ALASKA DEPARTMENT OF FISH AND GAME

DIVISION OF GAME

JUNEAU, ALASKA

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Don H. Strode, Federal Aid Coordinator

GAME BIRD REPORT

by

Peter E. K. Shepherd
Robert B. Weeden

Volume IV
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-6-R-4, Work Plan I

The subject matter contained within these reports is often fragmentary in nature and the findings may not be conclusive; consequently, permission to publish the contents is withheld pending permission of the Department of Fish and Game.

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FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: I TITLE: Upland Game Bird Investigations

JOB NO.: 1; 2

PERIOD COVERED: July 1, 1962 to April 1, 1963

ABSTRACT

Recipients of a questionnaire on game bird abundance were of the opinion that grouse were scarce throughout Alaska in 1962; ptarmigan were thought to be at moderate levels and slightly more numerous than in 1961. Increases in numbers of breeding pairs or broods of ptarmigan were noted during censuses of three small areas of Interior Alaska. Populations were apparently stabilized at high levels at Chilkat Pass and on one Alaskan study area. Limited counts of sharp-tailed grouse along roads in May revealed little change in abundance from low densities in 1961. Only about 50-60 per cent of 150 female rock ptarmigan nesting at Eagle Creek brought off broods. The average clutch contained 7.0 eggs; broods averaged 6.4 chicks at hatching and 5.5 chicks at the end of the first month. Mortality of ptarmigan on the study area was estimated at 60-65 per cent from August 1961 to August 1962. Banding efforts yielded 68 adult male rock ptarmigan, 95 adult females and 141 young, all from the study area. Studies from October to May revealed that sex-segregation occurs in the fall, with male ptarmigan tending to stay near alpine habitats all winter while females move to forested areas at lower elevations. Hens did not return to Eagle Creek until late in March and early in April 1962.

RECOMMENDATIONS

No recommendations relating to management can be made at this time.

WORK PLAN SEGMENT REPORT
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JOB NO.: 1; 2

PERIOD COVERED: July 1, 1962 to April 1, 1963

OBJECTIVES

To record changes in abundance of upland game birds 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

Questionnaires of the type used since 1960 were mailed in November to about 365 cooperationg Alaskans in an attempt to assess the current relative abundance of all species of grouse and ptarmigan on a regional and statewide basis.

Counts of several species of grouse and ptarmigan were made on restricted study areas as follows:

a) Rock and Willow ptarmigan, Eagle Creek, central Alaska; complete count of territorial males in spring.

b) Willow ptarmigan, Chilkat Pass, British Columbia; complete count of territorial cocks on a small area in June.

c) Sharp-tailed grouse, Tok-Fortymile area; roadside census of counting birds in May.

d) Rock ptarmigan, Harrison Summit (Steese Highway), mile 13 Denali Highway, and Mount Fairplay (Taylor Highway); counts of broods in July.

Distribution records were obtained during the course of other studies by the investigator, and through correspondence with other biologists. Records also were obtained from published literature. The data were coded and placed on topographic maps.

Population characteristics of rock and willow ptarmigan were studied by means of intensive field research from March 1962 through September 1962 on a 15-square-mile area in central Alaska. A dog was used to help locate breeding pairs, nests and broods. Adults and chicks were caught in hand-held hoop nets, marked, banded and released. Specimens were collected throughout the year for studies on molts, morphology, reproduction, food habits and sex and age determination.

FINDINGS

Current Abundance of Upland Game Birds

Statewide Survey

About 365 registered guides, biologists and other interested Alaskans received the mailed questionnaire in November 1962. Up to January 25, 1963, 180 persons had returned 226 usable cards. Experience of the past three years indicates that the expected return from a questionnaire of this type averages about 50 per cent.

Complete results of the survey are given in Appendix 1. Generally speaking, recipients were of the opinion that grouse were scarce in Alaska in 1962, and that all species suffered a drop from 1961 levels. Ptarmigan, on the contrary, were at moderate levels and slightly more numerous than in 1961.

Census of Sharp-tailed Grouse

Experimental roadside counts of sharp-tailed grouse in 1962 were made by Joseph Nava, Alaska Department of Fish and Game. The methods and coverage were the same as in 1961 except that one unproductive route (Tok West - see completion report, Job I-1, for 1961-62) was eliminated. Results of the counts are given below:

	Grouse Counted		
Area	April 21, 22	May 5, 6	May 23, 24
Tok East	0	5	0
Tok South	0	1	0
Taylor 46-56	0	8	3
Taylor 16-20	3	0	0
	3	14	3

Eighty-six miles of road were covered in the three counting periods. The highest number of grouse counted in each route (in the order listed above) was 5, 1, 8, and 3, for a total of 17 different grouse. The average number of birds per mile on the days of maximum counts was 17 ÷ 29 = 0.62. The comparable figure for 1961 was 0.66.

The counts in 1962 were made at long intervals in an attempt to discover the most suitable census period. Both in 1961 and 1962, maximum counts were obtained during the first week of May. Counts in 1963 will be concentrated in that time period, or as close as possible.

Censuses of Ptarmigan: Counts of Breeding Males

Eagle Creek: A total count of territorial male ptarmigan at Eagle Creek was made by two people in the period May 30 - June 4, 1962. Seven male willow ptarmigan and 170 male rock ptarmigan were counted on 15 square miles of breeding habitat.

Many hens were nesting, and others were overlooked; only 46 females, including three willow ptarmigan, were tallied.

Chilkat Pass: The annual count of territorial willow ptarmigan on a study area about three-fourths of a square mile in extent revealed that approximately 150 males were present in 1962. The count was made on June 8 by two men, and took 11 hours. Seven nests were located during the count. The population of ptarmigan on this area has increased each year since 1960 (when 75 cocks were found), and possibly since 1957 (when studies showed 39 males using the area). Densities indicated in 1961 and 1962 are remarkably high for breeding ptarmigan in any part of the world.

Censuses of Ptarmigan: Counts of Broods

Broods counted in July 1962 on three study areas in Interior Alaska are shown below:

Area	Date	Broods	Chicks Per Brood
Harrison Summit (10 miles east of Eagle Creek)	July 10	16	6.1 (3-10)
Mount Fairplay	July 16	13	5.1 (2-8)
Denali Highway	July 17	7	5.1 (3-9)

These limited counts indicated higher populations or better hatching success than in 1961 in the Fairplay and Denali areas. There was no significant change in the counts at Harrison Summit.

Distribution of Grouse and Ptarmigan

The work of compiling records of game bird distribution continued throughout the reporting period. Some useful data were culled from publications, and other records were obtained through contacts with biologists, hunters, guides, etc. No unusual records were uncovered; the main outlines of the range of each species seem to have been delineated, and data now obtained generally just fill in the gaps.

Population Characteristics of Ptarmigan at Eagle Creek

Breeding Population

The spring census showed that about 170 male rock ptarmigan were present on the Eagle Creek study area, 105 miles from Fairbanks via the Steese Highway, in 1962. This estimate probably is accurate to within 5 per cent of the true number. Accurate counts of hens were not possible. However, careful listing of hens seen on territories, on nests or with broods, plus banding studies which resulted in the capture and color-marking of at least half of the females present, suggested that there were 155-160 hens on the study area in June 1962.

All male willow ptarmigan on the area had mates. One of the seven cocks was accompanied by two hens until incubation was over.

Breeding populations of rock ptarmigan this year were higher than at any time since studies began on the area in 1956.

Nesting

Nesting Schedule of Adult vs. Yearling Females: While reviewing data from the current research project, I found evidence that old hens (those nesting for the second or third time) may nest earlier than yearling females in some years. The evidence was derived from an examination of pigmentation of flight quills of hens with broods of known age. As pointed out in a short publication recently, first year rock ptarmigan almost always have dark pigment on the ninth primary, whereas only about one-third of older females have this character (Weeden, 1963). Comparisons of primary condition of hens with early broods with those accompanying late-hatched broods, therefore, should reveal differences in the time of nesting of hens of different age.

Data on hatching date and wing-quill pigmentation of females are given in Table 1. The only year in which age-specific differences in nesting schedules appeared was in 1962. That year the midpoint of hatching of 64 known age broods was June 23. Hens with unpigmented primaries led 14 of 30 broods hatched before that date, whereas hens with uncolored primaries led only 7 of 34 broods hatching on or after June 23. The latest year of nesting was 1962. It is possible that in years when extensive snow cover delays nesting, older hens are able to select and hold the few warm sites that provide early nesting places, resulting in the observed tendency for early-hatched

broods to be led by these older females.

