

BIRD POPULATIONS IN COASTAL HABITATS  
ARCTIC NATIONAL WILDLIFE RANGE  
ALASKA

0020

C.4

Results of 1978 and 1979 Aerial Surveys

By

Michael A. Spindler



U.S. Fish & Wildlife Service  
1011 E. Tudor Road  
Anchorage, Alaska 99503

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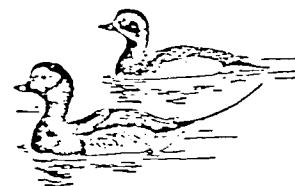
December 1979



ABSTRACT

Within the coastal zone of the Arctic National Wildlife Range, the highest breeding populations of birds occurred in wet and flooded sedge tundra areas surrounded by shallow and deep ponds, such as those found near river deltas. The highest waterfowl use occurred in the coastal lagoon systems. Together, the river delta and lagoon estuarine system represents the most important habitat for breeding, molting, and migrating birds. Maximum bird use on the tundra nesting grounds occurred in late June/early July; maximum use of lagoons occurred in late July and early August.

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## INTRODUCTION

The greatest concentrations of breeding and summer resident waterbirds on the Arctic National Wildlife Range occur in the narrow strip of coastal habitat ranging from 18 km offshore in the Beaufort Sea to approximately 34 km inland on the coastal tundra. This area includes expansive shallow coastal lagoons, river deltas, mudflats, barrier islands, beaches, offshore waters, and numerous tundra wetland and upland habitat types. Aerial transect surveys over these habitats were conducted in 1978 and 1979 to identify major bird concentration areas, major periods of concentration, and to obtain baseline population estimates.

## METHODS

Transect methods followed the "Standard Operating Procedures for Aerial Waterfowl Breeding Ground Population and Habitat Surveys" (USFWS-CWS 1977). Offshore and lagoon transects were flown at 200 ft. above sea level (ASL) with a transect width of 400 m (200 m each side of plane). Some lagoon transects were flown at 100 ft. ASL with a width of 200 m if visibility was poor, or if habitat was restricted (e.g., limited open water surrounded by extensive sea ice). All tundra transects were flown at 100 ft. above ground level (AGL), with a width of 200 m (100 m each side of plane). Transects were flown at 100 m.p.h. whenever possible.

A crew of two to four persons performed the transects. Survey crew and aircraft type were as follows:

<u>Date</u>	<u>Aircraft</u>	<u>Observers (right;left)</u>	<u>Recorder</u>	<u>Pilot</u>
5 July 1978	C-185	M. Spindler; E. Knudtson	M. Jacobson	G. Zemansky
22 July 1978	C-185	M. Spindler; E. Knudtson	M. Jacobson	G. Zemansky
5 August 1978	C-206	C. Welling; D. Schamel	-	J. Helmericks
5 Sept. 1978	C-206	C. Welling; S. Johnson	-	J. Helmericks
14 Sept. 1978	Beaver	M. Spindler; D. Ross	-	D. Ross
29 July 1979	C-206	C. Welling; S. Johnson	-	J. Helmerick
1 August 1979	C-185	M. Spindler; P. Martin	-	G. Zemansky
7 Sept. 1979	Beaver	M. Spindler; B. Conant	M. Jacobson	B. Conant
10 Sept. 1979	Beaver	M. Jacobson; B. Conant	M. Spindler	B. Conant

The coastal zone was surveyed as three separate habitat types: 1) nearshore waters, approximately 0.5 km offshore of barrier islands and beaches; 2) lagoons, that area between mainland and barrier islands; 3) coastal tundra, approximately 0.5 km inland of shoreline on mainland. The types were further subdivided into transects east of Barter Island and those west of Barter Island. In addition, a short 16-km segment between the Staines River and Point Thompson was flown on 14 September, 1978. The lagoon transects surveyed on 5 August and 5 September by Johnson, Welling, and Schamel included both mid-lagoon segments, and segments 200 m south of the barrier islands, which were pooled together for this report. The route of the barrier island transect is shown in Figure 1. The routes of the other two transects may be located by referring to Figure 1 and the definitions above.

