Alaska Department of Fish and Game
Division of Wildlife Conservation

Federal Aid in Wildlife Restoration
Research Progress Report
31 May 1996 - 31 December 1997

Game Management Unit 13
Ptarmigan Population Studies

William Taylor, Jr.

ADF&G

Grant W-24-5
Study 10.7
May 1999

STATE OF ALASKA
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DEPARTMENT OF FISH AND GAME
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P.O. Box 25526
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(907) 465-4190

RESEARCH PROGRESS REPORT

STATE: Alaska **STUDY:** 10.7

GRANT NR.: W-24-5

STUDY TITLE: Game Management Unit 13 Ptarmigan Population Studies

AUTHOR: William Taylor, Jr.

PERIOD: May 31, 1996–December 31, 1997

SUMMARY

Ptarmigan are the most wide-ranging and abundant of the upland game birds in Alaska. All 3 species of ptarmigan inhabit Game Management Unit (GMU) 13. Willow ptarmigan (*Lagopus lagopus*) are the most common and widespread, composing an estimated 65–70% of the total. Rock ptarmigan (*Lagopus mutus*) make up 25–30%, and white-tailed ptarmigan (*Lagopus leucurus*) total <10% (Taylor 1994).

Since 1990 considerable concern and some disagreement have occurred regarding the status of ptarmigan in GMU 13, the effects on ptarmigan populations of recreational snowmobiles and late winter (February and March) hunting, and the need for more restrictive hunting regulations.

Limited research on Unit 13 ptarmigan was initiated in 1992. The goal of this research has been to determine a way to assess effects of late winter hunting and recreational snowmobiles on Unit 13 ptarmigan populations. Early work focused on a ptarmigan hunter questionnaire and examining hunter-killed ptarmigan, which provided information on transportation methods, harvest rates, sex and age structure of the harvest, and percentage of juveniles. In 1995 and 1996 4 breeding pair/territorial male count sites were established in Subunits 13B and E to assess ptarmigan densities. Objectives for this 2-year portion of the study are to evaluate breeding pair/territorial male count sites and establish new ones and to collect data from harvested birds regarding species, sex, and age.

In May 1997 multiple ptarmigan breeding pair/territorial male counts were conducted at the 3 road-accessible sites in Subunit 13B. A remote site in Subunit 13E could not be accessed. On 20 May a highway vehicle roadside count was completed between mileposts 10 to 14 on the Denali Highway. Despite variability in the counts due to poor weather conditions, willow ptarmigan densities increased in all 3 previously established count areas and seemed to be at high levels. Rock ptarmigan counts remained unchanged and densities appeared low.

During February and March 1997, hunters provided 211 ptarmigan carcasses that were examined for species, sex, and age. Males composed 58% of the sample and juveniles made up 49%. Wing chord and eighth primary feather measurements were used to determine sex with 98% accuracy for males and 94% accuracy for juveniles.

Key words: aging, breeding pair counts, rock ptarmigan, willow ptarmigan.

CONTENTS

BACKGROUND

Ptarmigan range throughout alpine and intermountain valleys of GMU 13. During winter ptarmigan form into large flocks; some of these travel many miles from their breeding territories to lower elevations often below tree line (Weeden 1963).

Unit 13 provides much of the recreational ptarmigan hunting in Alaska. Most of this activity occurs in late winter, primarily in the northern portion of Unit 13. Observations in the late 1980s by hunters and biologists led to concerns that ptarmigan populations, primarily along the road system in northern Unit 13, were declining below what was believed to be normal cyclic fluctuations. Throughout the 1980s, a major increase in both ptarmigan hunting activities and late winter recreational snowmobile use occurred in this area. Weeden (1963) stated that an overharvest could occur with a population of ptarmigan accessible to many hunters, an open season early enough to expose birds to hunting on their breeding grounds, and with a liberal bag limit. Weeden also addressed as future concerns for ptarmigan management the effects of increased human populations, increased numbers of hunters, and increased access amid decreased big game availability.

