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JUNEAU, ALASKA

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REPORT OF SURVEY AND INVENTORY
ACTIVITIES-WATERFOWL

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(Printed December 1977)

STATEWIDE WATERFOWL
SEASONS

1976-77

OPEN SEASONS	Species	LIMITS		Exceptions or Explanations
		Daily Bag	Possession	
GAME DUCKS, OLD SQUAW, HARLEQUIN, SCOTERS, EIDERS, MERGANSERS, GEESE AND BRANT:	Game Ducks	7	21	
(a)* Pribilof and Aleutian Islands (except Unimak Island). Oct. 9 - Jan 21 (b) Kodiak Island (State Game Management Unit 8). Sept. 11 - Oct. 10 and Nov. 6 - Jan 21 (c) Remainder of Alaska and Unimak Island Sept. 1 - Dec. 16	Old Squaw,	15	30	Singly or in aggregate of all kinds.
	Harlequin			
	Scoters, Eiders			
	and Mergansers			
	Geese (except Emperor)	4	8	For snow geese 6 per day 12 in possession.
	Emperor Geese	6	12	
	Brant	4	8	
JACKSNIFE:				
All of Alaska Sept. 1 - Nov. 4	Jacksnipe	8	16	
CRANES:				
All of Alaska Sept. 1 - Oct. 15	Cranes	2	4	
The taking of Canada geese in the Aleutian Islands, except on Unimak, is illegal. (To protect the Aleutian Canada goose.)				

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WATERFOWL HARVEST AND HUNTER ACTIVITY

INTRODUCTION

A post-season mail survey of waterfowl hunters in Alaska was conducted for the sixth year. This survey, in conjunction with field bag checks and data from the Fish and Wildlife Service parts collection survey, provides the most accurate estimate of hunter activity and waterfowl harvest by species in Alaska.

The number of hunters sampled in the U.S. Fish and Wildlife Service (FWS) parts collection survey has been significantly increased during the past five hunting seasons. Mr. Sam Carney (pers. comm., USFWS, Laurel, Md.) believes duck species composition harvest data for Alaska, as measured by the Federal mail survey, are becoming more and more reliable.

Waterfowl hunter field bag check data have been summarized in this report by the harvest areas used for data breakdown of the mail questionnaire survey. More specific location data are available in the Anchorage office files.

The 1976 fall flight of waterfowl from Alaska was predicted to be average. There were average numbers of breeding ducks and normal weather prevailed over much of Alaska during the nesting season. However, weather conditions which facilitated good hunting prevailed over much of Alaska during the season. Reports from the field indicated that hunting was good and this survey confirms those field reports.

PROCEDURES

Mechanics of the Survey and Hunter Reports

A computerized list of all residents licensed to legally hunt in 1976 was used as a sampling base. On 4 April, 1977, 7,000 survey forms (10.0% sample) were mailed. Unavoidable delays in mailing resulted from a change in computers at Data Processing. In early June a reminder form was sent to those persons not replying to the first form. Forms received more than four weeks after the second mailing were not considered in the analyses.

Each form (Fig. 1) was self-contained inside a snap-open envelope. This container eliminated the folding of conventional survey forms and stuffing them into envelopes. A postage paid return address was printed on the form's reverse side.

Field Bag Checks

Random field checks of hunters were made in 6 of the 11 harvest areas. A total of 1,010 ducks were checked by Department of Fish and Game biologists. About 80 percent of the duck species composition data came from the Southeast and Central harvest areas.

The geographical distribution of bag checks this year was substantially different than in some years. The Department was conducting an ingested lead shot study and biologists spent more time collecting gizzards from individual birds on specific areas rather than examining large numbers of birds from many areas.

Figure 1. Waterfowl hunter questionnaire used in the 1976-77 survey.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME



WATERFOWL HUNTER SURVEY 1976-1977

DEAR HUNTER:

Your cooperation is needed to better manage Alaska's waterfowl--now and in the future. By accurately answering the questions below concerning your hunting activities in 1976, you can help insure continued liberal bag limits and good hunting for the future. If you can't remember exact numbers, give your best estimate. Complete the form printed below as soon as possible, and drop this card in the mail. No stamp is necessary. Thank you for your cooperation.

PART I (ALL HUNTERS COMPLETE)

2. DID YOU BUY A DUCK STAMP IN 1976? -----YES ☐ NO ☐
3. DID YOU HUNT FOR WATERFOWL DURING THE 1976-77 SEASON? YES ☐ NO ☐

PART II (COMPLETE ONLY IF YOU ANSWERED YES TO EITHER QUESTION ABOVE)

4. HOW MANY DAYS DID YOU HUNT WATERFOWL?
- AT WHAT PLACE DID YOU HUNT FOR MOST OF YOUR DUCKS?
5. _____
(I.E. PILOT POINT, MINTO FLATS, PYBUS BAY, ETC.)
- AT WHAT PLACE DID YOU HUNT FOR MOST OF YOUR GEESE?

6. _____

COMMENTS _____

PART II (CONT.) HOW MANY OF THE FOLLOWING BIRDS DID YOU SHOOT AND RETRIEVE?

- | | | |
|------------------------------------|----------------------|-----|
| GAME DUCKS ----- | <input type="text"/> | 7. |
| NON-GAME DUCKS ----- | <input type="text"/> | 8. |
| CANADA GEESE ----- | <input type="text"/> | 9. |
| SNOW GEESE ----- | <input type="text"/> | 10. |
| WHITE FRONTED (SPECKS) GEESE ----- | <input type="text"/> | 11. |
| BRANT ----- | <input type="text"/> | 12. |
| EMPEROR GEESE ----- | <input type="text"/> | 13. |
| UNKNOWN KIND OF GEESE ----- | <input type="text"/> | 14. |
| CRANE ----- | <input type="text"/> | 15. |
| NIPE ----- | <input type="text"/> | 16. |

Analyses of Survey Results

The state was divided into 11 harvest areas to facilitate analysis of survey data (Fig. 2). Because the area of residence for each hunter was known, an accurate estimate of days hunted, birds bagged, etc., could be made for each harvest area.

Bias factors influencing reported days hunted and ducks bagged were considered to be: (1) a superstition bias resulting from a tendency not to report the number 13; (2) a memory bias resulting in a tendency to report numbers ending in zero, five and multiples of the daily bag and (3) a memory bias from the unreliability of those hunters reporting large numbers. Bias corrections for the average number of days hunted were made as suggested by Williams (1953). The reported mean season duck bag was reduced by 15 percent, as suggested by Mr. Sam Carney (pers. comm., USFWS, Laurel, Md.).

No bias corrections were made for goose harvest. It is believed that most hunters know exactly how many geese they shoot each season. Therefore, reporting rates may be higher for geese than ducks, as geese are usually considered more of a trophy.

Data from the 1,098 usable waterfowl questionnaires were expanded for total waterfowl hunters on a proportionate basis. Although about 18,501 duck stamps were sold in Alaska according to Fish and Wildlife Service data, only 18,436 people were considered to be potential hunters. The FWS annually measures the proportion of stamps purchased by collectors and about 65 were purchased in Alaska for this purpose (Sorensen et al. 1977b).

RESULTS

Number of Hunters

Because of the number of people in Alaska hunting without duck stamps and the incidence of hunting outside the legal season limits, the assessment of waterfowl hunter activity and waterfowl harvest is complicated (Timm 1972). Although 23 people returned questionnaires which indicated they hunted waterfowl but purchased no duck stamp, these people were not included in the analyses. Data on number of hunters, harvest, etc. in this report are based solely on duck stamp sales and therefore should be considered the sport hunting harvest only.