Clutch Size and Nesting Success: Twenty-one nests of rock ptarmigan were found in 1962. Eighteen contained completeded clutches averaging 7.0 eggs apiece (range 4-9; total 126). Of these nests, 11 produced 70 chicks at hatching (52 per cent hatching success out of 77 eggs laid in them (egg hatchability of 91 per cent). Hatchability was 94 per cent in 1961, and nesting success was 80 per cent.

Evidence of the relative success of nesting attempts was gained from records of hens seen with and without chicks during the period after most broods had hatched. In 1960 about 11 hens with chicks were seen for every hen seen without a brood. In 1961 the proportion was 15:1. During 1962, however, the frequency of observations of broodless females increased, yielding an overall ratio of 3:1.

The same data were recorded during brood counts in secondary study areas in Interior Alaska. At Harrison Summit, only 10 miles from Eagle Summit, 14 hens without chicks and 17 hens with chicks were seen on July 10. Only one hen without a brood was found on Mount Fairplay and on the Denali Highway, compared to 14 and 9 hens on these areas, respectively, observed with chicks.

Mortality

Losses of Nests: Eight of 21 nests found in 1962 were destroyed by predators. A weasel took the eggs from one of these nests, and weasels or ravens probably destroyed the others. One nest was abandoned. The chicks in one nest died a few hours after hatching.

Table 1. Hatching dates and condition of primaries of female rock ptarmigan leading broods, 1960-62.

Hatching Date	Condition of P9 of Female					
	1960		1961		1962	
	D[1]	L[2]	D	L	D	L
June 14				1		
15		1	2			
16	1	1	3			
17	3	1	3	1	1	
18	1		5	4	2	
19	2	1	8	1		3
20	2	2	5	2	1	2
21	1		1		3	4
22	1				9	5
23				1	8	2
24					5	1
25					7	2
26					2	1
27					1	
28					1	
29					1	
30					1	
July 1					1	
2						1
3				1		
Totals	11	6	27	11	43	21

[1] Ninth primary pigmented
[2] Ninth primary unpigmented

Losses of Chicks: The approximate rate of chick mortality can be derived as follows:

a) Average clutch size 7.0
b) Percentage of eggs hatching 91
c) Average brood size hatching 6.4
d) Subsequent brood counts:

Period	No. Counts	Av. No. Chicks
July 1-7	34	5.0
July 18-25	50	5.5

e) Chicks lost per brood, hatching to late July 0.9
f) Percentage of chicks lost, hatching to late July 14

Loss of Adults in Summer: Six adult male and five adult female rock ptarmigan were found dead from early May to the end of August. Three cocks and two hens had been killed by hawks or owls, the others by unknown predators. Considering the fairly intensive coverage of the study area by dogs and people in summer, it seems that mortality among adults is quite low in that season.

Hunting Losses: Bands returned by hunters are the only source of information on the sportsman's kill of local ptarmigan. The true loss to hunters may be greater than herein suggested, as some bands may not have been reported, and as mortality prior to the hunting season is not known.

Assuming that about 160 adult cocks survived until the beginning of hunting on August 10, one can calculate the approximate rate of mortality from hunting by means of band returns. Sixty-eight of the 160 cocks were banded in 1962, but one banded male was killed in June. Four of the remaining 67 banded males were shot by hunters. There were thought to be 17 adult cocks on the area that were banded in 1960 or 1961; three of these were shot. If the proportion of unbanded birds shot was the same as for banded birds then

$$\frac{4 + 3}{67 + 17} = \frac{X}{160 - (67 + 5)}$$ or about seven

unbanded, adult males also were taken. The total kill (14) is 9 per cent of the adult male segment of local population.

Only one band from an adult hen was returned in the fall of 1962. The kill of local adult hens must have been extremely low, as about 78 per cent of this population segment on the study area carried bands.

Two banded young-of-the-year were returned by hunters in 1962. All but 15 of 141 chicks banded were caught between July 19 and August 10; the loss of banded chicks before the hunting season probably was not high. Hunting losses in this population segment must have been slight.

Mortality in Winter: Direct evidence of winter mortality is limited. Carcasses of 14 rock ptarmigan killed in winter were found on the study area in the summer of 1962, but these may not have been local residents.

Every autumn there is a general increase in movement of ptarmigan that results in an exodus of most females and some males from their breeding areas. Each spring some of these locally-reared birds return to the same area, along with some immigrants from other breeding grounds. If it can be assumed that for every ptarmigan that emigrates from the study area in the fall and breeds elsewhere the following spring there is another ptarmigan of like sex and age that immigrates from some other area, then the total population of ptarmigan each spring is a measure of net survival since the preceding fall.

On the basis of that assumption, I have calculated approximate mortality rates for males and females from August 1961 to late May 1962. The total male population in August of 1961 was 405-445 birds, of which 120-130 were adults. The census in the spring of 1962 revealed 170 males on the area. The mortality, therefore, was 235-275 ptarmigan, a loss of from 58-62 per cent over the winter as a whole. The death rate from August 1961 to August 1962 was roughly 60-64 per cent. Similar calculations suggest a loss of females from August 1961 to June 1962 of 60-65 per cent, and a net loss from August 1961 to August 1962 of 62-67 per cent.

About 32 per cent of the adult hens banded in 1961 returned to the study area to breed in 1962. The loss of all females in this period (see above) was 60-64 per cent. In 1961 about 60 per cent of hens banded as adults in 1960 returned to breed, and the mortality rate for all females was calculated to be about 43 per cent. In both years about as many adult hens returned as survived, indicating strong philopatry in this age group.

Banding

The results of banding operations in 1962 are shown in Table 2.

Band returns recorded in 1962 are listed in Table 3. These do not include banded birds that were recaptured and released.

Summer Population Gain

Data from studies of reproduction and mortality allow an estimate of the net gain to the ptarmigan population by August 1962. Assuming that 50-60 per cent of the hens nesting at Eagle Creek produced chicks, that broods averaged 5.5 chicks on August 1, and that 140 female and 155 male rock ptarmigan survived until that date, there were 735-790 rock ptarmigan present early in August. Therefore, there were 2.2-2.4 birds alive in August for every adult alive in late May. This is the lowest net production of young calculated for ptarmigan on the area since 1960. Figures for other years were 2.9 in 1960 and 3.0-3.3 in 1961. The high nest loss in 1962 was responsible for the lower net gain to the population.

Spring Movements of Ptarmigan at Eagle Creek

I spent the period March 4 - May 18 at Eagle Creek, observing ptarmigan wintering there and watching the passage of migrants. Throughout March the wintering ptarmigan (130-150 rock ptarmigan, mostly males, plus 100-150 willow ptarmigan) moved about the lower parts of the study area in response to wind, snow depth and food availability. Sunny hillsides with abundant stems of willow and birch showing above the snow were favored, with rock ptarmigan occupying slightly higher slopes than willow ptarmigan. Movements of more than a mile seemed to be rare.

In late March there was a slight increase in numbers of willow ptarmigan, followed by a sharp drop early in April as the birds moved to breeding areas elsewhere. Only about seven pairs remained on the area to breed. In contrast, there was a rapid build-up of rock ptarmigan from March 25 to April 20 as hens and a few cocks returned from wintering areas. The two main periods of movement were March 28 - April 2 and April 13-17.

Table 2. Results of banding operations at Eagle Creek, 1962.

Item	Adult Male	Adult Female	Young
New birds			
Rock ptarmigan	68	95*	141
Willow ptarmigan	4	5	5
Recaptures			
Rock ptarmigan			
(from 1961)	2	18*	7 (3 males)
(from 1960)	0	5*	4 (2 males)
Willow ptarmigan			
(from 1961)	2	0	0

*Some of the females were caught late in the brood season. Because of the movement of broods at this time, a number of these hens may have nested off the study area. An arbitrary cut-off date of July 22 has been set, after which time the adults caught are assumed to have originated off the study area. The adjusted totals are 93 new females, 15 recaptures from 1961 bandings and 4 recaptures from 1960 bandings.