All of the concerns that Weeden addressed are now facing us. The human population in Alaska doubled from 226,000 to 550,000 between 1960 and 1990 (Famighetti 1996: 385), and the number of resident hunting licenses nearly tripled from approximately 30,000 to 87,000 during the same period (ADF&G Licensing, unpubl. data). Reduced big game seasons and limited permit hunts are forcing urban hunters to seek more small game hunting opportunities. However, the most dramatic change is increased access, due primarily to a tremendous increase in the use of snowmobiles associated with recent technological advances with these vehicles.

Therefore, in 1989 the department proposed and the Board of Game adopted a reduction in the ptarmigan hunting season that eliminated April hunting for most of Southcentral Alaska. The justification was to protect breeding birds on their territories.

From statehood through the early 1990s, the bag and possession limits for ptarmigan were 20 and 40, respectively. We occasionally received reports of wanton waste. Ptarmigan hunter questionnaires indicated most hunters rarely shot more than 10 ptarmigan, even when they had the opportunity. Therefore, in 1993 the Board of Game, with ADF&G's recommendation, reduced the limits to 10 per day and 20 in possession.

In 1992 I began research to assess effects on ptarmigan populations of late winter hunting and increased snowmobile use in northern Unit 13 (Taylor 1992). With a very limited budget and time constraints, I started with a hunter questionnaire to collect data on hunting methods, estimate the number of birds observed, and determine the number of birds harvested/hunter/day. The following year I modified the questionnaire to separate hunters using highway vehicles and snowshoes to access roadside areas versus hunters using snowmobiles or airplanes to access more remote areas. I also began to collect data on the sex and age of harvested birds.

These data provided information on transportation methods, harvest rates, sex and age structure of the harvest, and percent juveniles in the population (Taylor 1994). To address the questions of population densities and the effects of increased hunting pressure and recreational snowmobile use, I attempted to establish 4 breeding pair count areas. The objectives were to establish 2 sites in heavily hunted areas and 2 sites in remote lightly hunted areas that would provide an indication of the population density and trend and a comparison between the heavily and lightly hunted areas. We established 1 count area in May 1995 and 3 others in May 1996 (Taylor 1995, 1996).

We have learned the following from this initial work:

1 Ptarmigan exhibit cyclic (nonrandom) fluctuations in abundance characteristic of many northern species (Keith 1963). Ptarmigan in Unit 13 seem to cycle at approximately 10-year intervals similar to and in synchrony with the ptarmigan cycles reported by Gudmundsson (1960), Watson (1965), Weeden and Theberge (1972), and Mossop (1994). During the early 1990s, Unit 13 ptarmigan were on the declining to low phase of the cycle. From 1993 to 1995 the percent juveniles in the harvest steadily increased from 43% to 59%. The sample size in 1996 was too small to be useful. This indicated the population reached a low point in the cycle in 1993 and started to gradually increase in 1994. Rock ptarmigan were the exception. Their population remained low through 1996.

2 Ptarmigan harvested during winter within a few miles of the Richardson, Parks, and Glenn Highways consisted of a much higher percent of adult females than birds harvested in more remote areas at higher elevation (Taylor 1994). Ptarmigan separate into flocks during the winter of predominantly adult males with some juvenile males, and of adult females and juveniles (Weeden 1964, Mossop 1988).

The predominantly adult male flocks tend to remain at higher elevations above tree line near their breeding territory. The adult female/juvenile flocks migrate farther from breeding areas to lower elevations often below tree line. They may travel more than 100 miles from their breeding territory (Irving et al. 1967). This may have accounted for the bias toward adult females in the harvest data from hunters accessing their hunting area by highway vehicle/snowshoes. Most of this group's hunting activities occurred at lower elevations adjacent to highways (Taylor 1994).

3 During the 1990s, snowmobile use for both hunting and recreation continued to increase (ADF&G 1996). Heavy recreational snowmobile use occurs from February through April. During some weekends in late winter, several thousand snowmobile users are operating their machines in Unit 13. Centers for these activities are Paxson and the eastern part of the Denali Highway, Summit Lake, Fielding Lake, Cantwell and the western part of the Denali Highway, and Eureka. All of these areas contain wintering habitat for ptarmigan.

GOALS AND OBJECTIVES

The primary goal of this research is to determine a way to assess effects of late winter hunting and recreational snowmobile use on the Unit 13 ptarmigan population.