Of those sampled, 733 people reported that they purchased stamps and hunted 1 day or more. The number of stamp purchasers who did not hunt was 365 (67 percent active hunters). A calculated 12,308 people

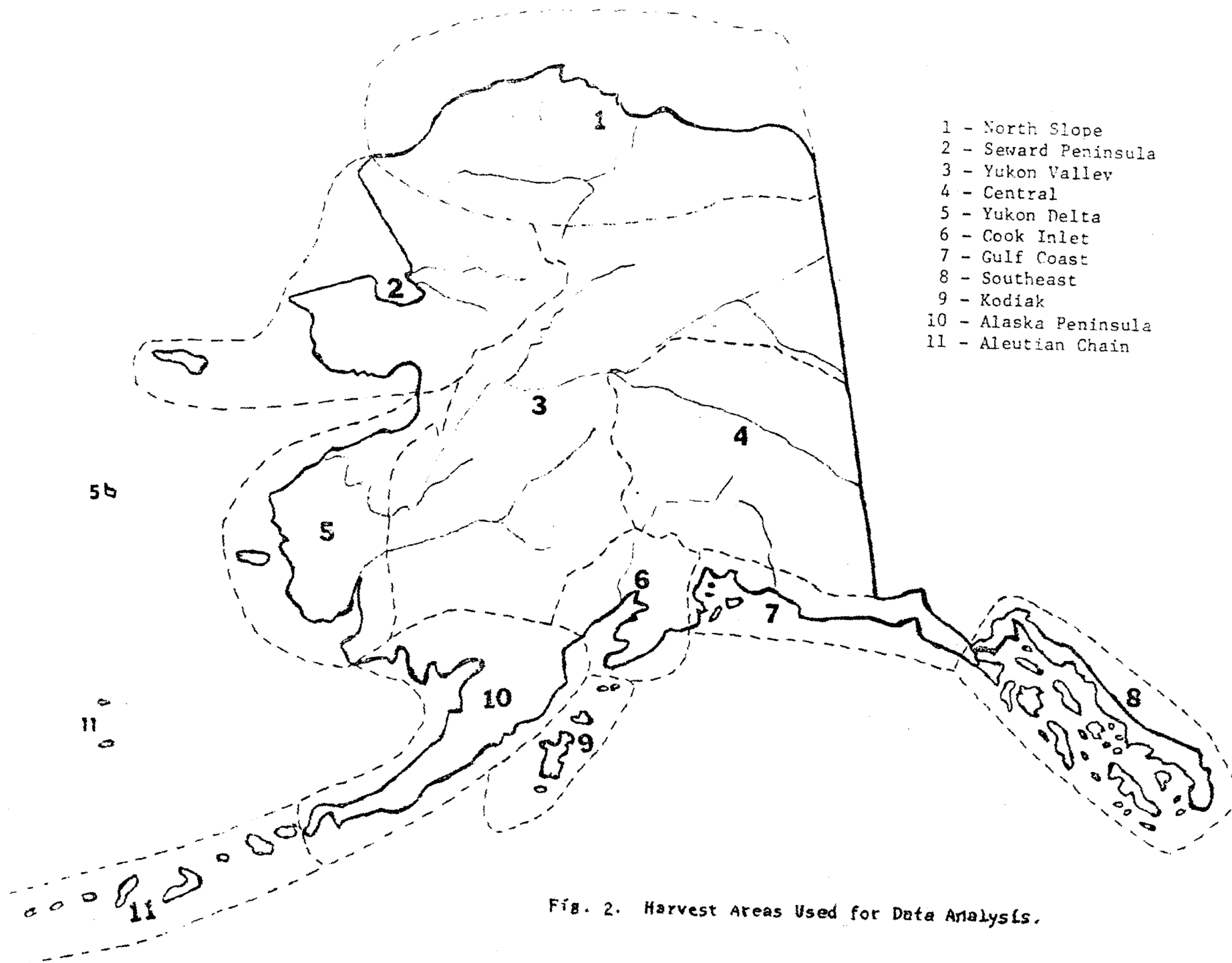


Fig. 2. Harvest Areas Used for Data Analysis.

hunted waterfowl one or more days during the 1976-77 season. Table 1 summarizes these data.

Independent calculations using results of this survey projected duck stamp sales in Alaska to be 18,447, compared to known sales of 18,501. This close correlation (0.3 percent error) is one indication of ample sample size for this survey.

Hunting Activity

Hunters reported hunting an average of 5.9 days during the 1976-77 season. After corrections for bias, each active hunter was calculated to have hunted an average of 5.4 days during the season. This projects to a total of 66,832 waterfowl hunter-days during the 1976-77 season.

Table 2 presents statewide hunter activity, success and birds bagged by harvest area. Table 3 provides projected hunter days and duck and goose harvests for specific hunting areas in the state on which the most activity and harvest occurred. Table 4 summarizes season statistics for the 5-year, 1972-76 period.

Duck Harvest

Magnitude of the Harvest

Hunters reported taking an average of 9.7 ducks this season, compared to 9.8 in 1975. Corrections for bias provide a mean calculated kill of 8.3 ducks per active hunter, compared to 8.4 last year. Reported daily success was 1.7 ducks per day, while calculated daily success was 1.5 birds per day, the same as in 1975.

The projected statewide duck harvest was 102,033 birds, or a 16 percent increase from the 1975 harvest and a 15 percent increase from the 1972-76 5-year average (Table 4). Game ducks represented 92.1 percent (93,972) and other species 7.9 percent (8,061) of the total bag.

Species Composition of Harvest

From 1960 through the 1971-72 season, field bag checks were intermittently conducted in 6 of the 11 harvest areas. Timm (1972) summarized these data. During the 1976-77 season, field checks were conducted in 6 of the harvest areas (Table 5). Pintails, mallards, wigeons, green-winged teal, scaups and shovelers comprised over 94 percent of the total ducks checked.

As described previously, the FWS significantly increased their hunter sample in the parts collection survey during the 1972-76 seasons. Because of random hunter sampling of this survey throughout the season and adequate sample size, it is believed that duck species composition of the harvest estimated by the FWS is the best estimate available for

Table 1. Summary of Alaska waterfowl hunter mail questionnaire survey, 1976-77.

Number of licensed hunters:	Resident - 69,614 (includes 5,064 subsistence)
Number of licensed buyers sampled:	<u>7000</u> (10 %)
Number and proportion of respondents from survey <u>1</u> /:	
	1st mailing <u>3,251</u> (47.0%)
	2nd mailing <u>892</u> (24.6%)
	TOTAL <u>4,143</u> (60.2%)
Number of returns usable for waterfowl calculations: <u>1,098</u>	
Projected number of hunters:	
Duck stamps sold in Alaska:	<u>18,501</u> (18,436 potential hunters)
Number of active hunters:	<u>12,308</u> (66.76 %)
Calculated statewide harvests:	
Ducks:	Game - <u>93,972</u> ; other species - <u>8,061</u> ; Total - <u>102,033</u>
Geese:	Canada - <u>9,547</u> ; emperor - <u>2,592</u> ; brant - <u>907</u> ;
	white-fronted - <u>864</u> ; snow - <u>490</u> ; Total <u>14,400</u>
Cranes:	<u>873</u>
Snipe:	<u>7,003</u>
Hunter Days:	<u>66,832</u>

1/ Estimated rate of deliverable questionnaires only - excludes change of address, insufficient address, deceased, etc.

Table 2. Calculated duck, crane and snipe harvests and hunter activity by harvest area, 1976-77.

Harvest Area	Hunter Days		Game Ducks		Scoters, Eiders, Harlequin and Mergansers		Crane		Snipe	
	% of		% of		% of		% of		% of	
	No.	total	No.	total	No.	total	No.	total	No.	total
North Slope	67	0.1	94	0.1	0	0	0	0	0	0
Seward Pen.	1,403	2.1	1,316	1.4	242	3.0	167	19.2	0	0
Yukon Valley	3,074	4.6	3,665	3.9	89	1.1	84	9.6	35	0.5
Central	11,829	17.7	18,982	20.2	1,757	21.8	235	26.9	203	2.9
Yukon Delta	1,804	2.7	1,785	1.9	0	0	151	17.3	0	0
Cook Inlet	24,928	37.3	38,246	40.7	3,192	39.6	34	3.9	4,146	59.2
Gulf Coast	6,082	9.1	6,954	7.4	669	8.3	202	23.1	1,527	21.8
∞ Southeast	12,966	19.4	18,137	19.3	1,451	18.0	0	0	1,092	15.6
Kodiak	1,204	1.8	1,410	1.5	459	5.7	0	0	0	0
Alaska Pen.	3,408	5.1	3,289	3.5	202	2.5	0	0	0	0
Aleutian Chain	67	0.1	94	0.1	0	0	0	0	0	0
Statewide	66,832	100.0	93,972	100.0	8,061	100.0	873	100.0	7,003	100.0

Table 3. Locations of most hunting activity and greatest waterfowl harvest, 1975-76.