Table 3. Band returns of rock and willow ptarmigan, 1962

Species	Date Banded	Age	Sex	Band. No.	Date of Return	How Killed
Rock	June 24, 1960	Ad	♀	32	July 4	predation
"	August 4, 1960	I	♂	1	Sept.23	shot
"	May 25, 1961	Ad	♂	151	Sept.30	shot
"	May 26, 1961	Ad	♂	158	Oct. 7	shot
"	June 2, 1962	Ad	♂	408	Sept. 30	shot
"	June 5, 1962	Ad	♂	415	June 19	predation
"	June 11, 1962	Ad	♂	428	Sept. 11 or 12	shot
"	June 14, 1962	Ad	♂	439	Aug. 10 or 11	shot
"	June 27, 1962	Ad	♂	469	Oct. 27	shot
"	July 9, 1962	Ad	♂	620	Sept. 30	shot
"	July 23, 1962	I	-	520	Sept. 30	shot
"	July 27, 1962	Ad	♀	543	Sept. 23	shot
"	July 31, 1962	I	-	554	July 31	predation
Willow	June 25, 1961	Ad	♂	16	April 18	shot
"	May 12, 1962	Ad	♀	21	Aug. 20	shot
"	July 20, 1962	I	-	32	Aug. 20	shot
"	July 20, 1962	I	-	33	Aug. 20	shot

Winter Studies: Exodus from Breeding Habitats

On October 24, 1962 I found tracks of ptarmigan on Ester Dome (near College), a small hilltop used in winter only. By mid-November many observations had been made of ptarmigan in low-altitude, non-breeding habitats. First records of ptarmigan in such areas have come in late October and early November each year since studies began in 1959, suggesting a fixed pattern of behavior in response to light or some other consistent stimulus.

One young female white-tailed ptarmigan was collected near Donnelly Inn, Richardson Highway, in November 1962. Late in December two hunters killed five of this species near Donnelly Dome. Neither collection site is less than five miles from breeding habitats of this species. This shows the possibility of a fall movement of white-tailed ptarmigan similar to that of rock and willow ptarmigan.

Winter Studies: Sex-Segregation

Collection of rock and willow ptarmigan in wooded areas more than a mile or so from breeding habitats has proven that hens outnumber cocks by about 10 to 1 in these low-altitude wintering areas. During the winter of 1962-63 I obtained information on sex ratios of ptarmigan wintering in or near summer habitats. Most of the birds examined had been shot by sportsmen. The data (Table 4) show a very high preponderance of males in the three areas represented.

Field studies in March 1962 at Eagle Creek revealed that about 130 male and 10 female rock ptarmigan were present in late winter, occasionally in breeding habitats but frequently on slightly lower slopes. The sex of the birds was determined by the presence or absence of a black eyestripe; 80-90 per cent of females are without eyestripes, whereas all males have them.

These studies have made it clear that rock and willow ptarmigan undergo a sorting-out of the sexes in early winter in interior Alaska. How or why sex-segregation occurs is not known.

Table 4. Sex of rock and willow ptarmigan shot near breeding habitats, Anaktuvuk Pass, 1/ Isabell Pass (Alaska Range), and Dry Creek, 2/ Alaska, in 1962-63.

Place, Date	Rock Ptarmigan Males	Rock Ptarmigan Females	Willow Ptarmigan Males	Willow Ptarmigan Females
Anaktuvuk Pass (Brooks Range)				
October-November			8	6
January			19	1
February			16	1
Isabell Pass (Alaska Range)				
February 16, 17	16	8		
February 22-24	29	5	23	15
March 2, 3	33	7	11	4
March 31			5	2
Dry Creek (Alaska Range)				
March 4 - April 8			22	0

1/ Collected by Simon Paneak for Laboratory of Zoophysiology, University of Alaska.
2/ Collected by Howard Kantner for Laboratory of Zoophysiology.

SUBMITTED BY:

Robert B. Weeden
Game Biologist

APPROVED BY:

Don H. Strode
Federal Aid Coordinator

James W. Brooks
Director, Division of Game

LITERATURE CITED

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Appendix 1. Game Bird Questionnaire, 1962

Table 1. Statewide totals, 1962 annual survey of game bird abundance.

Species	Population 1962 High	Mod.	Low	Index[1]	Comparison 1962-1961 More	Same	Fewer	Index
Grouse (gen.)	1	49	37	3.34	13	35	26	4.30
Ruffed		6	38	1.54	3	12	24	2.84
Spruce	14	62	48	3.90	36	40	40	4.86
Sharp-tailed	2	8	27	2.30	3	14	19	3.22
Blue		3	8	2.10	1	5	4	3.80
All Grouse	17	128	158	3.14	56	106	113	4.17
Ptarmigan (gen.)	19	70	22	4.90	45	29	28	5.66
Rock	16	46	13	5.16	27	32	8	6.13
Willow	28	78	24	5.12	51	46	18	6.14
White-tailed	1	6	9	3.00	4	3	7	4.14
All Ptarmigan	64	200	68	4.95	127	110	61	5.89
All species	81	328	226	4.23	183	216	174	5.07

[1]Index = 9 (No. answers in "High" column) + 5 (No. "Mod." answers) +1 (No. "Low" answers) ÷ Total No. of Replies.

Table 2. Grouse, Region (North); 53 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Grouse (gen.)		14	16	2.87	4	6	15	3.24
Ruffed		4	25	1.55	2	5	19	2.38
Spruce	5	18	24	3.38	12	9	22	4.07
Sharp-tailed		8	13	2.05		9	11	2.80
All Replies	5	44	88	2.57	18	29	67	3.28

Table 3. Grouse, Region II (Central); 98 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Grouse (gen.)	1	35	15	3.71	8	24	10	4.81
Ruffed		5	14	2.05	3	6	7	4.00
Spruce	9	48	22	4.21	26	29	20	5.45
Sharp-tailed	2		14	2.00	3	5	8	3.75
All Replies	12	88	65	3.71	40	64	45	4.86

Table 4. Grouse, Region III (Southern); 18 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Grouse (gen.)		4	7		2	7	2	
Ruffed			3			2	1	
Spruce		1	3			3	1	
Blue		3	8		1	5	4	
All Replies		8	21	2.11	3	17	8	4.29

Table 5. Ptarmigan, Region I (North); 12 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Ptarmigan (gen.)	1	2	2		2		1	
Rock			1			1	1	
Willow	2	7	1		2	4	1	
All Replies	3	9	4	4.75	4	5	3	5.33

Table 6. Ptarmigan, Region II (Central); 44 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Ptarmigan (gen.)	2	20	9	4.10	9	5	15	4.18
Rock	3	14	2	5.21	7	6	3	6.18
Willow	6	17	5	5.14	10	4	8	5.36
White-tailed		1	3		2		2	
All Replies	11	52	19	4.61	28	15	28	5.00

Table 7. Ptarmigan, Region III (Southcentral); 131 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Ptarmigan (gen.)	16	49	10	5.32	35	20	10	6.54
Rock	13	36	9	5.27	23	24	5	6.38
Willow	20	58	14	5.26	41	37	8	6.53
White-tailed	2	6	5	4.08	4	3	4	5.00
All Replies	51	149	38	5.22	103	84	27	6.42

Table 8. Ptarmigan, Region IV (Southeastern); 16 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Ptarmigan (gen.)		5	6		3	4	3	
Rock			1			1		
Willow		1	4			3	2	
White-tailed			1				1	
All Replies		6	12	2.33	3	8	6	4.30

Table 9. Ptarmigan, Region A (West); 34 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Ptarmigan (gen.)	5	10	1	6.00	9	2	4	6.33
Rock	4	5	1	6.20	5	5		7.00
Willow	5	18	3	5.31	15	7	2	7.17
White-tailed	1				1			
All Replies	15	33	5	5.54	30	14	6	6.92

Table 10. Ptarmigan, Region B (Central); 110 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Ptarmigan (gen.)	10	41	13	4.81	27	17	14	6.04
Rock	11	34	9	5.14	21	22	6	6.23
Willow	18	49	12	5.30	32	29	11	6.16
White-tailed		6	5		4	2	5	
All Replies	39	130	39	5.00	84	70	36	6.01

Table 11. Ptarmigan, Region C (East); 43 replies.