Based on results of research during 1992–96, we decided that breeding pair counts, through the identification of territorial males, should be conducted for 2 more years to determine if these counts can be used to assess population changes. In addition, I will continue to collect sex and age data from harvested birds and try to get a statistically significant sample size.

The specific objectives for this 2-year portion of the project are listed:

1 Establish and evaluate ptarmigan breeding pair/territorial male count sites in Subunits 13B and E

2 Obtain sex and age composition data by examining hunter-killed ptarmigan carcasses of birds harvested in late winter

3 Evaluate methods of sexing birds from wing measurements.

STUDY AREA

This study is being conducted in Unit 13, which is bordered by and includes portions of the Alaska Range on the north, the Talkeetna Mountains on the west, and the Chugach Mountains on the south. The Copper River forms the eastern boundary. Major drainages within Unit 13 include the upper Susitna, Gulkana, Gakona, Chistochina, Nelchina, and upper Matanuska Rivers. Highway vehicle access is limited to 4 major road systems that traverse Unit 13: the Richardson, Glenn, Parks, and Denali Highways. However, numerous trails make much of Unit 13 accessible by all-terrain vehicles in summer and fall and snowmobiles in winter.

Vegetation types for Unit 13 are reported by Skoog (1968), who also reported 36% of the unit was subalpine habitat. Willow ptarmigan prefer subalpine, sparsely timbered or treeless areas with willow-lined waterways. They also prefer level ground or gentle to moderate slopes and luxuriant plant growth with shrub height usually 1–3 meters. Rock ptarmigan prefer treeless subalpine to alpine areas and moderate slopes vegetated with sparce shrubs <1 meter in height (Weeden and Ellison 1968).

Unit 13 contains a substantial portion of the ptarmigan habitat available to upland bird hunters in Southcentral Alaska. Harvest data is being collected from the entire unit.

Breeding pair/territorial male counts are being conducted in Subunits 13B and E in the northern portion of the unit. Four ptarmigan breeding pair count sites have been previously established (Fig. 1). Two sites are in heavily hunted areas in Subunit 13B, 1 is on the plateau north of McCallum Creek and east of the Richardson Highway. It is accessed by a gravel road to the transmitter site on the plateau. Rock ptarmigan utilize habitat along the top of the bluff on the western and northern boundary of the site. Willow ptarmigan are just above tree line at the base of the bluff on the west side and scattered in the patches of willow brush in the remainder of the area. The other heavily hunted site contains only willow ptarmigan and is associated with a willow-lined drainage that crosses the Denali Highway between milepost 15 and 16.

Of the 2 less impacted sites, 1 is on Maclaren Summit along the Denali Highway between milepost 34 and 36 in Subunit 13B. Willow ptarmigan are primarily on the north side of the highway in the willow-dominated flats. Rock ptarmigan live along the ridge on the south side of the highway. The last area is located in the upper portion of the north fork of Coal Creek in Subunit 13E. This site is in a high mountain bowl consisting of many small drainages with wide swaths of willow separated by small dwarf birch plateaus. Only willow ptarmigan occupy this site. In May this site can only be accessed by aircraft.

METHODS

Choate (1963), Watson (1965), Bergerud and Mercer (1966), Bergerud (1970), Braun and Rogers (1971), and Myrberget (1972) discuss the use of breeding pair/territorial male counts for assessing ptarmigan populations. These articles and consultations with D. Mossop, Yukon biologist, guided me in the selection of the count sites. The 3 basic criteria used in selecting a site were 1) an area containing a minimum of 2 km^2 of good breeding habitat, 2) the presence of at least 6 territorial males, 3) and proximity to the road system.

During mid May we counted territorial male ptarmigan at 4 sites. The 3 previously established road system sites were counted at least 3 times in the morning at approximately one half hour before sunrise. By walking established routes that take 3 to 4 hours to complete, we counted these 3 sites. The fourth site was a newly established roadside count area located from milepost 10 to 14 of the Denali Highway. It was conducted by highway vehicle making 9 preplanned stops at 0.5-mile intervals. We conducted this count in the evening and timed it to end just before sunset. I was not able

to access the remote site at Coal Creek with fixed-wing aircraft. The intent was to count it twice, once in the evening and again the following morning.