Location	Calculated duck kill and hunter days				Calculated goose kill		
	Ducks		Hunter Days		Location	No. Geese	% of State Total
	No.	% of State Total	No.	% of State Total			
Susitna Flats	11,836	11.6	5,280	7.9	Izembek Lagoon	2,549	17.7
Minto Flats	11,020	10.8	4,411	6.6	Copper R. Delta	1,426	9.9
Palmer-Hay Flats	6,326	6.2	4,945	7.4	Pilot Point	1,354	9.4
Copper R. Delta	4,489	4.4	3,609	5.4	Minto Flats	936	6.5
Kachemak Bay	3,979	3.9	1,604	2.4	Port Moeller	576	4.0
Stikine R. Delta	3,775	3.7	1,337	2.0	Susitna Flats	418	2.9
Redoubt Bay	3,367	3.3	1,470	2.2	Stikine R. Flats	259	1.8
Mendenhall Flats	3,163	3.1	1,871	2.8	Kachemak Bay	259	1.8
Trading Bay	2,551	2.5	735	1.1	Delta Area	259	1.8
Portage Flats	2,449	2.4	1,871	2.8	Redoubt Bay	202	1.4
Duncan Canal	1,428	1.4	668	1.0	Duncan Canal	202	1.4
Blind Slough	1,224	1.2	1,069	1.6	St. James Bay	158	1.1
Rocky Pass	1,020	1.0	334	0.5	Port Heiden	158	1.1
Pilot Point	1,020	1.0	735	1.1	Mendenhall Flats	130	0.9
Chickaloon Flats	816	0.8	668	1.0	Chikaloon Flats	115	0.8
Eielson AFB	816	0.8	936	1.4	Blind Slough	101	0.7
Potter Marsh	510	0.5	668	1.0	Palmer-Hay Flats	72	0.5
Goose Bay	510	0.5	601	0.9	Portage	43	0.3
St. James Bay	408	0.4	200	0.3	Trading Bay	29	0.2
Yakutat Area	408	0.4	267	0.4			
St. James R. Flats							
Chuk Inlet)	306	0.3	200	0.3			
Chuk Inlet)	306	0.3	200	0.3			
Chuk Inlet)	306	0.3	267	0.4			
Kalsin Bay	306	0.3	735	1.1			
Cold Bay	102	0.1	134	0.2			
Salchaket Slough	102	0.1	134	0.2			
Farragut Bay	102	0.1	134	0.2			
Chilkat River	102	0.1	468	0.7			
Port Moeller							
Subtotal	61,237	60.0	35,551	53.2		9,375	65.1
Statewide	102,033	100.0	66,832	100.0		14,400	100.0

Table 4. Comparison of statewide resident waterfowl hunting statistics, 1972-76 and a 5-year average.

Category	Hunting Season					5-year Average
	1972	1973	1974	1975	1976	
Duck stamp sales	14,824	16,449	15,750	16,100	18,501	16,325
Percent active hunters	75.06	68.57	67.57	69.26	66.76	69.44
No. active hunters	10,930	11,150	10,499	10,480	12,308	11,073
No. days per hunter	5.4	5.2	5.1	5.4	5.4	5.3
Total hunter days	59,350	57,868	53,650	57,011	66,832	58,942
No. ducks per hunter	8.4	8.0	6.8	8.4	8.3	8.0
Total duck harvest	91,703	89,534	71,813	87,822	102,033	88,581
No. geese per hunter	0.99	1.65	1.27	1.78	1.17	1.37
Total goose harvest	10,822	18,397	13,334	18,654	14,400	15,121
Total crane harvest	765	602	640	1,642	873	904
Total snipe harvest	3,498	1,661	2,205	4,318	7,003	3,737

Table 5. Duck species composition in the harvest as determined by random field bag checks--Cook Inlet, Central Gulf Coast, Alaska Peninsula, Southeast and Kodiak harvest areas, 1975-76.

Species	Area and Percent Species Composition						All Areas
	Cook Inlet	Central	Gulf Coast	Alaska Peninsula	Southeast	Kodiak	
Pintail	29.3	27.3	-	43.5	23.7	11.1	27.0
Mallard	4.9	21.2	33.3	16.9	28.6	33.3	23.9
Wigeon	41.5	15.7	55.6	24.2	13.1	3.7	16.6
G-W Teal	17.1	12.5	-	6.5	18.5	18.5	14.8
Scaup	-	2.6	11.1	3.2	11.2	3.7	6.6
Shoveler	2.4	9.3	-	0.8	2.6	-	4.6
Bufflehead	2.4	7.6	-	-	1.1	-	3.2
Goldeneye	2.4	2.0	-	-	0.2	22.2	1.5
Gadwall	-	-	-	4.8	-	7.4	0.8
Canvasback	-	1.2	-	-	-	-	0.4
B-W Teal	-	-	-	-	0.6	-	0.3
Scoter	-	-	-	-	0.2	-	0.1
Ruddy Duck	-	0.3	-	-	-	-	0.1
Redhead	-	-	-	-	0.2	-	0.1
Ringneck	-	0.3	-	-	-	-	0.1
	100.0	100.0	100.0	100.0	100.0	99.9	100.0
Sample Size	41	344	9	124	465	27	1010

1976-77 statewide game duck projections. However, it is also believed that hunters somewhat bias this survey by tending not to send in wings of nongame ducks. The State's hunter questionnaire mail survey is believed to provide the best estimate of nongame duck kill.

Table 6 provides what is believed to be the most reliable estimate of duck harvest by species in Alaska, during the 1976-77 season. A combination of FWS and State mail survey data is used.

Goose Harvest

Hunters reported taking an average of 1.17 geese per active waterfowl hunter. This is below hunter success for the 1972-76, 5-year average of 1.37 birds (Table 4). The 1976-77 statewide goose harvest was calculated to be 14,400 birds.

Field bag checks are not considered to be adequate for determining statewide or even regional species composition of the goose kill. Numbers of geese checked are few and bag checks are not conducted in enough locations to adequately sample harvests of all species.

Although hunters were not asked to report goose kill by species in the 1971-72 mail questionnaire, they have been asked to do so in all surveys since then. Table 7 presents calculated goose harvest by species and by harvest area for 1976-77. Canada geese made up 66 percent of the reported state goose harvest and emperor geese comprised 18 percent of the total bag. Black brant, white-fronted geese and snow geese made up 6, 6 and 3 percent, respectively, of the total goose harvest.

Crane Harvest

Hunters reported taking an average of 0.07 cranes per active hunter, as compared to 0.16 birds per hunter in 1975. The statewide calculated crane harvest was 873 birds, compared to 1,642 the previous year. Table 2 summarizes crane harvest by area. The 1976-77 harvest was about average, compared to the 5-year average harvest.

Snipe Harvest

An average of 0.57 snipe reported per active hunter resulted in a calculated statewide harvest of 7,003 birds. During the 1975-76 season hunters reported 0.41 birds per person, for a total harvest of 4,318 snipe. Table 2 summarizes snipe harvest by area. The 1976-77 snipe harvest was the largest attained during the past five hunting seasons.

DISCUSSION

Bias corrections for reported season duck bags were made using the same methods as last year and the same as the FWS method. Reported

Table 6. Estimate of statewide duck harvest by species, 1976-77.

Species	Harvest ^{1/}	Percent of Total ^{2/}
Mallard	26,529	26.0
Pintail	23,672	23.2
G-W Teal	13,468	13.2
Widgeon	13,162	12.9
Shoveler	7,448	7.3
Scaup (both spp.)	4,183	4.1
Goldeneye (both spp.)	2,347	2.3
Bufflehead	1,633	1.6
Gadwall	816	0.8
Canvasback	408	0.4
B-W Teal	306	0.3
Total game ducks	93,972	92.1
Total other ducks ^{3/}	8,061	7.9
Total ducks	102,033	100.0

^{1/} Total harvest from ADF&G mail survey

^{2/} Percent species composition from 1976 FWS wing collection data (Sorensen et al. 1977a) except for other duck species

^{3/} Mergansers, eiders, scoters, old squaw, harlequin

Table 7. Calculated goose harvest by species by harvest area, 1976-77.