Species	Population 1962 High	Mod.	Low	Index	Comparison 1962-1961 More	Same	Fewer	Index
Ptarmigan (gen.)	4	20	7	4.61	10	6	8	5.33
Rock	2	11	2	5.00	4	5	3	5.33
Willow	5	16	5	5.00	6	9	4	5.42
White-tailed		1	2		1		1	
All Replies	11	48	16	4.73	21	20	16	5.37

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: I TITLE: Game Bird Investigations

JOB NO.: 3-b

PERIOD COVERED: July 1, 1962 to June 30, 1963

ABSTRACT

Aerial surveys of Black Brant nesting habitat revealed that the major nesting distribution in 1962 extended from the south shore of Hazen Bay to the mouth of the Kashunuk River. Brant were found nesting in a restricted habitat characterized by sparse cover dominated by a sedge community. This cover occurs in an intertidal zone bounded by storm tide debris and open water. There were 332 Black Brant nests with an average of 3.6 eggs per nest on the 231 acre study area: this compares to 260 nests in 1960. Egg hatching success from a sample of 100 nests was 86 per cent, with the peak of hatch occurring on June 29. Testing of various types and sizes of ground plots suggested that the one-acre nesting plots were satisfactory as estimators of nest density. Examination of 85 one-acre plots on the Kashunuk River and Hazen Bay indicated a 20 per cent increase in nest densities over the 1961 count. The average brood at hatching was 3.5 young, decreasing to 3.3 young one week later. The brood size of 5 to 6 week old brant as calculated from the banding operation averaged 2.9 young. Variability of transects and requirements for exact timing of aerial brood counts appears to influence these surveys to a point where they may not be useful as trend indicators of annual production. Age determination of yearling brant is possible during the molting period thus allowing classification of trapped brant into 3 age categories. A three man crew banded 2,132 adult, 322 yearling, 1,042 local, and 4 unknown age brant in 1962.

RECOMMENDATIONS

All phases of the job should be continued for at least one more year. Renewed emphasis should be placed on habitat analysis, banding, and establishment of more check plots.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: I TITLE: Game Bird Investigations

JOB NO.: 3-b

PERIOD COVERED: July 1, 1962 to June 30, 1963

OBJECTIVES

To determine the location and approximate size of breeding and summering populations of Black Brant in Alaska. To determine the pattern of natural mortality and mortality from hunting among juvenile and adult Black Brant. To determine annual fluctuations in numbers of brant nesting on permanent ground transects. To determine the probable contribution of renesting to total brant production.

TECHNIQUES

Field activities during June, July and August of 1962 were divided into the following phases: 1) aerial surveys of brant distribution; 2) analysis of brant nesting habitat; 3) survey of nest-study area and testing of experimental nest sample plots; 4) brood surveys; and 5) banding. The aerial surveys were conducted by the writer assisted by Stanley W. Harris. The ground nest searches, brood counts, habitat analysis and banding operations were conducted by Harris, J. J. Henzler, and Jack Paniyak.

Aerial Surveys of Black Brant Distribution

The entire coastline from Scammon Bay to the mouth of the Kuskokwim River was flown on July 2 and 3 to determine the specific areas of brant nesting. The characteristic sedge-rye grass salt flats which provide the major nesting habitat were marked on aerial photos and the relative density of any brant was indicated by subjective estimates.

Habitat Analysis

For purposes of habitat analysis in relation to brant nesting, the vegetation complex on the nest-study area was divided into 9 "cover" types arranged in order of increasing concealment of nests as follows:

I. Water and Mud Flat Areas

Type 1. Non-tidal ponds, dead-end channels, or mud flats resulting from evaporation of these.

Type 2. Tidal channels, physically connected with the river, bay, or ocean and subject to regular tidal action.

II. Vegetation Types (classified on the basis of the relative abundance of sedge and rye grass)

Type 3. Sedge 100%. No rye grass. No old dead stems from previous year. New sedge growth grazed to less than 1 inch continuously during the nesting season.

Type 4. Dominated by sedge but containing 5 to 25% of rye grass by subjective estimate.

Type 5. Ground cover essentially equally divided between sedge and rye.

Type 6. Dominated heavily by rye grass with light understories of sedge.

Type 7. Rye grass 100%, or only the barest trace of sedge.

Type 8. Sedge 100%. No rye grass. New growth being added faster than grazing by brant can remove it. Contains some to considerable dead stems and leaves from previous year.

Type 8-4. Identical to type 8 but containing up to 5% of beach rye grass.

The actual habitat analysis of the area was made by recording the number of paces walked through each of the 9 "cover" types while traversing each of 8 longitudinal transects and while pacing a 300-pace pattern in each of 50 one-quarter acre nest subsample plots.

Intensive Nesting Study Area

The same 231 acre study area covered in 1961 was again searched in 1962 for waterfowl nests. The search was conducted by two observers who walked abreast on transects across the area. All waterfowl nests were numbered by writing directly on all eggs with a soft lead pencil. A sample of 100 brant nests was marked with aluminum rods which were numbered to match the nest number. These 100 nests were re-checked periodically to collect information on nest success, clutch size, etc. All data were recorded on standard nest-record cards.

The study area was subsampled in three ways in an attempt to determine the best plot size for sampling nesting density. Fifty one-quarter acre plots, 5 five-acre plots and 8 line transects 12 feet wide and extending the entire length of the area were laid out in a predetermined pattern. The number of nests occurring in these plots was then recorded and the nest density was compared to the "known" density for the entire study area.

A re-survey of the randomly placed one acre nest-density plots on the Lower Kashunuk River and Hazen Bay was conducted again in 1962. These plots originally were laid out and marked in 1961; however, severe storms and high water destroyed the habitat where 10 of the plots were located so that the 1962 data were based on the data from 85 of the 95 laid out in 1961 (see appendix).

Brood Census

Ground brood surveys were conducted on foot and by boat on the Lower Kashunuk River for the first 10 days following the peak of the hatch in late June. At about 10 days of age, brant broods combine into large flocks of adults and young making counts of individual broods impractical.

Eleven line transects each 8 miles long were flown on July 3 for purposes of counting broods. A 180 Cessna flying at 90 MPH at 100 feet was used. Two observers recorded all broods seen within 1/8 mile of each side of the aircraft. A portable stenorette dictation machine was used to tape all transects.

Banding

All banding of brant in 1962 was done with a three-man crew, usually consisting of two men on foot and one man in the river or slough running the boat. Techniques of trap construction and driving were the same regardless of whether work was being concentrated on flocks of flightless adults or on flocks of broods and their parents. The trap consisted of one roll of 3 foot high wire poultry netting. This was erected on the Kashunuk River bank in selected locations, always at a break in the steep bank of the river. The best trap locations were one-to-two hundred yards away from the mouths of major tributary sloughs which held flocks of moulting brant. The trap was a standard pot and two wing design with the pot usually about 15 to 20 feet in diameter and the wings about 50 feet long. The trap faced the river. Care was taken to have the pot located on a grassy sod area where wetting and muddying of the trapped brant would not be a problem. The wire was held up with aluminum rods and driftwood stakes. A lip of wire 4 inches wide was bent in at the bottom to prevent the birds from going underneath.

In operation, a major slough with birds in it was selected up-current from the trap and the boat was run up past the brant in the slough. The brant usually would run out on the bank of the slough as the boat passed and then back into the slough after the boat was out of sight around a bend. Two people were then deposited, one on each bank, who ran out to the sides and herded the birds into and down the slough, the boat slowly following. The brant were chased out of the slough into the river where tidal current drifted them toward the trap. The boat had the job of keeping them bunched near the near shore and the walking crew kept them from running overland. When the brant were opposite the trap, they were driven ashore and into the trap.

Aging

In 1962, it was found possible to age the yearling brant during the mid-summer molt, thus allowing for classification of the trapped sample into 3 age catagories--locals, yearlings (sub-adults) and adults.

The yearling aging technique is based on the fact that the juvenile secondary wing coverts of brant carry a white tip on an otherwise dark feather. It was possible to find one or more of these juvenile-white-tipped coverts still unmolted during the

banding operation. Care had to be used to avoid confusion with the sometimes pale brown tips on the coverts of some adults or with the faded-worn condition of some adults, especially females. Additional help is obtained by the fact that many yearling brant have very faded and light-tan colored belly and breast feathers, giving these birds a "pinto" effect. Not all yearlings show this pattern, but it was never seen on a bird that also did not have juvenile secondary coverts. The penis development of the yearlings showed much variation, some being as large as adults and some as small as locals and is not a usable aging technique. It does not appear practical to probe the bursa on living brant.

All adult female brant banded were also inspected for the presence of a "brood patch". This usually appeared as a patch of newly replaced feathers in the lower belly region where the previous plumage had been plucked for nest material. It was taken as evidence of the female having made an attempt to nest and was not present on any yearlings.

FINDINGS

Distribution

Aerial surveys of the coast from Scammon Bay to the mouth of the Kuskokwim River revealed that the major brant nesting area extends from the mouth of the Kashunuk River to the south side of Hazen Bay. No brant were found south of Nelson Island. North of the Kashunuk River, brant were found in small numbers only on the south side of Igiak Bay and at Scammon Bay. This is essentially the same distribution as in 1961.