Each individual conducting counts used tape-recorded calls of territorial male rock or willow ptarmigan for the appropriate site. The recorded calls were played at 200 to 300 meter intervals along the route to stimulate any males in the vicinity to respond. At each stop a short series of calls was played followed by 2 minutes of waiting for a response. If there was no response, this procedure was repeated before moving to the next stop. All ptarmigan observed or heard were plotted on a map. If territorial males responded by flying to the recorded call, we attempted to plot the bird's location at the point of origin or center of its territory and to look for a hen. We used snowshoes and cross-country skis when conditions dictated.

In February and March we collected carcasses from ptarmigan hunters in Unit 13. This was done by direct contact with hunters in the field or by hunters coming into the Glennallen or Palmer area offices. A Ptarmigan Hunter/Harvest Survey form (Appendix A) was used to record the date and area hunted, the number of birds observed and harvested, and the methods of transportation used to and in the hunt area. We grouped carcasses by species and then by age, using pigmentation of the outer 3 wing primaries (Bergerud et al. 1963, Weeden and Watson 1967, Braun and Rodgers 1971). Both the left and right wing chord (distance from the outside in the bend of the carpal joint to the tip of the longest primary on a folded wing) were measured, and the eighth primary was pulled and measured. We determined sex by examining each carcass for an ovary or testes. In addition, each crop was examined for food content.

RESULTS

Counts of breeding pairs/territorial male willow and rock ptarmigan are summarized in Table 1. During 13–15 May, we conducted 3 counts at each of the 3 previously established road-accessible count sites (Fig. 1). Unfortunately, the weather through this period was poor, with overcast skies and wind, snow, and fog. Willow ptarmigan counts at all 3 sites varied considerably (Table 1). The only consistent data gathered were for rock ptarmigan counts on McCallum Plateau, where 4 breeding pairs were evenly distributed along the western edge of the survey route that parallels the plateau's edge. Due to the poor weather conditions during mid May, I decided to repeat one or more of the counts. In addition, to simplify methods and make counts more replicable, I attempted a highway survey using preplanned stops. During the evening of 20 May, a count was done from milepost 10 to 14 of the Denali Highway. Five male willow ptarmigan flew up to the highway and displayed. An additional 5 males called out from their territory but were not observed (Table 1). Weather conditions were good, with mostly sun and light wind.

On 21 May I conducted another count at the Mile 15–16 Denali Highway site. However, the weather deteriorated overnight to cold, overcast, and breezy conditions, causing poor responses by territorial males (Table 1). An unfavorable weather forecast prevented further attempts to repeat surveys.

I was unable to conduct counts at the Coal Creek site in Subunit 13E (Fig. 1) because of the lack of a suitable fixed-wing landing site.

I examined 211 ptarmigan carcasses provided by late season hunters for species, sex, and age. These data were categorized by transportation methods of those using snowmobiles versus those using highway vehicle/snowshoes (Table 2) to compare differences in the harvest from lower elevation, roadside areas (highway vehicle/snowshoes) to remote higher elevation areas (snowmobiles). As was documented previously (Taylor 1994), the percent of female ptarmigan taken by hunters near maintained highways (57%) is substantially higher then by those hunting in more remote areas (35%) (Table 2).

Juveniles made up 49% of the 211 ptarmigan carcasses examined (Table 2). This compares with 43% (n = 200) in 1993, 51% (n = 295) in 1994 (Taylor 1994), and 59% (n = 184) in 1995 (Taylor 1995). The sample size in 1996 (n = 51) was inadequate to evaluate the percentage of juveniles (Taylor 1996).

A summary of willow ptarmigan wing chord and eighth wing primary measurements tabulated by sex and age are provided in Table 3. These data indicate that once birds are segregated by age, the sex of the bird can be determined by wing chord measurement with 98% reliability and by the length of the eighth primary feather with 94% reliability. If the wing chord in an adult is $\geq$19.2 cm, it is a male; in a juvenile it is male if the wing chord is >18.8 cm. If the length of the eighth primary feather in an adult is $\geq$16.2 cm, the ptarmigan is male; it is a male in a juvenile if the eighth primary feather is >16.0 cm.