Area	S P E C I E S A N D N U M B E R											
	Canada		Emperor		Brant		Snow		Whitefront		Total	
	No.	% of species total	No.	% of species total	No.	% of species total	No.	% of species total	No.	% of species total	No.	% of total harvest
North Slope	-	-	-	-	-	-	-	-	-	-	-	-
Seward Pen.	382	4.0	135	5.2	319	35.2	119	24.2	-	-	955	6.6
Yukon Valley	650	6.8	-	-	-	-	17	3.4	67	7.7	734	5.1
Central	1,155	12.1	-	-	-	-	51	10.4	281	32.6	1,487	10.3
Yukon Delta	640	6.7	49	1.9	-	-	17	3.4	117	13.5	823	5.7
Cook Inlet	1,107	11.6	-	-	-	-	17	3.4	183	21.2	1,307	9.1
Gulf Coast	1,642	17.2	-	-	-	-	17	3.4	117	13.5	1,776	12.3
Southeast	2,291	24.0	-	-	-	-	51	10.4	-	-	2,342	16.3
Kodiak	-	-	-	-	51	5.6	-	-	-	-	51	0.4
Alaska Pen.	1,680	17.6	2,390	92.2	537	59.2	201	41.4	99	11.5	4,907	34.1
Aleutian Chain	-	-	18	0.7	-	-	-	-	-	-	18	0.1
Statewide	9,547	100.0	2,592	100.0	907	100.0	490	100.0	864	100.0	14,400	100.0

harvest was reduced by 15 percent as described by S. Carney (pers. comm.). The FWS uses a constant 15 percent reduction factor in Alaska. This represents a long-term average rate which was derived by using the Williams (1953) method.

Although the FWS does not correct for hunter bias in reported days hunted per season (S. M. Carney, pers. comm.), bias corrections were made in the ADF&G survey. Carney believes that if a hunter can remember anything about his hunting, he can remember the number of days he hunted. A review of the frequency of reported days hunted per season in Alaska indicates this may be a false assumption. People report hunting those number of days divisible by five (5, 10, 15, 20 etc.) much more frequently than other day classes. Also, very few people report hunting 13 days during the season (superstition bias). Therefore, bias corrections for days hunted were made as described by Williams (1953), which resulted in a 7.3 percent reduction in reported days hunted.

A comparison of the results of our 1976 mail survey and the 1976 estimates of waterfowl harvest and hunter activity made by the FWS (Sorensen et al. 1977b) shows, except for number of active hunters, total hunter days and goose harvest estimates by species, fairly close correlation (Table 8). Unlike previous years State and Federal estimates of percent active hunters varied significantly (66.8 percent and 73.0 percent, respectively). This, in combination with the lower State estimates of average days hunted per season--5.4 vs 6.2 -- resulted in a 25 percent difference in estimated total hunter days (66,832 State and 83,440 Federal). Although our estimate of 14,400 total geese harvested was only 4 percent higher than the Federal estimate, harvest estimates for most species varied significantly (see Table 8).

The ADF&G mail survey, since its conception in 1971, has consistently projected higher goose harvests than the FWS survey. This is due, in part, to the FWS correcting for bias in reported goose bag. However, we believe there is a more significant factor involved. The State survey probably is more random in sampling, as the FWS derives most of their hunter sample from the larger cities and towns in Alaska. The ADF&G survey samples a cross section of license buyers including subsistence license holders.

It is believed that our mail survey provided the best estimate of goose harvest by species in Alaska during the 1976-77 season. The FWS has considered going to a hunter reporting system to estimate harvest by species, as opposed to the present system where people send in goose tails. For various reasons they are not satisfied with the present system (S. M. Carney, pers. comm.).

The Alaska Peninsula was, as it has been the past 6 years, the major goose harvest area in the State. Over one-third of the total harvest occurred there. Still relatively unknown to people outside

Table 8. A comparison between ADF&G and F&WS waterfowl hunter success surveys, 1976-77^{1/}

			<u>ADF&G</u>	<u>FWS^{2/}</u>
Percent active hunters			66.8	73.0
Number of active hunters			12,308	13,458
Days per active hunter			5.4	6.2
Total hunter days			66,832	83,440
Duck bag per active hunter			8.3	7.8
Total duck harvest			102,033	104,972
Goose bag per active hunter			1.2	1.0
Total goose harvest			14,400	13,855
Goose harvest by species:	<u>No.</u>	<u>% of total</u>	<u>No.</u>	<u>% of total</u>
Canada	9,547	66.3	7,024	50.7
Emperor	2,592	18.0	3,824	27.6
Black brant	907	6.3	1,635	11.8
White-fronted	864	6.0	1,275	9.2
Snow	490	3.4	97	0.7

^{1/} For hunter 16 years or older

^{2/} Sorenson et al. 1977b

Alaska, the Alaska Peninsula has some of the world's best goose hunting. Reeve Aleutian Airlines has, in recent years, sponsored two, 2-day charters to Cold Bay for about 65 hunters on each trip. In 1976 these charters were expanded to 3-day trips.

A comparison of the estimates of duck and goose harvest and hunter days on one area (Izembek Lagoon) as calculated from this survey to those projected from local, intensive field bags checks can be made. John Sarvis, Izembek NWR manager, estimated retrieved harvests of 362 ducks, 1,628 geese and 966 hunter days from the refuge. The State survey showed 306 ducks, 2,549 geese and 735 hunters days (Table 3).

The Minto and Copper River Delta areas have also been growing in popularity as duck and goose hunting locations. As the human population increases in the Fairbanks and Cook Inlet-Cordova areas, more and more hunting pressure is anticipated.

Duck stamp sales, number of active hunters, duck harvest and snipe harvest all increased significantly in 1976 (Table 4) from previous years and reached new highs. These phenomena are probably due to an increasing human population in Alaska. Duck and snipe harvests and hunter days probably will increase proportionately to number of active hunters while goose and crane harvests may not. Goose and crane hunting is a more specialized pursuit and harvests of these birds should lag behind increases in hunter numbers.

The daily bag and possession limits of game ducks in Alaska were 7 and 21, respectively, in 1976-77, compared to 6 and 18 in previous seasons. This liberalization did not result in a significant increase in the individual hunter's average seasonal duck bag. The average bag was 8.3 birds in 1976-77, compared to 8.4 in 1975-76 and 8.0 ducks in the previous 5-year average. Also, the proportion of game ducks in the total harvest was less in 1976-77 than in previous years.

About 60 percent of the duck harvest and 65 percent of the state's total goose harvest occurred on the more well known hunting areas in Alaska (Table 3). However, estimates in Table 3 are probably minimal as some hunters do not report the area of most hunting activity.

This survey did not sample hunters under age 16 who did not purchase a hunting license. The FWS estimates that an additional 8 percent total hunter days and 5 percent total duck harvest can be attributed to juvenile hunters each year.

SUMMARY

1. Total calculated duck, goose, crane and snipe harvests in Alaska during the 1976-77 season were: 102,033; 14,400; 873; and 7,003

birds, respectively. The harvests of ducks and snipe were all time highs.

2. Hunters spent a calculated 66,832 days afield during the 1976-77 season, also an all-time high.
3. Hunters shot an average of 8.3 ducks each, and hunted an average of 5.4 days during the season.
4. Mallards, pintails, g-w teals and wigeons constituted about 75 percent of the total duck harvest.
5. Canada geese comprised two-thirds of the State's goose harvest.

DUSKY CANADA GOOSE STUDIES

Production, Fall Flight and 1977 Breeding Population

The January 1976 mid-winter inventory of dusky Canada geese (*B. c. occidentalis*) in Oregon's Willamette Valley did not provide a reliable estimate of the post-season dusky goose population (see Timm 1976). Therefore, spring surveys were flown on the Copper River Delta resulting in a calculated breeding population of 21,870 geese in 1976.

Dusky Canada goose production in 1976 was average or a little below. Until the last week of May the weather was cold and rainy, which probably delayed nesting. However, from the last week of May until mid-June conditions were excellent. On May 18 the ponds on the outer Delta had 60 to 75 percent ice cover and the uplands had about 10 percent snow cover.

Because Bob Bromley had completed his M.S. study and was not on the Delta, Julius Reynolds and Dan Timm worked his nest plots on June 8-10, 1976. For 168 nests (both on and off study plots) which had not been destroyed by predators, we found an average clutch of 4.8 eggs per nest. This average is slightly below the previous 10-year average of 4.9 eggs per nest. Of the 168 nests inspected, only one was judged to have hatched by June 8-10. Of the 151 total nests on the study areas, 12 (8 percent) had been destroyed and 3 (2 percent) were judged to have been deserted. Since incubation was still in progress, it can not be assumed that nest hatching success was 90 percent.

On July 27, 1976 ADF&G and USFWS personnel made an aerial assessment of goose productivity on the Copper River Delta. Calculated production for 1976 and previous years is presented in Table 9. A total of 7,092 geese were counted on July 27 during the aerial survey. Table 9 also presents a summary of other dusky Canada goose population data collected since 1971.

Table 9. Summary of population data for dusky Canada geese, 1971-77.