The population estimates derived from the tundra transects were adjusted for visibility by using a conversion factor calculated from ground census plots (Table 1). Twelve aerial transect lines were flown over the Okpilak River Delta study area, so that the ground census plot data (Spindler 1978) could be used to "truth" the aerial data. Where our data were insufficient, we used the factors given by King (1977). A conversion factor was not used for the lagoon and offshore transects because visibility was usually excellent and we could not easily gather

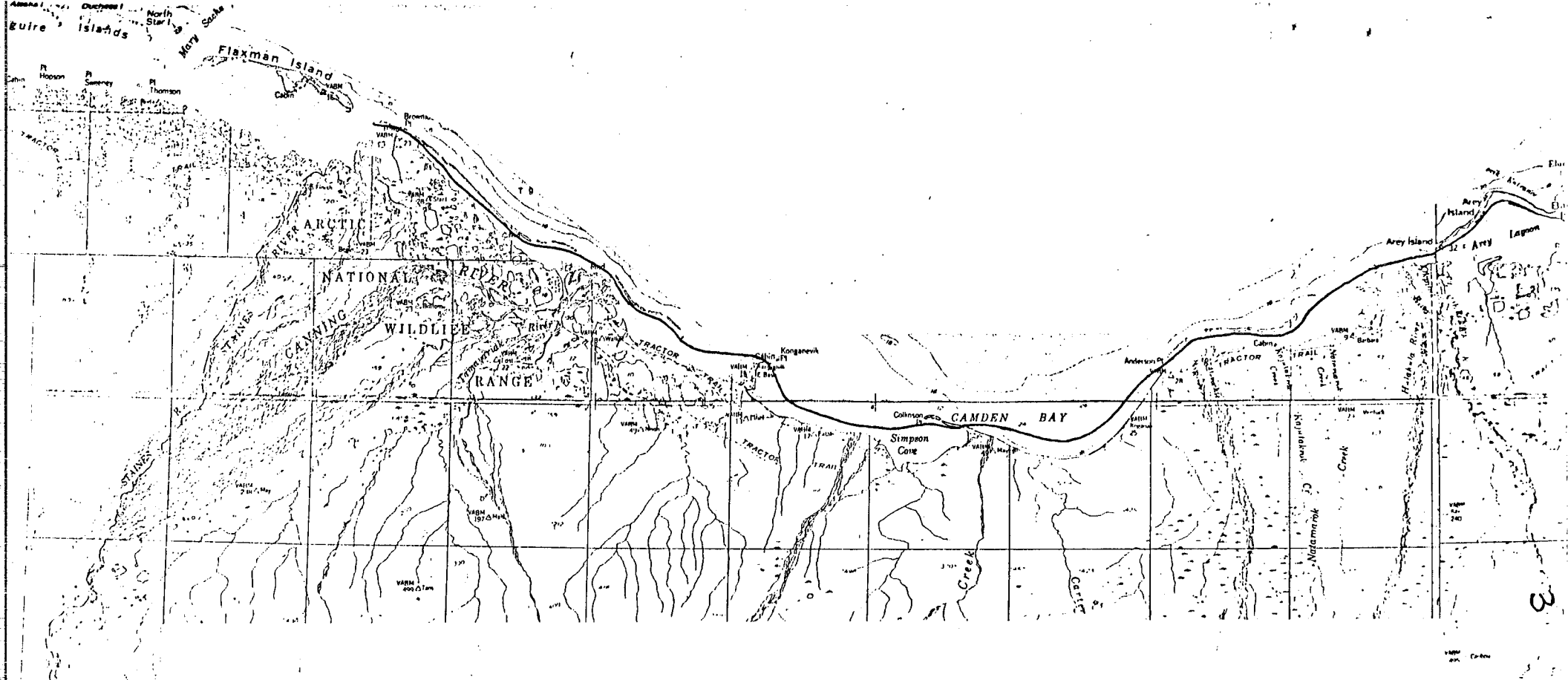


Figure 1a.

Location of the barrier island transects along the coast of the Arctic National Wildlife Range, Alaska, Canning River delta to Barter Island.

Figure 1b.

Route of barrier island transects along the coast of the Arctic National Wildlife Range, Alaska, Barter Island to Demarcation Bay.