DISCUSSION

With the exception of the rock ptarmigan counts from McCallum Plateau, the territorial male count data varied markedly (Table 1). Behavior of territorial males is strongly influenced by weather conditions with the best responses occurring on sunny calm days (Bergerud and Mercer 1966; Watson 1965: 140–142; D. Mossop, pers. commun.). Poor weather during nearly all of the surveys was probably responsible for most of this variability. However, willow ptarmigan numbers seem to have increased substantially from 1996 levels. Count data from 3 sites surveyed in 1996 and 1997 (Table 4) are consistent with reports from biologists and observations by hunters, and with population surveys of willow ptarmigan in the Yukon (D. Mossop, pers. commun.). This population density information also fits into the pattern of a 10-year cycle (Keith 1963). If the population density continues in this pattern, it is expected to increase for 1 or 2 more years before reaching a peak.

Rock ptarmigan remain low with no apparent increase (Table 1 and 4). These data are also consistent with reports and field observations in Unit 13. Of the 211 ptarmigan carcasses provided by hunters, only 3 were rock ptarmigan and all were adults. Field observations by Dave Mossop (pers. commun.) lead him to believe rock ptarmigan are also at low densities in the Yukon. I have no explanation why rock ptarmigan populations have remained low. With their preference for higher elevation and steep terrain, it seems logical they would be the least affected by hunting or recreational snowmobile use.

The roadside count conducted on the evening of 20 May between milepost 10 to 14 of the Denali Highway provided good results (Table 1). However, time constraints and poor weather prevented further testing of this method. This method has been used in Newfoundland to provide population trends (Bergerud and Mercer 1966). Since this method would be easier and quicker for an area biologist to conduct, further testing is warranted.

In 1996 a remote count site in an upper portion of Coal Creek in Subunit 13E (Fig.1) was established using a Robinson R-22 helicopter for access (Taylor 1996). This population probably received very little human impacts and provided an excellent control group. At the time it was established, it was believed that we could access this site with a fixed-wing aircraft by landing on a nearby ridge. Unfortunately in May 1997, no landing could be safely made and this site had to be abandoned.

With willow ptarmigan obviously increasing, I would have expected the percentage of juveniles in the harvest to be $\geq$60% instead of the 49% obtained (Table 2). One possible explanation for this lower percentage relates to ptarmigan sex and age segregation in winter. Only 30% of our sample came from roadside hunters in lower elevation areas dominated by adult female/juvenile groups (Table 2), which could bias the data in favor of adult male groups. Conversely, the lower than expected percent juveniles may indicate the population, which has been increasing since 1993, has reached a peak or suffered lower brood survival the previous summer.

Based on a sample of approximately 150, I was able to accurately determine the sex of a willow ptarmigan from either wing chord (98%) or the eighth primary feather (94%) measurements. This was unexpected and contrary to results obtained by researchers in Canada, whose wing chord and primary 8 measurements of willow ptarmigan had considerable overlap between sexes (Gruys and Hannon 1993). If these results hold up with a larger sample size, a trained individual will be able to obtain both age and sex of late winter willow ptarmigan by examining only the wing.

RECOMMENDATIONS

1 In May, conduct territorial male/breeding pair counts at the 3 established sites in Subunit 13B using recorded calls and attempting to focus on good weather periods.

2 Conduct counts by highway vehicle along 2 segments of the Denali Highway stopping at 0.5-mile intervals and using recorded calls. These counts should be done between milepost 10 to 14 and milepost 28 to 32 and compared to the 3 count sites conducted on foot.

3 Explore and establish a remote site where a lightly hunted ptarmigan population can be accessed by fixed-wing aircraft in May.

4 In February and March, collect ptarmigan carcasses from hunters to obtain adult/juvenile ratios and to increase the sample size for testing the hypothesis of obtaining the sex of willow ptarmigan from wing measurements.

ACKNOWLEDGMENTS

I wish to thank biologists Herman Griese and Jeff Selinger and volunteer Jim Storey for their assistance in conducting counts and Bob Tobey and Nick Steen for collecting hunter harvest data and ptarmigan carcasses. Harley McMahan provided fixed-wing aircraft support. I would also like to thank Howard Golden and Herman Griese for editing this report and Pat Oldford and Becky Strauch for technical support.