<u>Year</u>	<u>From Aerial Surveys</u>						
	<u>Mid-winter</u>	<u>Breeding Pop.^{2/}</u>	<u>% Yg.</u>	<u>% Non-Prod. Ad.^{3/}</u>	<u>No. Yg. Produced</u>	<u>Fall Flight</u>	<u>Harvest^{4/}</u>
1971	20,850	20,065	16.2	79.8	3,880	23,945	5,995
1972	17,950	17,275	10.6	71.7	2,050	19,325	3,450
1973	15,875	15,280	36.0	64.6	8,595	23,875	4,875
1974	19,000 ^{1/}	18,290	51.4	35.7	19,345	37,635	12,070
1975	26,550	25,565	17.9	84.5	5,575	31,140	9,010
1976	22,725 ^{1/}	21,870	24.2	54.2	6,890	28,850	6,350
1977	22,500	21,650					

^{1/} Calculated from breeding grounds survey.

^{2/} Mid-winter less 0.0375 mortality (Chapman et al. 1969).

^{3/} Percent adults in flocks having no young.

^{4/} Fall flight less mid-winter inventory.

Banding and Recoveries

During summer 1976, 1,294 dusky geese were banded by personnel from the A.D.F.&G., the U.S.F.W.S., the U.S.F.S. and the University of Alaska. Large numbers of people (Y.C.C. personnel) herded the birds into sloughs. Boats were then employed to drive the geese into a trap.

The following number of geese were banded in 1976 and recovered during the 1976-77 season:

	<u>Leg Banded Only</u>		<u>Neck-Collared Birds</u>	
	<u>Adults</u>	<u>Young</u>	<u>Adults</u>	<u>Young</u>
Number Banded	358	334	100	502
Number Recovered	33	46	14	62
Percent Recovered	9.2	13.8	14.0	12.4

The following are first year recovery rates for dusky Canada geese banded since 1971:

<u>Year</u>	<u>Leg Banded</u>		<u>Neck Collared</u>	
	<u>Locals</u>	<u>Adults</u>	<u>Locals</u>	<u>Adults</u>
1971	15.5%	2.8%	--	--
1972	--	7.7	--	--
1973	10.0*	3.4	16.7%*	7.1%
1974	17.1	7.6	16.0	4.1
1975	8.3	8.0	16.4	13.0
1976	13.8	9.2	12.4	14.0

* Small sample size.

There are some unexplained aspects of the data above, such as: why are recovery rates higher for leg-banded birds than for neck-collared geese in two different years? Also, why are the recovery rates higher for collared adults than for collared locals in 1976? A thorough analysis of band recovery data is planned for in 1978, with the help of Dr. David Anderson, Utah State University.

The recovery distribution of bands reported from birds shot or found dead during hunting seasons by state-province since 1973 is as follows:

	<u>Oregon</u>	<u>Alaska</u>	<u>Washington</u>	<u>British Columbia</u>
1973	68.1%	17.4	10.1	4.4
1974	67.8	11.5	14.4	6.3
1975	67.3	14.0	13.5	5.2
1976	65.5	10.0	13.3	11.2

COOK INLET WATERFOWL SURVEYS

Breeding Waterfowl Survey

As part of an effort to document waterfowl values on coastal marshes of Cook Inlet, especially in view of the recently created and proposed refuges on some of these areas, a breeding waterfowl survey was made on June 6, 1977. Areas surveyed in 1977 were: Palmer-Hay Flats, Goose Bay, Susitna Flats, Trading Bay, Redoubt Bay, and Chickaloon Flats. Spring chronology in the Cook Inlet area in 1977 was 7-10 days "early," and nesting conditions should have been excellent. Breeding waterfowl surveys have been flown on Cook Inlet marshes since 1975.

Procedures

The coastal waterfowl habitat (sedge flats) were first encompassed by lines drawn on 1 inch:4 mile maps (see Timm 1976). The land area within these lines was then determined using a planimeter. Transect lines were drawn on the maps in an attempt to sample representative habitat types in each area. Each transect was broken into 4-mile segments which were individually numbered. More precise duck distribution data could be attained from these small segments.

Dan Timm and Paul Arneson (both of ADF&G) flew the surveys and the same survey techniques were used as are employed by the USFWS except the pilot did no counting. Data were analyzed for each survey area and then expanded for the total of all areas. Visibility rates were applied for each species; rates were provided by Jim King, USFWS.

Results

Total 1977 calculated duck breeding populations were: Palmer - 3,427; Goose Bay - 784; Susitna - 13,273; Chickaloon - 1,776; Trading Bay - 11,553; and Redoubt Bay - 19,215. Dabblers (46,342) comprised 93 percent of the 50,030 ducks on all areas. Pintails, mallards, green-winged teal and wigeons comprised over 85 percent of the total calculated birds present. Table 10 summarizes the species composition and number of birds for all areas surveyed. Table 11 presents size of the areas surveyed, percent of each area sampled and duck densities on each area since 1975. The records of birds seen on each 4-mile segment are in the Anchorage office files.

In 1977 Trading Bay had the greatest density of breeding ducks ($108/\text{mi}^2$) and the Chickaloon Flats had the lowest ($45.5/\text{mi}^2$). The average density of ducks on all coastal habitat in 1977 was $86.0 \text{ birds}/\text{mi}^2$.

Table 10. Calculated bird populations on Cook Inlet coastal marshes, June 6, 1977.

Species	Palmer-Hay		Goose Bay		Susitna		Chickaloon		Trading Bay		Redoubt Bay		Total	
	No.	% of Tot.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Pintail	1,945	56.8	166	21.2	8,430	63.5	756	42.6	5,805	50.2	6,307	32.8	23,409	46.8
Mallard	337	9.8	97	12.4	2,651	20.0	98	5.5	1,996	17.3	3,205	16.7	8,384	16.7
Green-winged Teal	101	2.9	292	37.2	647	4.9	594	33.5	2,243	19.4	2,670	13.9	6,547	13.1
Widgeon	58	1.7	199	25.4	979	7.4	253	14.2	578	5.0	2,968	15.5	5,035	10.1
Shoveler	533	15.6	24	3.0	261	1.9	--	--	164	1.4	1,655	8.6	2,637	5.3
Gadwall	51	1.5	--	--	--	--	75	4.2	204	1.8	--	--	330	0.6
Total Dabblers	3,025	88.3	788	99.2	12,968	97.7	1,776	100.0	10,990	95.1	16,805	87.5	46,342	92.6
Scaups	344	10.0	8	0.8	305	2.3	--	--	114	1.0	1,797	9.4	2,568	5.1
Goldeneyes	--	--	--	--	--	--	--	--	--	--	119	0.6	119	0.2
Mergansers	32	0.9	--	--	--	--	--	--	449	3.9	--	--	481	1.0
Canvasback	26	0.8	--	--	--	--	--	--	--	--	262	1.3	288	0.6
Redhead	--	--	--	--	--	--	--	--	--	--	232	1.2	232	0.5
Total Divers	402	11.7	8	0.8	305	2.3	--	--	563	4.9	2,410	12.5	3,688	7.4
Total Ducks	3,427	100.0	784	100.0	13,273	100.0	1,776	100.0	11,553	100.0	19,215	100.0	50,030	100.0
Swan	--	--	--	--	23	--	--	--	86	--	151	--	260	--
Canada Goose	171	--	75	--	478	--	--	--	43	--	--	--	767	--
White-fronted Goose	--	--	--	--	--	--	--	--	--	--	86	--	86	--
Sandhill Crane	--	--	--	--	45	--	--	--	171	--	517	--	733	--
R-T Loon	--	--	--	--	--	--	--	--	86	--	--	--	86	--
Arctic Loon	21	--	--	--	91	--	--	--	--	--	--	--	112	--

Table 11. Total area, sample size and breeding birds per square mile on Cook Inlet coastal marshes, 1975, 1976 and 1977.

Area	Size in Mile ²	% of Area Sampled	Birds Per Mile ²								
			Dabblers			Divers			Total		
			1975	1976	1977	1975	1976	1977	1975	1976	1977
Palmer-Hay Flats	42.7	18.7	62.1	37.1	70.8	14.4	11.5	9.4	76.5	48.6	80.2
Goose Bay	9.2	32.6	70.1	42.4	84.6	3.7	4.0	0.9	73.8	46.4	85.5
Susitna	136.0	8.8	54.2	83.6	95.4	6.7	12.7	2.2	60.9	96.3	97.6
Chickaloon	39.0	12.8	39.4	21.6	45.5	-0-	-0-	-0-	39.4	21.4	45.5
Trading Bay	107.0	9.3	NS	93.5	102.7	NS	7.7	5.3	NS	101.2	108.0
Redoubt Bay	248.0	9.3	NS	65.5	67.8	NS	9.2	9.7	NS	74.7	78.5
Fox River Flats	16.6	36.1	NS	26.4	NS	NS	19.7	NS	NS	46.1	NS
Port e	18.3	32.8	NS	101.8	NS	NS	21.6	NS	NS	123.4	NS

Note: NS = Not Surveyed.