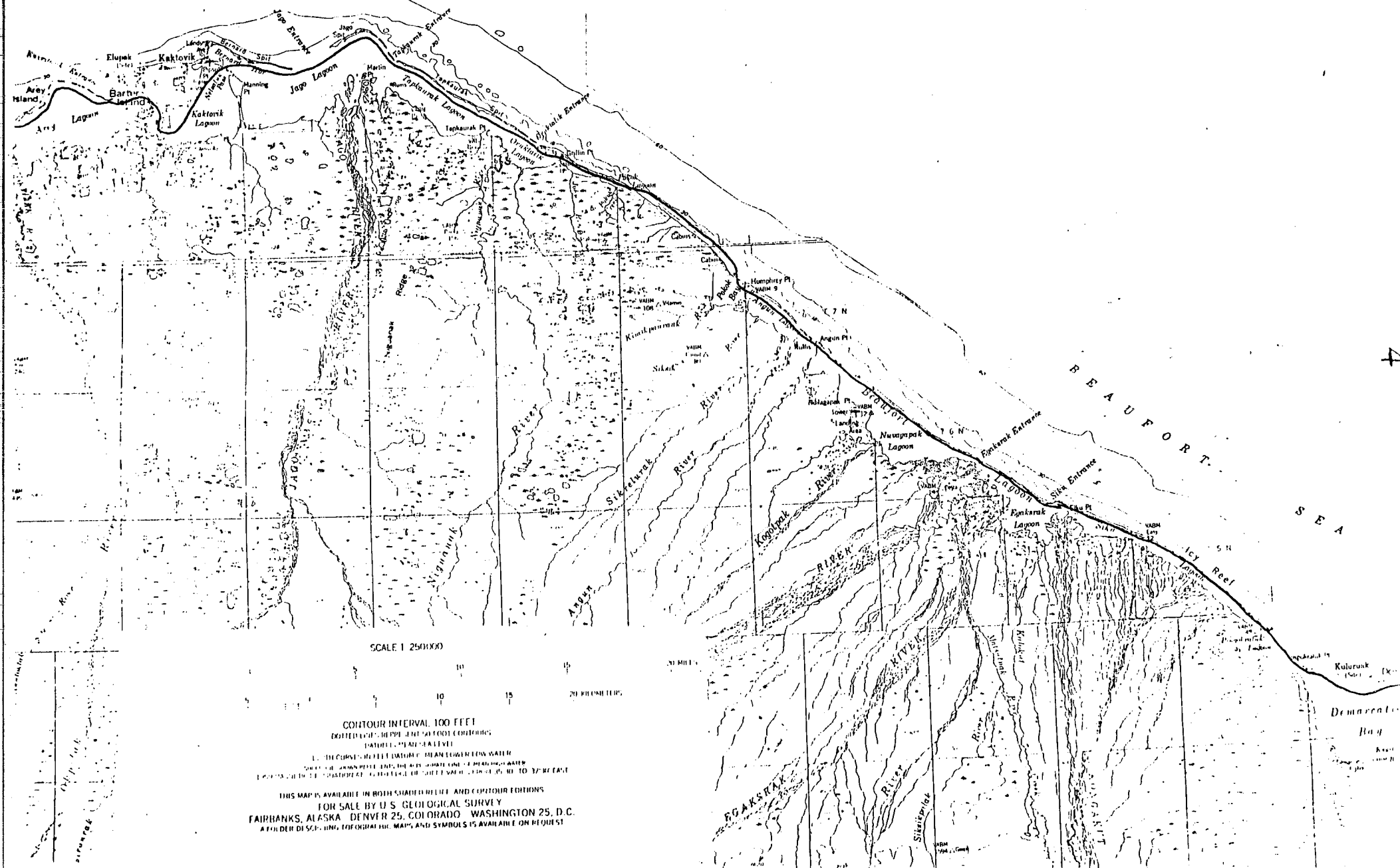


Table 1. Ground truth/aerial transect conversion factors used to adjust aerial survey data over tundra for visibility. Calculations are based on four ground census plots totalling 1.75 km<sup>2</sup> and 12 aerial transect lines on the Okpilak River delta study area, Arctic National Wildlife Range, July 1978.

<u>Bird Category</u>	<u>Conversion Factor</u>
Loons	9.1
Swans	1.0
Geese	1.0
Diving Ducks	9.6
Dabbling Ducks	3.0 <sup>2</sup>
Raptors	1.0
Ptarmigan	10.0 <sup>2</sup>
Shorebirds	17.6
Jaegers	5.5
Gulls	1.0
Terns	6.0 <sup>2</sup>
Passerines	577.7

1. Includes Raven because of similar nesting ecology and visibility.
2. Insufficient data from Okpilak area, factors given by King (1977) were utilized.