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Prepared By:

William Taylor, Jr.
Wildlife Biologist III

Submitted by:

Donald Spalinger
Research Coordinator

Approved By:

Wayne Regelin, Director
Division of Wildlife Conservation

Steven R. Peterson, Senior Staff Biologist
Division of Wildlife Conservation

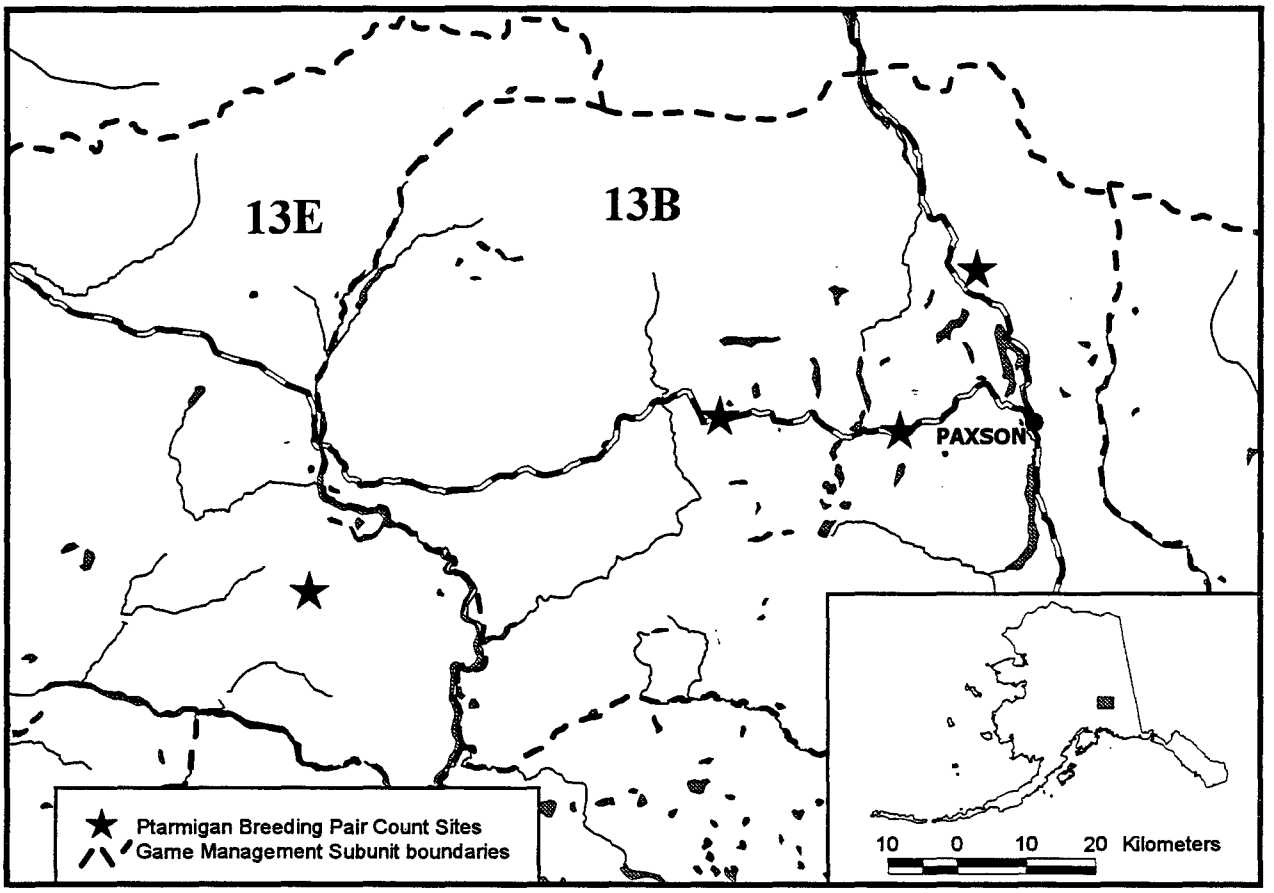


Figure 1. Ptarmigan breeding pair/territorial male count sites in GMU 13.

Table 1. Ptarmigan territorial male breeding pair counts at 4 sites in GMU 13, 1997.