Discussions and Conclusions

The 1977 survey confirmed what was found in 1975 and 1976: coastal marshes in Cook Inlet are much more important to breeding birds than surrounding habitats of similar size. King and Lensink (1971) estimated an average of 12.1 ducks present per square mile in Kenai-Susitna habitat, or 26,700 birds in 2,200 square miles of habitat. In 1977 we found 50,030 ducks in 581.9 square miles of habitat, or 86.0 ducks per square mile. This compares to 45,903 ducks or 78.9 birds/mi² in 1976 on the same six areas (9 percent increase).

The 1977 statewide breeding duck survey showed that record numbers of ducks were present in Alaska (King and Bartonek 1977). A comparison between 1976 and 1977 for that survey showed an increase of 66 percent in 1977, using only those species observed on our Cook Inlet survey in 1977.

It is commonly believed that ducks which overfly southern production areas because of drought (as occurred in 1977) are not as productive as they would have been on the nesting areas. An indication of this may be seen by comparing the ratios of birds observed to be in pairs, flocks or as lone males in 1976 and 1977 on Cook Inlet. These ratios were:

	<u>Lone Male</u>		<u>Pairs</u>		<u>Flocked Birds</u>	
	<u>1976</u>	<u>1977</u>	<u>1976</u>	<u>1977</u>	<u>1976</u>	<u>1977</u>
Dabbler	54%	48%	28%	23%	18%	29%
Diver	14%	21%	39%	33%	47%	47%

Even though spring 1977 in the Anchorage area was one of the earliest on record, the proportion of dabblers in flocks was much greater than in 1976 (29 percent vs 18 percent), which was also an early year. Also, the percent of dabblers in pairs or as lone males was less in 1977 than in 1976. Considering that the 1977 spring was early and the 1977 survey was conducted nearly two weeks later than the 1976 survey, it appears that a substantial proportion of dabblers were in flocks of probably non-breeding birds. However, an unknown number of females may have already attempted to nest and failed by the time the 1977 survey was made. This may have increased the flocked bird ratio if the hens came to coastal areas after unsuccessful nesting attempts. The distribution of divers by pairs, flocks and lone males was similar for both years.

The calculated Canada goose population in Cook Inlet was 767 birds (Table 11), compared to 2,484 in 1976 (Timm 1976). The estimate in 1977 may be close to actual numbers as a reliable count in 1974 indicated that about 2,000 Canadas were present in Cook Inlet, post-production.

The 1977 pre-nesting population estimate did not include 50-60 adults on Potter Marsh. Goose production there resulted in over 1 young per adult in 1977.

The estimate of 733 sandhill cranes in Cook Inlet is probably high and may have resulted from a peculiarity of the survey. However, there were obviously more cranes on Cook Inlet marshes in 1977 than in 1975 and 1976, judging from casual observations as well as the formal counts.

Bird Banding

In our continuing efforts to learn more about the distribution of ducks using the local Anchorage area, 42 ducks were banded on Elmendorf AFB by Air Force personnel in 1976. Some of these birds were probably migrants as they were captured in late August. Since 1974, 217 ducks have been banded on Elmendorf, Lake Hood, and Potter Marsh. See Timm (1975 and 1976) for a summary of the recoveries from these banded birds.

During the winter of 1976-77 ADF&G employees Ron Modafferi and Jim Riis banded passerine bird species in the Anchorage city limits: 432 common redpolls, 27 black-capped chickadees, 12 dark-eyed juncos and 6 boreal chickadees. No recoveries from these birds have been reported.

LESSER CANADA GOOSE STUDIES

An aerial survey in 1974 documented a large (estimated 2,000) population of lesser Canada geese summering on tidal areas of Upper Cook Inlet (Timm 1975). Efforts to document some aspects of these birds' life history were made in 1974, 1975 and 1976 through banding on Potter Marsh and the Palmer Hay Flats. Adult birds captured during the banding operations were measured and compared to measurements of birds of known subspecies. Dr. John Aldrich, of the National Museum, Washington, D.C., also examined the measurements and two specimens. Both Aldrich and this author agree that the subspecies of Canada goose nesting in Upper Cook Inlet is parvipes.

Since 1974, 320 geese have been banded. A helicopter was used all three years to help capture the geese (Timm and Bromley 1976). A summary of geese banded to date follows:

<u>Year</u>	<u>Local</u>	<u>Adults</u>	<u>Total Geese</u>
1974 (Potter Marsh)	122	53	175
1975 (Palmer Hay Flats)	35	18	53
1976 (Anchorage International Airport Flats)	<u>67</u>	<u>25</u>	<u>92</u>
All Years	224	96	320

The numbers of the banded geese shot during open hunting seasons and reported follow:

<u>Year Banded</u>	<u>Hunting Season of Recovery</u>					
	<u>1974-75</u>		<u>1975-76</u>		<u>1976-77^{1/}</u>	
	<u>Adult</u>	<u>Local</u>	<u>Adult</u>	<u>Local</u>	<u>Adult</u>	<u>Local</u>
1974	5	3	4	3	6	0
1975	-	-	0	1	3	2
1976	-	-	-	-	2	18

^{1/} Recoveries through 8/31/77 FWS IBM run

Of the 47 total recoveries, 42 (89%) have occurred in Oregon's Willamette Valley; 3 (6%) came from the immediate Anchorage area; and 2 (5%) were reported from Washington along the Columbia River. Nearly all of the recoveries in Oregon came from the immediate vicinity of Baskett Slough NWR.

All of the Anchorage area recoveries occurred on September 1, 1975. For the 44 recoveries to the south of Alaska, the percent recovery

distribution by time period was: October--9 percent; November 1 to 15--11 percent; November 16 to December 15--56 percent; and December 16 on--24 percent. From these data it appears that although the locally raised Canada geese in Upper Cook Inlet probably move out of the area late in August or in early September, most do not reach their Willamette Valley wintering grounds until after mid-November.

In 1974 9 wild goslings were raised in captivity and banded and released on Potter Marsh. Of these 9 birds, 4 were reported shot (44%) during the 1975 season. Two recoveries came from the Anchorage area; one was from Queen Charlotte Island in British Columbia; and the other occurred in the Baskett Slough area. These 4 recoveries are not included in the 47 recoveries of wild Canada geese.

Cold Bay

No Canada geese were banded at Cold Bay in 1976. Although a field of wheat and oats was planted near Outer Marker to attract geese, the birds' pattern of feeding changed from that observed in 1974 and 1975 (possibly due to the berry crop and hunter harrassment). Also, less than 50 percent of the normal number of Canada geese used the Izembek Lagoon area in 1976, as confirmed by an aerial survey showing 29,000 Canadas present on October 17, compared to 73,500 birds in 1975 (Timm 1976).

Night lighting was tried in an attempt to catch Canada geese. We found that although emperor geese, brant and some ducks could be caught easily, Canada geese could not be approached close enough for capture.

During fall 1976 (and 1975) an extensive set of measurements were taken on Canada geese in hunters' bags. These data will be used to better define what subspecies of goose is using the area and will also help to differentiate Aleutian Canada geese (*B.c. leucopareia*) from other subspecies.

ALEUTIAN CANADA GOOSE STUDIES

Recovery Team and Recovery Plan

In early 1975 the Director, U.S. Fish and Wildlife Service, appointed a 6-man Aleutian Canada Goose Recovery Team. The Team's responsibilities (like those of other Teams working on rare and endangered species) are to recommend the actions which are necessary to cause the Aleutian Canada goose to increase in numbers and to eventually be removed from the rare and endangered list. These recommendations go to the USFWS. The Recovery Team is made up of four USFWS personnel and State biologists from the California and Alaska Departments of Fish and Game. Dan Timm is Alaska's representative.