"ground truth" data.

## RESULTS AND DISCUSSION

### Coastal Tundra

Bird populations on the coastal tundra averaged 274 birds/km<sup>2</sup> in early-July, and 219 birds/km<sup>2</sup> in late-July (Table 2). The majority of the population was comprised of shorebirds, primarily Red Phalaropes, Northern Phalaropes, Pectoral Sandpipers and Semipalmated Sandpipers. Next in abundance were Lapland Longspurs (5 July). Loons and diving ducks were the predominant large birds, mostly Red-throated Loon, Arctic Loon, Oldsquaw, and Common Eider. See also Tables 3 and 4 for location-specific transects.

In the aerial data, shorebird density increased between 5 July and 24 July, however, this apparent increase is probably a function of increased visibility due to flocking in late-July rather than an actual increase in population. The general trend for all species combined indicated a decrease in population from early-July to late-July; this also was true when shorebirds and Passerines were excluded--19 birds/km<sup>2</sup> and 15 birds/km<sup>2</sup>, respectively. A pattern of decreasing bird density following a peak in late June--early July was also apparent on the ground plots at the Okpilak delta in 1978.

Major "pockets" of high bird density in the coastal tundra occurred in the following areas: Canning-Tamayariak delta, Hulahula-Okpilak delta, lakes south of Barter Island, Jago delta, Aichilik-Egaksrak deltas, and Demarcation Bay. Those areas are predominantly wet sedge and flooded sedge tundra habitats where high concentrations of flocking shorebirds occurred (especially Phalaropes and Pectoral Sandpipers), and where a diversity of wetland types were used by loons and diving ducks.



Table 2

Summary of bird utilization of coastal tundra habitats, Arctic National Wildlife Range, Canning River to Canada Border. Data are from aerial transects flown approximately 0.5 km inland from coastline, July 1978. Densities in birds/km<sup>2</sup>. (Figures in parentheses refer to sum of species category).

Bird Species/Category	July 5			July 24		
	Total #	Adjusted #	Adjusted density	Total #	Adjusted #	Adjusted density
Loons	(15)	(137)	(3.25)	(29)	(265)	(5.23)
Arctic Loon	6	55	1.30	9	82	1.94
Red-throated Loon	9	82	1.95	15	137	3.25
Loon species	-	-	-	5	46	1.09
Whistling Swans	19	19	0.45	9	9	0.21
Geese	(6)	(6)	(0.14)	-	-	-
Brant	4	4	0.09	-	-	-
Canada Goose	2	2	0.05	-	-	-
Diving Ducks	(41)	(394)	(9.34)	(31)	(298)	(7.04)
Scaup species	6	58	1.37	-	-	-
Common Eider	-	-	-	-	-	-
Eider species	16	154	3.65	2	19	0.45
Oldsquaw	19	182	4.32	29	278	6.59
Dabbling Ducks	(31)	(93)	(2.20)	(8)	(24)	(0.56)
Pintail	31	93	2.20	-	-	-
Unidentified	-	-	-	8	24	0.56
Raptors	(7)	(7)	(0.17)	(15)	(15)	(0.36)
Snowy Owl	6	6	0.15	10	10	0.24
Short-eared Owl	1	1	0.02	1	1	0.02
Raven <sup>1</sup>	-	-	-	4	4	0.09
Ptarmigan	5	50	1.18	-	-	-
Shorebirds	(348)	(6125)	(145.15)	(488)	(8589)	(203.53)
Small Shorebird	28	493	11.68	1	18	0.43
Medium Shorebird	153	2693	63.82	328	5773	136.80
Large Shorebird	2	35	0.83	2	35	0.83
Phalaropes	165	2904	68.82	157	2763	65.47
Jaegers	(14)	(77)	(1.84)	(5)	(29)	(0.69)
Parasitic Jaeger	10	55	1.30	3	17	0.40
Long tailed Jaeger	1	6	0.14	1	6	0.14
Jaeger species	3	17	0.40	1	6	0.14
Gulls	(18)	(18)	(0.43)	(4)	(4)	(0.69)
Glaucous Gull	18	18	0.43	2	2	0.05
Sabine's Gull	-	-	-	2	2	0.05
Arctic Tern	3	18	0.43	2	12	0.28
Passerines	(8)	(4622)	(109.52)	-	-	-
Lapland Longspur	6	3466	82.13	-	-	-
Snow Bunting	2	1156	27.39	-	-	-
Total No. of Species	23					
Total	515	11566	274.08	591	9245	219.04
Transect area (km <sup>2</sup> )	42.2			42.2		
Transect Width; Altitude	200m; 100' AGL			200m; 100' AGL		