Habitat Analysis

Within the geographic area described above, brant nesting habitat characteristically consists of an exposed flat area. The occupied areas consist of a strip of coastal tidal flats from 100 yards to no more than 1/2 mile wide bordering either the coast, the shores of coastal bays or the shores of the mouths of rivers. Basically, this strip lies between the river, ocean or bay and higher typical lichen and subarctic shrub dominated tundra which starts anywhere from waterline to 1 mile or more back from the tide lines. The general physical location of these flats can be characterized as that narrow strip of coastline lying above normal high tide, but below

storm tide lines, or the "inter-storm tidal zone". The elevation of the nesting flats is only 6 to 18 inches above normal high tide and the inshore boundary of the strip is marked with a line of driftwood deposited by storm tides. The portions of these areas occupied by brant typically are those portions lying closest to the tidal area and the areas where the brant reach their highest numbers are very much cut up with small ponds and dead-end channels that are at uniform elevations and depths. These ponds and channels are very numerous and contain water 6 to 18 inches deep during the nesting season. They are not tidal. Tidal channels dissect and drain the flats at irregular but frequent intervals.

The vegetation of the "brant flats" is a very simple flora dominated by Carex sp. (either C. aquatilis or C. lyngebyei; positive identification not yet possible based on present available specimens), and beach rye grass (Elymus mollis). The banks of the rivers and tidal channels are dominated by beach rye and the intervening flats are dominated by the sedge. Back from the main riverbank or shoreline, to gradually increasing elevations, the sedge gives way to a greater preponderance of beach rye. Usually at about 1/4 to 1/2 mile back from the tide water, beach rye has completely dominated and brant nesting densities drastically decline. At variable distances back, these beach rye areas abruptly give way to tundra.

A detailed analysis of the nest study area revealed that as one progresses away from the river, those cover types containing beach rye grass (types 4 through 7) increase in abundance while the sedge-dominated types (types 3 and 8) gradually decline (Table 1). The amount of area covered with non-tidal ponds and channels (type 1) remains reasonably constant over the entire area. Line Number 8 (Table 1) represents the approximate inland boundary of brant nesting, so these data are felt to represent a reasonably representative cross-section of the type of terrain which brant select for nesting activities. Back from line 8, rye grass continues to dominate increasingly and brant nests rapidly decline in abundance.

Table 1. Relative composition of habitat types on Lower Kashunuk River study area by line transect. (Figures are per cent of total paces recorded per line based on 26,394 paces.)

Line	Approximate Distance of Line from Kashunuk River in Feet	Habitat Types: Water Types 1	Water Types 2	Vegetation Types → Increasing Amount of Concealment → 3	8	8-4	4	5	6	7
1	30	29.9	.7	15.9	31.9	1.9	12.9	6.2	.6	0
2	360	19.4	.9	6.8	42.1	7.0	19.8	3.4	.5	.1
3	690	28.8	1.6	4.7	33.5	3.8	17.8	5.0	4.8	0
4	1,020	30.5	.6	9.5	26.5	6.0	19.5	7.2	.2	0
5	1,185	27.1	.9	5.6	22.8	4.7	25.5	11.4	2.0	0
6	1,515	22.4	2.4	5.1	16.5	7.2	26.4	18.2	1.1	.7
7	1,845	29.9	1.0	5.0	15.4	2.6	35.3	9.1	1.7	0
8	2,175	23.1	3.8	2.3	10.2	2.3	32.7	20.6	5.0	0
Total Area		26.5	1.4	7.1	25.9	4.5	23.0	9.6	1.9	.1

In addition to the relative composition of the various habitat types, the frequency of "edges" between vegetation types and ponds or channels was recorded and expresses an "interspersion index" of "upland" and ponded areas. This is felt to be a particularly important aspect of brant nesting terrain since brant nests typically were located in the following types of situations, all conspicuous by their proximity to an upland-water edge:

1. Small islands in non-tidal type 1 pond.
2. The extreme point of a miniature peninsula that extended into a type 1 pond.
3. A narrow neck of upland between two type 1 ponds or channels.
4. Within 3 feet of the water's edge of otherwise extensive sedge or sedge-grass flats.

Type 1 water-upland edges were crossed for every 100 paces during the habitat analysis, and .7 type 2 water-upland edges for every 100 paces for the entire study area 11. The conspicuously "broken up" nature of the general terrain can be appreciated when one realizes that on the average, for every 30 feet paced, one would cross a water-upland edge.

Brant nests were randomly clumped within the study area. Dense pockets of nests coincided with a situation where the vegetation was characterized by a preponderance of pure sedge or small patches of type 4 scattered in an otherwise sedge type habitat, and where the small points, islands, and narrow necks of upland were particularly abundant. Portions of the study area that held the highest density of nests were characterized by a succession of long narrow type 1 ponds 5 to 10 feet wide, alternating with similarly shaped and sized upland areas covered with sedge cover types.

Nest preference indices were calculated by dividing the per cent of composition of the total cover types excluding water types into the per cent of the total classified nests multiplied by 100 (Table 2). This resulted in an index which compares the placement of nests by cover type according to the relative abundance of each cover type present. An index of over 100 indicates that more nests were placed in a particular cover type than one would expect on the basis of acreage of the type alone. Indices of less than 100 indicate fewer nests in the cover type than would be expected based on type availability.

Table 2. Nest cover preference of waterfowl on the entire study area.

	Cover Types (excludes water and mud)						
	3	8	8-4	4	5	6	7
No. paces	1879	6835	1191	6070	2533	506	25
Per cent of total paces	9.9	35.9	6.3	31.9	13.2	2.7	.1
No. brant nests	13	50	25	109	10	0	0
Per cent total brant nests	6.4	24.2	12.1	52.6	4.8	0	0
Preference index	64	67	191	165	36	0	0
No. Cackling goose nests	1	3	22	24	11	0	0
Per cent total Cackler nests	2.4	7.3	4.9	58.6	26.8	0	0
Preference index	24	20	78	184	203	0	0
No. Spectacled Eider nests	0	3	2	3	5	1	0
Per cent total Spectacled Eider nests	0	21.4	14.3	12.4	35.8	7.1	0
Preference index	0	60	227	67	271	263	0

Although Table 2 shows a preference by brant for type 4 habitat, it should be noted that in many cases the type 4 nests occurred in quite small patches of type 4 vegetation which were surrounded by type 8 vegetation. Frequently these patches were on the peaks of small "islands" of vegetation approximately 30 feet in diameter and surrounded by ponds or mud flats. Thus, the great majority of brant nests actually were located in type 4 vegetation or in small isolated patches of type 4 that occurred in an otherwise type 8-dominated landscape.

Cackling geese showed a preference for areas with more rye grass than brant and spectacled eiders selected even heavier stands of rye grass. Both the cacklers and eiders frequently placed their nests in the rye grass stands bordering the banks of the tidal channels which dissected the study area.

A total of 422 nests of all waterfowl species was found on the study area in 1962 (Table 3). This compares to a total of 358 found on the same area in 1961 and to 136 in 1951. Of these, in 1962, 332 were brant, 67 cackling goose, and 4 unclassified goose (probably brant). There were approximately 15 additional brant and 5 additional "cackling goose" (from general appearance) bowls which were well formed, contained large amounts of down, but in which no eggs were found, nor was there any evidence that eggs had ever been in them. It is unknown if these bowls represented early attempts where eggs were lost to predators, false starts, or a situation where the nesting urge was present but for some reason the females may not have been physically capable of laying the eggs. The nesting season in 1962 was approximately 7 to 10 days later than normal and it is possible that a small percentage of females may have had their physiology upset by abnormal weather conditions early in the season. One adult brant (sex unknown) was observed to "incubate" an empty bowl from June 21 to June 29, performing all typical behavior of incubation, on a well-built and lined bowl, but containing no eggs. How long this bird may have "incubated" this empty bowl prior to June 21 is unknown. During the period June 28 to July 1, most other brant nests adjacent to the "empty bowl bird" hatched and it is possible that the presence of young near-by may have stimulated the abandonment of the empty bowl. Also, the bird may have been the mate to an adjacent nesting female. The average clutch size of brant nests in 1962 was 3.56 eggs (Table 4), no significant difference from an average of 3.64 for 127 nests in 1961.

Table 3. Waterfowl nests found on Lower Kashunuk River area, 1951, 1961 and 1962.