The Recovery Team has written a Recovery Plan for the subspecies. The objectives of this plan are to: 1) sustain the wild population of Aleutian geese which nest on Buldir Island at the spring 1977 level or greater (1,190 geese); and 2) to establish three additional breeding populations on Aleutian Islands which were formally inhabited by geese. When two islands are restocked with 50 or more nesting pairs the subspecies can be delisted to threatened. The third island will constitute a "secure" status for the subspecies. The islands scheduled for restocking are Agattu, Nizki-Alaid, Kanaga and possibly Amchitka.

During the period July 1, 1976 to June 30, 1977 three Recovery Team meetings were attended by Dan Timm. Travel expenses for out-of-state meetings are paid by the USFWS.

Since the Recovery Team was created Timm has assumed the responsibility for coordinating radio-telemetry work and getting measurements from various subspecies of Canada geese analyzed. Radios on neck collars may be placed on geese in 1978 if a suitable package can be developed. To assist in the identification of individual Aleutian geese, measurements from over 1,350 known subspecies of Canada geese in Alaska are being analyzed statistically by Douglas Johnson, USFWS, Jamestown, North Dakota. Hopefully a simple "key" can be devised to assist people with the categorizing of Aleutian Canada geese and other subspecies of white-cheeked geese.

INGESTED LEAD SHOT STUDIES

During the 1974 waterfowl season the first ingested lead shot study in Alaska was conducted (Timm 1975). The results of that study indicated that on many areas in Alaska ducks were not ingesting lead shot through normal feeding activities. However, a few of the heavily hunted areas in southcentral Alaska were identified as being possible problems. For example, in 1974 25.3 percent of all duck gizzards collected from the Palmer-Hay Flats carried ingested shot. Also, those ducks in Alaska found with shot apparently had the highest average number of pellets per gizzard of ducks examined anywhere. However, from the birds' good physical condition and lack of gizzard stress, it appeared that ducks in Alaska were not being poisoned by the ingested pellets.

During the 1975 season additional gizzards were collected as well as livers and wing bones from ducks shot on the Susitna Flats and the Palmer Hay Flats. Analyses of these tissues indicated that most ducks which were ingesting lead shot were not being harmed in Alaska, probably due to biochemical dietary influences (Timm 1976).

During the 1976-77 waterfowl season emphasis was placed on collecting gizzards from areas where few had been collected in 1974 and 1975. The methods used in collecting gizzards and analyzing them were the same as those described by Timm (1975). A total of 939 duck gizzards were collected during the 1976-77 season and analyzed for the presence of ingested lead shot.

Rather than presenting individual years' data, it is appropriate to combine years which will present a more comprehensive picture of the lead shot studies to date. Since 1974, 2,169 duck gizzards have been analyzed from 29 hunting locations in Alaska. A summary of the number collected by area and the percent ingestion rate of lead shot is presented in Table 12.

Table 13 presents a summary of the ingestion rates by duck species by area where ingested shot was found. As can be seen in this table, the ingestion rates for mallards, pintails and scaups on some areas are quite high.

The USFWS has proposed for the Pacific Flyway a program of conversion to steel shot on some areas where lead shot poisoning problems may exist, during the 1978-79 waterfowl season. During late summer 1977 a letter was sent by Dr. Ronald Skoog, ADF&G Commissioner, to Mr. Kahler Martinson, Region I Director, USFWS. This letter, which describes the State's efforts in relating to the lead-steel shot issue and the current position regarding a conversion to steel shot, is presented below.

Dear Mr. Martinson:

During the 1974, 75 and 76 waterfowl seasons the Department of Fish and Game, assisted by other agencies and private citizens, collected

Table 12. Incidence of ingested lead shot in duck gizzards by area, 1974, 1975 and 1976 seasons.

Area	Total No. Gizzards Examined	With Ingested Shot	
		Number	% of total
Stikine River Delta	420	2	0.5
Mendenhall Wetlands	110	1	0.9
Baranof Island	96	0	0
Other Southeast	75	0	0
Total Southeast	701	3	0.4
Copper River Delta	220	8	3.6
Yakutat Area	9	0	0
Total Gulf Coast	229	8	3.5
Palmer-Hay Flats, Mat. Valley	273	64	23.4
Susitna Flats	203	21	10.3
Potter Marsh	53	2	3.8
Eagle River Flats	22	2	9.1
Kenai Peninsula	47	1	2.1
Other Cook Inlet	4	0	0
Total Cook Inlet	602	90	15.0
Kalsin Bay	49	1	2.0
Middle Bay	22	0	0
Other Kodiak	8	0	0
Total Kodiak	79	1	1.3
Izembek Lagoon	102	0	0
Naknek River	116	0	0
Other Alaska Peninsula	7	0	0
Total Alaska Peninsula	225	0	0
Minto	314	10	3.2
Salchaket Slough	13	3	23.1
Other Interior	6	0	0
Total Interior	333	13	3.9
	2,169		

Table 13. Incidence of ingested lead shot by duck species by area in Alaska, 1974, 1975 and 1976 waterfowl seasons.

Area	Mallard		Pintail		Shoveler		Unknown Dabbler		Scaup		Canvasback	
	Sample size	Percent with shot	Sample size	Percent with shot	Sample size	Percent with shot	Sample size	Percent with shot	Sample size	Percent with shot	Sample size	Percent with shot
Palmer-Hay Flats	67	44.8	78	34.6	38	0	0	-	10	40.0	9	33.3
Susitna Flats	17	35.3	30	10.0	16	0	83	8.4	19	21.1	4	25.0
Minto	64	7.8	73	2.7	32	3.1	0	-	15	13.3	4	0
Salchaket Slough	8	25.0	5	20.0	0	-	0	-	0	-	0	-
Potter Marsh	11	9.1	16	6.2	0	-	0	-	0	-	0	-
Copper River Delta	74	1.4	42	2.4	15	6.7	0	-	10	50.0	0	-
Chickaloon Flats	6	0	7	14.3	0	-	0	-	10	0	1	0
Eagle River Flats ^{1/}	13	7.7	1	100.0	0	-	4	0	0	-	0	-
Stikine River Delta	120	0.8	85	1.2	11	0	89	0	1	0	0	-
Mendenhall Wetlands	15	0	9	0	0	-	3	0	53	1.9	0	-
Kodiak ^{2/}	15	6.7	5	0	1	0	0	-	2	0	0	-

^{1/} InCook Inlet

^{2/} Primarily Kalsin and Middle Bays

and analyzed 2,169 duck gizzards from 29 hunting areas in Alaska, to assess lead shot ingestion. Emphasis was placed on major waterfowl harvest locations. Data which we have collected to date indicate that the situation in Alaska isn't as simple as originally supposed.

There are four basic criteria which will presumably be used to determine steel shot areas for the 1978-79 season. These are: 1) significant demonstrated mortality from lead shot poisoning; 2) presence and availability of lead shot in waterfowl feeding areas; 3) hunting pressure as an indicator of shot deposition; and 4) the ingestion rates of lead shot for mallards and pintails.

As has been demonstrated in numerous other studies, and in Alaska, the incidence of ingested shot cannot be taken at face value as an indicator of lead shot poisoning. For that matter neither can criteria 2 and 3. To assist in the interpretation of our data we had analyzed duck livers and wing bones for presence of stored lead. Therefore, the Department of Fish and Game will use a fifth criterion in recommending steel shot areas in 1978: lead levels in tissues as an indicator of poisoning from ingested lead shot.

I will discuss each of the five criteria and relate them to our situation in Alaska.

(1) Significant demonstrated mortality from lead shot poisoning.

To our knowledge not one duck has died from lead shot poisoning in Alaska, even though biologists spend a considerable amount of time on the areas where we found a high rate of shot ingestion. However, these areas are large and predators are abundant. Also, we do not have specific areas where these birds would tend to be found, such as in a closed area surrounded by an area open to hunting.

(2) Presence and availability of lead shot in waterfowl feeding areas.

We have sampled soils only from the Palmer Hay Flats--the area of highest gizzard lead shot incidence in the state. However, sample size was small and we don't place much credence in the results. For this area a projected 19,150 pellets/acre occur.

We assume, and I believe rightly so, that soil sampling for lead in Alaska would be more for academic interest than of practical value. Alaska is an immense state with only a few areas of concentrated hunting activity. For example, we have only 10 specific locations where 1,000 or more ducks are consistently harvested each year. Because these areas are widely dispersed and most of the ducks using them are females and broods which either have been reared right there or in nearby habitats which don't support heavy hunting

efforts, it is evident these birds must be getting the shot in these areas. Or, in the case of Cook Inlet as a unit, birds probably interchange between areas of high hunting pressure.

(3) Hunting pressure as an indicator of lead shot deposition.