1. Raven included with raptors because of similar nesting ecology and visibility.

Table 3

Summary of bird utilization of coastal tundra habitats, Arctic National Wildlife Range, Barter Island to Canada Border. Data are from aerial transects flown approximately 0.5 km inland from coastline, July 1978. Densities in birds/km<sup>2</sup>.

Bird Category	July 5			July 24		
	<u>Total #</u>	<u>Adjusted #</u>	<u>Adjusted density</u>	<u>Total #</u>	<u>Adjusted #</u>	<u>Adjusted density</u>
Loons	11	100	4.00	8	73	2.92
Swans	17	17	0.68	9	9	0.36
Geese	1	1	0.04	-	-	-
Diving Ducks	39	374	14.96	15	144	5.76
Dabbling Ducks	11	33	1.32	-	-	-
Raptors	3	3	0.08	3	3	0.12
Ptarmigan	4	40	1.60	-	-	-
Shorebirds	200	3520	140.80	329	5790	231.60
Jaegers	-	-	-	5	28	1.12
Gulls	14	14	0.56	2	2	0.08
Terns	2	12	0.48	1	6	0.24
Passerines	7	4044	161.76	-	-	-
Total No. of species	19			12		
Total	309	8158	326.28	372	6055	242.2
Transect area (km <sup>2</sup> )	25					
Transect width; altitude	200m; 100' AGL					
Most abundant species: (in relative order)	Medium Shorebirds Phalaropes Small Shorebirds Oldsquaw			Phalaropes Medium Shorebirds Oldsquaw		

Table 4

Summary of bird utilization of coastal tundra habitats, Arctic National Wildlife Range, Barter Island to Canning River. Data are from aerial transects flown approximately 0.5 km inland from coastline, July 1978. Densities in birds/km<sup>2</sup>.

Bird Category	July 5			July 24		
	<u>Total #</u>	<u>Adjusted #</u>	<u>Adjusted density</u>	<u>Total #</u>	<u>Adjusted #</u>	<u>Adjusted density</u>
Loons	4	36	1.44	21	30	1.74
Swans	2	2	0.12	4	4	0.23
Geese	5	5	0.29	-	-	-
Diving Ducks	2	19	1.10	16	154	8.95
Dabbling Ducks	22	66	3.84	8	24	1.40
*Raptors	4	4	0.23	12	12	0.70
Cranes	1	1	0.06	-	-	-
Ptarmigan	1	10	0.58	-	-	-
Shorebirds	153	2693	156.57	163	2869	166.90
Jaegers	14	77	4.48	-	-	-
Gulls	4	4	0.23	2	2	0.12
Terns	1	6	0.35	1	12	0.70
Passerines	1	578	33.60	-	-	-
Total No. of species	19			13		
Total	214	3501	202.8	227	3107	180.74
Transect area (km <sup>2</sup> )	17.2			17.2		
Transect width; altitude	200m; 100' AGL			200m; 100' AGL		
Most abundant species: (in relative order)	Medium Shorebird Phalaropes Pintail					

\* Raven included with raptors because of similar nesting ecology and visibility.