Species	Number of Nests 1951	1961	1962
Black Brant	74	260	332
Cackling Goose	49	49	67
Emperor Goose	0	0	1
Unidentified Goose	0	0	4
Spectacled Eider	8	36	26
Steller Eider	3	1	5
Common (Pacific) Eider	0	2	1
Old Squaw	0	0	2
Pintail	2	7	3
Green-winged Teal	0	1	0
Greater Scaup	0	0	1
Total	136	356	442

Table 4. Clutch sizes of nests of the three major species found on the Lower Kashunuk River areas, 1962.

Number of Eggs in Clutch	Number of Nests Brant	Cackling Goose	Spectacled Eider
1	23	0	0
2	47	6	0
3	69	5	6
4	111	17	14
5	78	18	5
6	4	17	1
7	0	3	0
8	0	1	0
Average Clutch Size	3.56	4.72	4.0

Periodic checks of 100 brant nests indicated an egg hatching success of 86 per cent and that at least 1 egg hatched from 95 per cent of the nests in 1962 (Table 5). These percentages are probably slightly higher than would be the case for the population as a whole since records were not begun on these nests until they were in mid-incubation. Hence, any loss occurring in the egg-laying and early incubation stages would not be included.

The "peak" of the hatch in 1962 occurred during the last 3 days of June and the first 3 days of July; many of the nests recorded under the date of July 8 on Table 5 actually were hatched on July 3 and 4 (pipped on July 2), dates on which no checks were made. Fifty per cent of the nests had hatched by June 29 in 1962. Some of the "dead embryos" represented chicks that died after the eggs were pipped and it appeared that some of this was caused by the brant leaving with a partially hatched clutch when the observer approached. In an undisturbed situation, undoubtedly some of these chicks would survive. The weather during the peak of hatch was unseasonably hot in 1962 and it was observed that adult brant sitting on the nests were panting. It is suspected that the large number of dead embryos recorded on June 29 and 30 (Table 5) was partially the result of the eggs getting too hot and drying out before the young could complete hatching.

Nest Density Studies

A comparison of the nest sampling data is presented in Table 6. These figures demonstrate that estimation of nest densities by use of sample plots varies in direct relationship to the size of the plot; thus, the smaller the plot, the more likely one is to find a greater number of nests. This suggests that nest searchers are more likely to overlook nests of large areas and that the nest density derived from the complete search of the study area is actually lower than the true figures.

Table 5. Brant nest histories, 1962 (100 nests).

Date	Fate of Nests and Eggs (Nests Terminating Since Previous Date) — Fate of Nests (Number of Nests)				Fate of Eggs (Number of Eggs)				
	Hatched[1]	Predation[2]	Dead Embryo[2]	Apparently Infertile[2]	Hatched	Predation	Dead Embryo	Apparently Infertile	"Addled"
June 22	0	0	0	0	0	0	0	0	0
June 27	25	3	0	0	77	7	3	1	2
June 28	12	0	0	0	46	0	0	1	0
June 30	25	0	1	0	67	0	10	3	10
July 2	9	0	0	0	30	0	3	1	2
July 8	22	0	0	0	61	0	1	1	0
July 9	1	0	0	0	3	0	0	0	0
July 15	1	0	0	1	4	0	0	2	0
Total	95	3	1	1	288	7	17	9	14
Per cent of Total	95	3	1	1	86	2	5	3	4

[1] Nests hatching at least 1 egg.
[2] Nests in which the entire clutch was lost to the cause indicated.

Table 6. Results of subsampling of study area for nesting density.

Sampling Method	Acres Covered	No. of Nests Brant	No. of Nests Cackling Goose	No. of Nests All Species	Nests Per Acre Brant	Nests Per Acre Cackling Goose	Nests Per Acre All Species
Complete	231	332	67	442	1.44	.29	1.91
1/4 acre plots	12.5	20	6	30	1.6	.48	2.40
5 acre plots	25	29	5	39	1.2	.20	1.56
Line transects	9.3	12	2	14	1.29	.21	1.51
Combined plots	46.8	61	13	83	1.33	.29	1.77

Comparison of data from 85 one-acre plots established in 1961 in the Kashunuk River and Hazen Bay nesting areas with that of the study area nest sampling suggested that the number of brant nests in 1962 was approximately 21 per cent more than in 1961 (Table 7).

Table 7. Comparison of Black Brant nesting densities 1961 and 1962.

	1961	1962	Percentage Increase
Study area	1.12	1.44	22
Experimental plots	1.04[1]	1.33[2]	21
Check plots	1.15	1.47[3]	21

[1] 45-1 acre plots
[2] 50-1/4 acre plots, 5-5 acre plots, and 8 line transects
[3] Adjusted from 1.55 for Cackling Goose Nests

Brood Counts

Data obtained on 459 broods indicated an average brood size of 3.5 at hatching and 3.3 one week later. This compares to 1961 counts of 3.4 at hatching and 2.8 after one week, indicating possibly slightly better survival in 1962. Computations of brood sizes during banding operations by relating the number of young caught per adult female in brood flocks indicated the average brood size at age 5 to 6 weeks was 2.9 in 1962 compared to 2.1 in 1961 (Table 9), also suggesting better survival in 1962.

Table 8. Statistical comparison of corresponding check plots.[1]

	1961	1962
No. plots	85	85
No. nests	109	132
Mean per plot	1.29	1.55
Standard error	.119	.162
Sampling error	17.9%	16.7%
Confidence limits	1.29 ± .23	1.55 ± .26
.05% level	1.52 ± 1.06	1.81 - 1.29

[1] Excluding ten plots lost due to storm damage.

Table 9. Gosling mortality as estimated from brood flock composition, 1961 and 1962.

Brood Flock Composition	1961	1962
Adult males	57	345
Adult females w/brood patch	54	341
Adult females w/o brood patch	7	15
Total young	114	1,019
No. young hatch	3.3	3.5
Young per adult ♀	2.1	2.9
Percentage loss	36.3	17.1

The glaucous gull is the only obvious possible predator on brant broods and some young brant are lost to this source each year. Several observations indicated that in undisturbed broods or in large flocks of adults and young, the adult brant were usually successful at bluffing the gulls away. In several instances, brant were seen to fly at gulls menacing nests or young and to drive the gull away. However, in spite of this defensive behavior on the part of the adult brant, one strongly gets the impression that any glaucous gull with enough determination can feed on young brant virtually at will, and indeed a few gulls seemed to be just such individuals. There seemed to be considerable variation in the

agressiveness of gulls in preying on young brant. The young brant are most susceptible for the first 2 to 3 weeks after hatching and thus serious gull predation on brant is dependent on the size of the gull population, and on the availability of substitute prey during this period. During the peak of the hatch in 1962, many of the glaucous gulls present were seen to be fishing in one particular bend of the river where many terns, sabine gulls, mew gulls, and loons also were concentrated. Apparently there was a large population of available fish at that time and it is probable that this situation saved many young brant from gulls in 1962.

It is my opinion that annual variation in gull predation on young, while undoubtedly occurring, probably would not be of sufficient magnitude to cause the violent fluctuations recorded in brant populations in the past. Rather, it seems more likely that massive climatic disturbances such as breeding season storms, and storm tides on the breeding areas, coupled with excessive scattering of young and resulting exposure of young to adverse weather and scavenger-type predation would be the more likely general cause of abrupt declines in the brant population. We were told by several natives about an island that was washed away in Hazen Bay several years ago (approximately 7 years) on which the brant nests were extremely dense and that was a traditional egg gathering area for the natives of the Hazen Bay area. Possibly recent increases in the nesting brant population on the Lower Kashunuk River may have resulted from the displacement of that segment of the population. Any large scale displacement such as that reported might be accompanied by lower breeding success for one or two years and thus a decline in the population.

Eleven transects were flown on July 3 to count brant broods in the major brant nesting area from the Kashunuk River south to the middle of Hazen Bay (Table 10). The use of aerial transects to detect year-to-year variations in brant populations has the following inherent problems which reduce its utility: 1) Because of the flocking habit by brant when broods are 1 to 2 weeks old, timing of the count must be very precise, occurring not more than 10 days after the peak of the hatch. This condition would be very difficult to meet in many years when phenology of the season and/or weather interfere; 2) The data available to date suggest that there is considerable variability in brood transects which creates a high sampling error. On the 11 transects flown in 1962 the number of brant broods per square mile varied from 9 to 214 with a sampling error for all 11 transects of 41.8 per cent.

Table 10. Summary of aerial brood counts, 1962. (Each transect = 1 square mile.)