Alaska was not provided with duck harvest data by county, or harvest per square mile information, as were the other flyway states. Each of the 11 "counties" which the FWS uses in data analysis for Alaska are bigger than many states. Judging from those data we would have no areas of concern, using the FWS criteria of 10 ducks/mi² or 10,000/county as "sensitive areas."

In the attached table (Table 14) we have provided total duck harvest data and data for ducks shot per square mile, for those areas where ingested lead shot were found. This information was obtained from the results of our waterfowl hunter mail surveys. A comparison between either set of those data to the ingestion rate found on each area results in no correlation. In fact, the r^2 values for a linear relationship between either data set and ingestion rate are far less than 1.0.

We conclude that for Alaska, "hot spot" areas can not reasonably be identified through harvest per square mile data or a total duck harvest figure.

(4) The lead shot ingestion rate for mallards and pintails.

In the attached table (14) the following data are provided for each area in Alaska where ingested lead shot were found: ingestion rate for all duck species; ingestion rate for mallards and pintails only; the percent of gizzards with 1, 2 and 3 or more shot; and the percent of total incidence of ingested lead shot by time period. If we had to make our recommendations for use of steel shot only on the basis of data in this table, we would recommend that all areas in Cook Inlet convert to steel shot. There are, however, considerations of these data which temper their significance.

On the Palmer-Hay Flats, where an ingestion rate of over 39 percent occurred for mallards and pintails, over 90 percent of the birds with shot occurred during the first two weeks of the season. Over 80 percent of all mallards and pintails with ingested shot were taken opening day. However, of all mallard and pintail gizzards collected at Palmer, 65 percent were from opening day and 75 percent came during the first 15 days of the season. These data, together with a knowledge that duck production occurs on Palmer, indicate that a substantial proportion of the ducks with ingested shot are locally produced.

The disproportionate take of locally produced ducks is indicated by data from other areas also, as the greatest proportion of birds

Table 14. Incidence of ingested lead shot, duck harvest and hunting pressure data; Alaska, 1974, 1975 and 1976.

Area	Total Gizzards		Mallards & Pintails		% of Gizzards with:			Total ^{1/} Duck harvest/mi ²	Total ^{1/} Duck harvest	% of Total Incidence of Ingest. Shot by time period		
	No.	% with shot	No.	% with shot	1 shot	2	3+			Sept.1-15	16-30	October on
Palmer-Hay Flats	273	23.4	145	39.3	6.2	3.4	29.7	145	6,200	91.2	4.4	4.4
Susitna Flats ^{2/}	203	10.3	47	19.1	8.5	4.2	6.4	75	10,250	66.7	22.2	11.1
Eagle River Flats	22	9.1	14	14.3	14.3	-	-	333	1,000	100.0	-	-
Potter Marsh	53	3.8	27	7.4	7.4	-	-	90	900	100.0	-	-
Chickaloon Flats	24	4.2	13	7.7	7.7	-	-	38	1,500	100.0	-	-
Total Cook Inlet	575	15.7	246	28.9	7.3	2.9	18.7	86	19,850	87.8	7.8	4.4
Minto	314	3.2	137	5.1	2.2	2.2	0.7	7	6,450	88.9	11.1	-
Salchaket Slough	13	23.1	13	23.1	23.1	-0-	-0-	22	550	100.0	-	-
Copper R. Delta	220	3.9	116	1.7	1.7	-0-	-0-	16	4,800	62.5	12.5	25.0
Mendenhall	110	0.9	24	-0-	-0-	-0-	-0-	335	3,350	-	-	100.0
Stikine R. Delta	420	0.5	205	1.0	1.0	-0-	-0-	157	3,150	100.0	-	-
Kodiak ^{3/}	79	1.3	20	5.0	5.0	-0-	-0-	95	950	100.0	-	-

^{1/} 1971-1976 six year average retrieved harvest from results of ADF&G mail surveys.

^{2/} A large number of gizzards were from ducks collected by the general public and thus were unknown species.

^{3/} Only Kalsin and Middle Bays.

NOTE: Only areas where ingested shot was found are included in the table.

with ingested shot occurred during the first 15 days of the season. This means that shot from previous hunting seasons are available for ingestion, even though all of the areas listed in the table, except two, are regularly flooded by high tides.

Another phenomenon not apparent from these data is that the average number of pellets for gizzards with ingested lead was almost 10! For only those ducks from the Palmer-Hay Flats with shot, the average was over 13 pellets per gizzard. These are the greatest average numbers of pellets per gizzard that we are aware of in the country.

It seemed to us that many of the birds, especially from Palmer, should have died from lead poisoning long before they were taken by hunters. However, of the 115 total gizzards examined in Alaska with ingested shot (including 86 mallards and pintails), only 2 (1.7 percent) were abnormally stained. This represents 0.09 percent of the total gizzards examined and 0.3 percent of all pintail and mallard gizzards. No crop impaction or abnormally thin birds were detected during the study.

(5) Lead levels in tissues as an indicator of poisoning from ingested lead shot.

To assist you in interpreting the results of liver and wing bone analyses for lead levels, a copy of our 1976 Waterfowl Survey and Inventory Report is enclosed (see pp. 42-61). This report explains in detail the techniques used, sample size, results and our interpretation of the results. I will provide only a summary of our findings here.

As you know, numerous studies have documented the effect of diet on the toxicity of ingested lead shot to waterfowl. I'm sure the FWS was utilizing data from those studies when they indicated that only mallards, pintails and black ducks would be used to ascertain ingested lead shot levels on given areas. Although divers frequently have high incidences of ingested lead, their diet of natural vegetation and animal matter precludes poisoning from ingested shot.

The biochemical and physical aspects of variables affecting lead poisoning in waterfowl and other animals are, at best, poorly understood. However, our data and those from other studies follow H. A. Schroeder's proposed first law of toxicity which states essentially that the toxicity of a given trace element is inversely proportional to the levels of environmental calcium present.

Ducks from the Palmer-Hay Flats which had ingested shot did not have tissue lead levels commensurate with the number of shot in their gizzards, compared to ducks examined in other studies which

were on a cereal grain diet. Using Longcore's et al., (1974) criteria of lead levels in the liver of 6 to 20 ppm as an indication of acute lead intoxication, we calculate that 47 or more ingested pellets were necessary to achieve those levels (see p. 59). Only 5 (5.8 percent) of the 86 pintail and mallard gizzards with ingested shot contained 47 or more pellets. Less than 1 percent of the 761 total gizzards from pintails and mallards had more than 47 pellets.

Although birds were analyzed from only the Palmer-Hay Flats, I am sure that the results are applicable to all of Alaska because we have very little agriculture in the State. The cereal grains are limited primarily to oats and barley, but very little field feeding by waterfowl occurs during the fall. Field feeding does extensively occur in the spring, but of course the birds remain on a soft vegetation-animal matter diet throughout the summer.

I am confident, as I'm sure you will be, that an insignificant number of birds are dying in Alaska from lead shot poisoning. However, I am concerned that birds ingesting shot on a few areas in Alaska could be reaching areas farther south when a diet change occurs, before shot passes from the gizzards.

For the 1978-79 season I am proposing that no areas in Alaska be designated for steel shot use. However, prior to the 1979-80 season the Department of Fish and Game will assemble and analyze all data available which will give an indication of: (1) how long it takes for shot to pass from duck gizzards and (2) how long it takes for the "average" pintail and mallard to migrate from Alaska to areas where a diet change occurs.

I wish to make one additional comment regarding use of steel shot on present Federal Refuges and the possibility of a blanket steel shot regulation on new Federal Refuges. The most concentrated hunting activity on Federal Refuges in Alaska occurs at Izembek. During the past three seasons 102 gizzards (72 pintails and mallards) from Izembek were analyzed, but no shot was found. We understand that during the 1977-78 season the FWS will be collecting additional gizzards from Izembek plus gizzards from other refuges. We are confident that there are no problems from lead shot poisoning on Federal Refuges in Alaska. Furthermore, it would be inane to impose steel shot only regulations on new refuges created under the (d) (2) section of ANCSA. State and Federal criteria for the implementation of steel shot should be identical.

Studies during the 1977-78 waterfowl season will be focused on collecting gizzards from upper Cook Inlet after September 15, on Salchaket Slough and on the Mendenhall Wetlands. Also, as explained in the above letter, a literature search will be made to ascertain how long pellets take to pass through a duck's gizzard. A coastal duck migration study is also planned for fall 1977.

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