Count Site	Date	Species	Territorial males		Paired females observed	Other ptarmigan observed	Recording used	Start time	Conducted by[a]
			Observed	Heard only					
Mi 34-36 Denali Hwy	13-May	Willow	8	2-4	2		Yes	5:30	BT
Mi 34-36 Denali Hwy	14-May	Willow	9	1	1		Yes	5:30	HG&JSty
		Rock	1	0	1		Yes		
Mi 34-36 Denali Hwy	15-May	Willow	4	0	1		Yes	6:15	JSty&JSel
Mi 15-16 Denali Hwy	13-May	Willow	18	1	4		Yes	5:20	HG
Mi 15-16 Denali Hwy	14-May	Willow	6	10-12	1		Yes	5:20	JSel
Mi 15-16 Denali Hwy	15-May	Willow	4	3	1	2 males	Yes	5:30	BT
Mi 15-16 Denali Hwy	21-May	Willow	6	1	1	1 pair flying and 3 males in distance	Yes	5:30	BT
McCallum Plateau	13-May	Rock	3	0	2			5:25	JSty
		Willow	1	0	0				
McCallum Plateau	14-May	Rock	4	0	3	2 males in distance		5:20	BT
		Willow	3	4	1				
McCallum Plateau	15-May	Rock	3	1	3	2 males in distance		5:30	HG
		Willow	2	3	0				
Mi 10-14 Denali Hwy (0.5 mi stops along hwy)	20-May	Willow	5	5			Yes	21:15	BT

[a]HG-Herman Griese, JSel-Jeff Selinger, JSty-Jim Storey, BT-Bill Taylor

Table 2. Sex and age composition of ptarmigan harvested by hunters using different methods of transportation in GMU 13, February and March 1997.

	Sex composition					Age composition				
Transportation method	Male	Percent	Female	Percent	Total	Adult	Percent	Juvenile	Percent	Total
Hwy vehicles/snowshoes	28	43.1	37	56.9	65	33	50.8	32	49.2	65
Snowmobiles	93	65.0	50	35.0	143	75	51.4	71	48.6	146
All hunters	121	58.2	87	41.8	208	108	51.2	103	48.8	211

Table 3. Wing chord and eighth primary measurements (cm) grouped by sex and age of willow ptarmigan collected in late winter in GMU 13, 1997.

	Adults		Juveniles	
	Males	Females	Males	Females
Wing Chord[a]				
Mean (n)	19.81 (53)	18.44(32)	19.53 (43)	18.22 (23)
SD	0.29	0.37	0.4	0.36
Range	19.15-20.50	17.80-19.15	18.80-20.65	17.55-18.90
Primary 8[b]				
Mean (n)	16.65 (47)	15.47 (34)	16.47 (38)	15.44 (24)
SD	0.32	0.43	0.35	0.38
Range	16.10-17.45	14.70-16.60	15.65-17.45	14.85-16.10

[a] Adults $\geq$ 19.2 cm and juveniles > 18.8 cm are males (98% reliability).
[b] Adults $\geq$ 16.2 cm and juveniles > 16.0 cm are males (94% reliability).

Table 4. Optimal counts of territorial male ptarmigan at 3 sites in GMU 13, 1995-97.

Count site	Species	Territorial males		
		1995	1996	1997
Mi 34-36 Denali Hwy	Willow	5	6	10
Mi 34-36 Denali Hwy	Rock	5	0	1
Mi 15-16 Denali Hwy	Willow	N/A	12	19
McCallum Plateau	Willow	N/A	1	7
McCallum Plateau	Rock	N/A	4	4

APPENDIX A

PTARMIGAN HUNTER/HARVEST SURVEY

Hunter's name _____ Date _____

Address _____

_____

Phone number: Home _____ Work _____

Date(s) hunted _____

Location: GMU/Subunit _____ Specific _____

Estimated distance from the highway: _____ miles

Habitat: alpine __ willow basin ___

timber ___ river bottom ___

Transportation:

To the hunt area:	Within the hunt area:
___ Highway vehicle	___ Snowshoes
___ Snowmobile	___ Snowmobile
___ 4-wheeler/ATV	___ 4-wheeler/ATV
___ Airplane	___ Walking (without snowshoes)
___ Other _____	Other _____