Transect[1] Number	Number of Broods Brant	Cackling Goose	Emperor Goose	Eider	Total
2	56	3	1		60
3	53	6	1		60
4	119	3	1		123
5	104	0	0		104
6	101	2	1		104
9	50	0	1		51
10	9	7	9		25
11	85	5	6		96
12	68	4	0	1	73
13	127	11	2		140
14	214	24	8		246
Totals	986	65	30	1	1,082

[1] Not all plots were flown in 1962.

Banding

In 1962, 3,499 brant were banded (Table 11) and 51 additional birds were captured that had been banded in previous years. During operations 3 young brant died in the trap and 4 adults broke one leg while in the trap. Additionally, the remains of 8 banded young were found in the vicinity of the traps where gulls had killed them.

Glaucous gull predation on young during banding operations is a problem for which there seems to be no really satisfactory solution. The banding operation disturbs and scatters broods by its nature and this makes the young more available to gulls than they would be normally. Care should be taken to release several adult brant with each group of banded young being released so that some small measure of protection may be given to the young. Also "riding shot gun" helps while the released brant are still within range.

Table 11. Brant banded Lower Kashunuk River, 1962.

	Aσ	A♀*	A♀BP*	Yearling σ	Yearling ♀	Local σ	Local ♀	U♀ **	UU ***	Total
Moulting flocks	646	225	346	117	146	--	--	1	2	1,501
Mixed flocks of moulters and broods	98	10	88	18	20	15	7	-	-	256
Flocks of mostly broods	345	15	341	13	8	518	501	1	-	1,742
Totals	1,089	250	793	148	174	533	508	2	2	3,499

* A♀ = no brood patch; A♀BP = brood patch present
** U♀ = either adult or yearlings
*** UU = not locals (Either adults or yearlings) Sex unknown; released before record made. 499 locals with red bands; 305 yearlings with yellow bands.

SUBMITTED BY:

Peter E. K. Shepherd
Game Biologist

APPROVED BY:

Don H. Strode
Federal Aid Coordinator

James H. Brooks
Director, Division of Game

Appendix I. Hazen Bay Black Brant One-Acre Nesting Check Plots

Plot	1961	1962
111	0	2
112	0	2
113	0	0
114	3	2
115	1	1
121	2	2
122	2	4
123	3	1
124	1	2
125	2	1
126	2	2
127	0	2
128	1	1
129	1	1
130	1	2
141	3	4
142	2	6
143	1	4
144	1	2
145	1	1
146	2	1
147	2	0
148	0	1
149	2	1
150	2	1
151	3	1
152	5	2
153	5	3
154	3	5
155	2	2
156	1	2
157	1	1
158	1	0
159	0	2
160	1	3
161	1	2
162	3	2
163	2	3
164	2	3
165	1	1

Appendix II. Kashunuk Black Brant One-Acre Nesting Check Plots.

Plot	No. of Nests 1961	1962
46	2	0
47	0	0
48	1	0
49	0	1
50	2	0
51	1	0
52	0	2
53	0	1
54	1	1
55	2	1
61	0	0
62	1	0
63	1	0
64	1	0
65	0	1
66	2	0
67	1	2
68	0	1
69	1	2
70	1	1
71	0	1
72	0	2
73	2	1
74	1	2
75	2	3
76	2	2
77	1	1
78	2	1
79	1	0
80	1	0
81	0	0
82	2	0
83	1	3
84	1	2
85	3	2
86	0	1
87	1	2
88	0	1
89	0	0
90	0	1
91	0	1
92	0	4
93	1	3
94	3	4
95	2	3

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: I TITLE: Game Bird Investigations

JOB NO.: 3-c

PERIOD COVERED: April 1, 1962 to March 1, 1963

ABSTRACT

One of the latest springs on record for Interior Alaska delayed nesting one to two weeks. Excessive runoff from a heavy snowpack resulted in general flooding conditions over much of the Interior. Ground surveys of breeding pairs at Minto revealed a nesting population of 56.5 drakes per square mile. Nest and brood surveys suggested an overall nesting success of from 17 to 25 per cent. The average brood size of 285 Class I and II broods was 6.0 ducklings. Production of young was estimated to be less than 50 per cent of the 1961 crop.

RECOMMENDATIONS

Continue the present production surveys at Minto utilizing the same methods for at least two more seasons.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: I TITLE: Game Bird Investigations

JOB NO.: 3-c

PERIOD COVERED: April 1, 1962 to March 1, 1963

OBJECTIVES

To determine nesting areas and migration routes for species where these facts are unknown.

To determine the production of waterfowl on selected nesting areas.

TECHNIQUES

Production Surveys

An entirely new method for production surveys was used at Minto during the period covered. Nine four-square-mile plots were established at random over the Minto Flats and visited by float airplane, canoe, and river boat during the pre-nesting and brood period. A detailed description of this work is presented in the 3-d report.

Brood counts on the Lower Kashunuk River, Yukon-Kuskokwim Delta were again made by boat and foot. The area covered extended from Old Chevak along the Kashunuk River and adjacent sloughs to the mouth of Rankin Slough.

Aerial counts were conducted in the same manner as described in the 1961-1962 segment report.

Banding

One banding station on the Yukon-Kuskokwim Delta was in operation during 1962. Banding efforts were directed toward taking a large sample of Black Brant. The State crew utilizing wire traps as described in the 1961-1962 report successfully banded 3,500 brant. Included in the banding sample were 2,133 adults, 322 yearlings, and 1,045 local brant.

FINDINGS

Production Surveys

Interior Alaska Breeding Ground Conditions: The spring of 1962 was one of the latest on record for interior Alaska. On May 11 a 50 per cent snow cover was still present over much of the Interior, and little open water appeared before May 15. Migrant waterfowl arrived on schedule but did not gather in numbers until one to two weeks after their usual arrival dates. Consequently, nesting was delayed approximately the same length of time.

An excessive runoff from a heavy snowpack resulted in general flooding conditions throughout all the Interior breeding areas. The Minto Lakes area was no exception, with rapidly rising water covering all the better nesting habitat (except the floating bogs) by June 1. These flood conditions prevailed the entire summer and effected some rather adverse habitat changes.

Breeding Pair Surveys: Aerial and ground surveys conducted in late May in the Minto Lakes area suggested the presence of fewer breeding pairs than in 1961. Thirty-six square miles of randomly-placed ground plots had a breeding drake population of 2,034 drakes or a mean of 56.5 drakes per square mile. This was not significantly different from estimates of the 1961 breeding population (approximately 60 drakes per square mile); however, my personal impression was that fewer birds were present this spring.

Counts of drakes and hens in flocks were made periodically throughout the nesting and brood periods. These surveys revealed unusually high numbers of dabbler hens in deserter drake flocks during the brood season. By the end of June the sex ratio counts of pintails and mallards suggested that no more than 26 per cent of the hens were still nesting or had successfully raised a brood.

Nesting Success: The fates of 60 duck nests were followed to the end of activity within them. In this sample only 15 nests were successfully hatched. Nearly all the nests lost were those situated on the floating mat, when the ice supporting the mat melted and submerged all but the naturally bouyant vegetation. Most nesting on the Minto Flats was confined to floating bogs, and nest losses in this cover were probably common over the entire area.

Brood Surveys: Brood production dragged on through mid-June to August. Ground surveys of broods at Minto Lakes revealed an average production of 7.0 broods per square mile over 800 square miles of habitat. The average brood as calculated from 285 broods was 6.0 ducklings (Table 1) or slightly larger than the 1961 average (approximately 1 duckling less than the 10 year average). Net production was estimated to be less than 50 per cent of the 1961 crop. Puddler production was especially poor, whereas divers, notably Canvasbacks, experienced a fair nesting season.

Table 1. Minto Lakes brood counts.

	1960	1961	1962
Pintail	3 (3.0)	78 (5.2)	56 (5.4)
Mallard		17 (5.0)	16 (5.8)
Widgeon	19 (6.2)	123 (4.1)	48 (6.8)
Shoveler	8 (6.6)	21 (6.0)	18 (7.7)
G.W. Teal	1 (8.0)	42 (5.9)	13 (6.0)
Scaup	39 (7.0)	73 (7.0)	73 (6.0)
Canvasback	3 (5.3)	17 (4.1)	36 (5.9)
Bufflehead			21 (4.9)
Goldeneye		4 (6.2)	1 (7.0)
Redhead		1 (5.0)	1 (8.0)
Scoter	2 (6.5)	1 (5.0)	1 (5.0)
Total	75 (6.6)	437 (5.7)	284 (6.0)

Black Brant Study

Black Brant investigations were made during the summer of 1962 on the Lower Kashunuk River, Yukon-Kuskokwim Delta as a continuation of work started in 1961. A complete search of a 231 acre study area revealed 442 waterfowl nests of all species in 1962 compared to 358 in 1961. Further sampling of the nesting area was conducted to determine the feasibility of using nesting study plots as a method for ascertaining the year-to-year trends in brant breeding populations. The histories of 100 brant nests were followed through to completion.

