males. Area B (Golddust Creek) held 36 males on about 2.5 square miles; the remainder was not censused due to poor weather conditions. Neither area is used by hunters, as both are at least two miles from a highway.

I decided to remove 40 percent of the fall population on Area A, leaving Area B untouched. On the basis of work at Eagle Creek, it was estimated that the population in Area A contained 103 adults and 244 chicks in August. I attempted to remove 20 adult females, 21 adult males and 98 chicks. Three hens and five cocks were removed by live-trapping early in August. Twelve adult hens, three cocks, and 34 chicks were shot August 10 and 11; two other birds of unknown sex or age (but not adult cocks) were crippled and lost. Three hens, one cock, and six chicks were shot August 28. On September 5, five hens, 13 cocks, and 45 chicks were shot, plus four cripples lost. The total number removed was 136 rock ptarmigan: 23 hens, 22 cocks, 85 chicks, and six of unknown sex and age.

Because of deep, soft snow which hampered travel on September 5, all birds shot that day were taken from one slope. It might be better to remove the birds more uniformly from all parts of the area, and an attempt will be made to do this in later years.

All birds shot in this experiment were autopsied, and appropriate specimens and data were given to UBC for use in the study of chick vigor.

Future work will include spring counts on Areas A and B 1968, 1969, and 1970, and removal of 40 percent of estimated August populations in 1968 and 1969.

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