Number of ptarmigan harvested _____Species _____

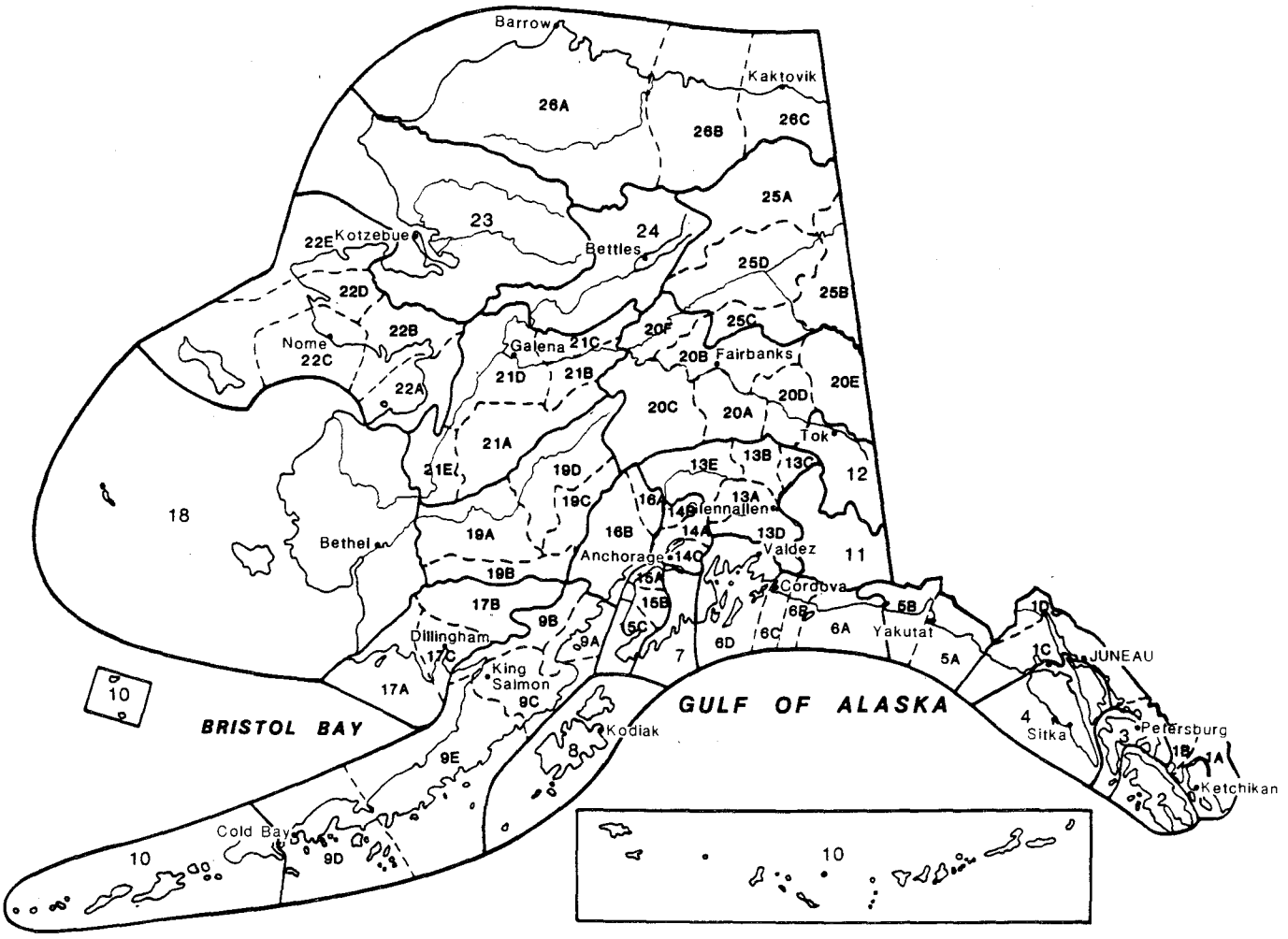
Estimated number of ptarmigan observed: Number of flocks _____

Size of flock(s) _____

Sex and age composition:

	Adult	Juvenile
Male		
Female		

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.

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