A tardy spring delayed nesting at least one week or more, allowing few brant to nest before May 25. By rule of thumb these conditions, if accompanied by inclement weather, would bespeak gloomy prospects for a good nesting season. However, any undesirable effects of the late break-up were probably nullified by unusually fine weather most of June.

The favorable environmental conditions resulting from these climatic factors possibly paved the way for an excellent production year. This was evident from the nesting and brood statistics (Table 2) which are suggestive of good egg hatching success and low brood mortality than in 1961.

Table 2. Black Brant hatching success, clutch sizes, and brood count--Kashunuk River, 1961 and 1962.

	1961	1962
Ave.clutch	3.6*	3.6*
Egg hatching success	89% (135 nests)	86% (100 nests)
Ave. brood at hatching	3.4	3.5
Ave. brood 1 week**	2.8	3.3
Ave. brood 2 weeks	2.8	
Total broods counted	454	459

* Based on clutches incubated 10 to 15 days
** After peak of hatch

Another factor in favor of increased production was an increase in brant nesting densities in the Kashunuk study area. This increase appeared not only in the study area, but was evident in a check of 85 one-acre nesting plots which were placed at random over the brant nesting habitat during 1961 (Table 3). In view of these findings, it is suggested that the breeding segment of the black brant population had increased since 1961.

Table 3. Comparision of study area and nesting plots.

	Total Nests 1961	1961 Nests Per Acre	Total Nests 1962	1962 Nests Per Acre	Percentage Increase Over 1961
Study area	358	1.54	442*	1.91	23.4
Check plots	109	1.28	132	1.55	21.1
Total nests	467		574*		22.9

*Chi-square significant at .02% level.

SUBMITTED BY:

Peter E. K. Shepherd
Game Biologist

APPROVED BY:

Don H. Rhode
Federal Aid Coordinator

James W. Brooks
Director, Division of Game

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: I TITLE: Game Bird Investigations

JOB NO.: 3-e

PERIOD COVERED: July 1, 1962 to June 30, 1963

ABSTRACT

Although a late freeze-up provided a longer than usual waterfowl season in much of the interior and in southcentral Alaska, the 1962 harvest was comparatively low. There were fewer hunters than in 1961, and their average daily bag was 3.3 ducks and geese per hunter, slightly under the 1961 figure. Flooding, poor production, and low bag limits contributed to the light harvest. Shovelers, Pintails, Widgeons, and Mallards were the most common ducks in hunter bags.

RECOMMENDATIONS

All phases of the present harvest program should be continued. An intensive check of the Copper River Delta and Stikine River Delta areas is needed and planned for 1963. The possibility of adding bonus birds to waterfowl bag and possession limits should be investigated in order to encourage the harvest of waterfowl in Alaska.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN.: I TITLE: Game Bird Investigations

JOB NO.: 3-e

PERIOD COVERED: July 1, 1962 to June 30, 1963

OBJECTIVES

To determine annual take, crippling loss, hunter success, species composition, and the sex and age ratios of birds harvested.

To study the important factors annually influencing the statewide waterfowl harvest.

To make an evaluation of report bias in postal questionnaires.

TECHNIQUES

Procedures for making waterfowl bag checks and recording these data followed those outlined in the segment report for W-6-R-3, Job I-3c.

FINDINGS

Seasonal Conditions and Movements

Weather conditions during the 1962 fall hunting season were good to excellent over much of interior and southcentral Alaska. Inclement weather following the opening day of the waterfowl season on September 1 bolstered hunting success measureably. Weather for the remainder of the month and part of October was comparatively mild resulting in a somewhat later migration of most species than in 1961. Fair numbers of ducks

were available to hunters until mid-October when most open water became frozen. Final freeze-up at Minto was at least 10 days later than in 1962.

Movements of waterfowl through the Interior largely followed the pattern of previous years. However, one noticeable difference was the early departure of adult birds at Minto--this was felt to be a direct result of flooding. Water levels were again abnormally high at Minto and in most of the interior marshes. This condition left few feeding and resting areas for dabblers and geese. Consequently, much of the better hunting was to be found on the river sloughs and sand bars. The high water also tended to disperse waterfowls over wide areas of flooded brush, further hampering the hunters' efforts.

Factors Affecting the 1962 Harvest

The 1962 open season on game ducks and geese in Alaska ran consecutively from September 1 to December 14. A daily bag limit on ducks was set at 5 with a possession limit of 10. There was no open season on Canvasback and Redheads. The limit on geese was 6 per day and 12 in possession, of which 3 daily or 6 in possession could be Canada geese or subspecies of Canada and White-fronted geese. The season was again opened on Little Brown Cranes and extended from September 1 to 30 with a daily bag limit of 2 and a possession limit of 4 birds.

Poor production of dabblers during the summer provided fewer Pintail and Mallards, but in general was not responsible for lowered hunter success. By and large, high water, low bag limits, and hunter apathy were the greatest factors affecting the season take. There were fewer hunters afield than in 1961; moreover, many hunters made a single trip and did not attempt further hunting.

Harvest Statistics

As depicted in Table 1, most waterfowl hunters took somewhat longer to bag approximately the same number of ducks in 1962 as were taken in 1961.

The 218 hunters interviewed during the 1962 season spent 251 days in the field and bagged 838 ducks and geese. Most hunters reported poor hunting which they blamed largely on the dispersal of the ducks and geese, the high water, and a shortage of favored species.

Table 1. Comparisons of average bag per hunter, per day, and hunting effort per day, 1961 and 1962.

Area	Average Bag Per Hunter Contact		Average Bag Per Day		Average Days Hunted Per Hunter Contact	
	1961	1962	1961	1962	1961	1962
Interior	5.0	4.7	4.1	3.7	1.2	1.3
Southcentral	3.3	3.2	3.5	3.1	.95	1.0
Statewide	3.7	3.8	3.8	3.3	1.0	1.1

Bag Composition

An interesting feature of the 1962 bag composition at Minto was the high percentage of shovelers (Table 2). Normally such a heavy kill of Shovelers is not common; however, Shovelers were extremely abundant in the flooded areas and readily available to hunters. The bag composition of waterfowl taken in the Anchorage area did not differ appreciably from that of the 1961 season (Table 3).

Table 2. Summary of 1962 interior Alaska bag checks.

Species	Ad ♂♂	Ad ♀♀	Im ♂♂	Im ♀♀	Unid.	Total	Per Cent Composition
Pintail	1	10	41	37		89	19.2
Mallard	1	1	33	28		63	13.6
Widgeon	4	3	42	33		82	17.7
Shoveler	1	3	110	39		153	33.0
G. W. teal	1	2	6	11		20	4.3
Scaup	3	2	7	8		20	4.3
Canvasback			1	2		3	.6
Goldeneye		1	3	2		6	1.3
Bufflehead	1	5	3	2		18	3.9
Lesser Canada Goose					8	8	1.7
White-fronted Goose					2	2	.4
Total	12	27	246	169	10	464	100.0

Table 3. Summary of 1962 Southcentral Bag Checks

Species	Ad ♂	Ad ♀	Im ♂	Im ♀	Total
Pintail	5	8	20	26	59
Mallard	1	11	12	18	42
Widgeon			7	2	9
G. W. teal	1	2	4	9	16
Shoveler	1	1	8	9	19
Scaup				3	3
Canvasback	1	—	—	—	1
Total	9	22	51	67	149

Age Ratios

Age ratios calculated from data presented in Tables 2 and 3 were felt to be biased in the Interior by an unusual concentration of juvenile waterfowl especially in the case of juvenile Shovelers; however, the southcentral figures suggest a lowered production in comparison with the 1961 data. The 1962 ratio of 2.6 juveniles as opposed to 3.2 juveniles per adult female in 1961 is the only hunting season data available to support the above assumption. It must be understood that these ratios do not reflect the actual population structure during the hunting season, but are also a measure of juvenile vulnerability. Therefore, one must assume they are only trend indicators until such data can be corrected species by species for juvenile hunting vulnerability.

SUBMITTED BY:

Peter E. K. Shepherd
Game Biologist

APPROVED BY:

Don H Strode
Federal Aid Coordinator

James H Brooks
Director, Division of Game