### Coastal Lagoons

In 1978, maximum bird utilization of the coastal lagoons occurred in early-August, when a total of 38,730 birds (30,982 of which were Oldsquaw) were counted on transects. Bird populations in the lagoon systems changed dramatically between early-July and mid-September (Table 5, Figure 2). Bird densities increased gradually as the lagoon ice melted in late-June and early-July, reaching 50.8 birds/km<sup>2</sup> on 5 July and 79.1 birds/km<sup>2</sup> on 22 July. Between late-July and early-August, densities increased drastically, reaching a peak of 154.7 birds/km<sup>2</sup> on 5 August. Densities declined through August and early-September, to 54.1 birds/km<sup>2</sup> on 5 September, and 39.5 birds/km<sup>2</sup> on 13-14 September, which was the lowest estimated population for the season. The total population of birds using the lagoon system was estimated at 60,000 birds during early-August, about 40,000 of which were Oldsquaws. Other common species using the lagoons were Arctic Loon, Red-throated Loon, Brant, Common Eider, King Eider, Surf Scoter and Glaucous Gull. Those species were also common in August and September, along with a notable increase in Red-breasted Mergansers, Phalaropes and other shorebirds, and a decrease in Eiders late in the season. The change in species composition was probably related to the fall migration of shorebirds and mergansers from tundra areas, and of eiders to wintering and offshore areas.

The greatest concentrations of birds observed in 1978 were rafts of 100-2000 Oldsquaws feeding and loafing at the ends of barrier islands, spits, entrances to lagoons, and along the shoreward side of barrier islands. Separate transects flown over the mid-lagoon and the waters immediately inshore of the barrier islands showed a disparate bird distribution W. of Barter Island. Significantly greater bird densities occurred near the barrier islands than in mid-lagoon -- 165.4 and 33.6 birds/km<sup>2</sup>, respectively, on 5 August, and 91.7 and 67.9 birds/km<sup>2</sup> on 5

Table 5

Summary of 1978 bird population data for the coastal lagoons of the Arctic National Wildlife Range. Based on aerial transects east and west of Barter Island, which have been pooled together for the entire coast from the Canning River delta to the Canada Border. Densities are given in birds/km<sup>2</sup> (not adjusted for visibility).

Species	July 5	July 22	August 5	Sept. 5	Sept. 13-14	Maximum Count 1	Estimated Maximum 1978 population on lagoons and barrier islands 2
Yellow-billed Loon		0.01		0.05		5	20
Arctic Loon	0.14	0.14	0.09	0.03	0.08	17	100
Red-throated Loon		0.06	0.06	0.09	0.10	21	200
Loon species	0.11	0.31		0.09	0.28	29	
Whistling Swan		0.06		0.03		14	20
Brant	2.80				0.88	122	250
White-fronted Goose				0.09	0.47	293	400
Canada Goose						10	50
Snow Goose				0.71	0.05	16445	20,000
Goose species						15	
Pintail			0.41	0.22		63	200
Diving Duck species			34.20	2.84		6956	
Scaup species	0.11	0.27	0.06			25	1000
Common Eider	0.39	0.22				20	200
King Eider	0.05	0.04			0.02	3	300
Eider species		0.42	0.41	0.86	0.03	288	
Oldsquaw	37.10	75.45	115.01	46.22	33.20	30982	40,000
White-winged Scoter		0.03				3	50
Surf Scoter	5.40	0.31				29	500
Scoter species	0.71	0.12		0.05	0.11	50	
Red-breasted Merganser			0.06	0.74		142	200
Unidentified Waterfowl	1.49	0.03	0.64	0.05	0.23	248	
Marsh Hawk	0.02					1	2
Phalarope species			0.56	0.09		1716	10,000
Small Shorebird			0.41	0.36	0.84	45	
Medium Shorebird				0.03	0.33	82	
Shorebird species			0.73	0.03		110	1000
Black-bellied Plover						5	
Parasitic Jaeger		0.01				1	100
Jaeger species		0.01				1	
Glaucous Gull	2.34	1.57	1.90	1.51	2.85	464	550
Sabine's Gull	0.02	0.01				1	10
Arctic Tern	0.07	0.06	0.04		0.01	6	50
Snowy Owl	0.02					3	10
Snow Bunting			0.09			14	1500
unidentified					0.02		
Total No. of Species	15	19	15	19	16	26	
Total No. of Individuals	2206	7354	25599	9963			
Total Density (birds/km <sup>2</sup> )	50.77	79.13	154.67	54.12	39.50		
Total area sampled (km <sup>2</sup> )	43.5	92.7	165.5	184.1	97.2		

1. Includes birds seen on and off transect.

2. Includes nesting, feeding, molting, and staging birds observed during a given day, July-September. Total numbers for migrating species such as ducks, geese, and shorebirds over the entire open water season would undoubtedly be much higher.

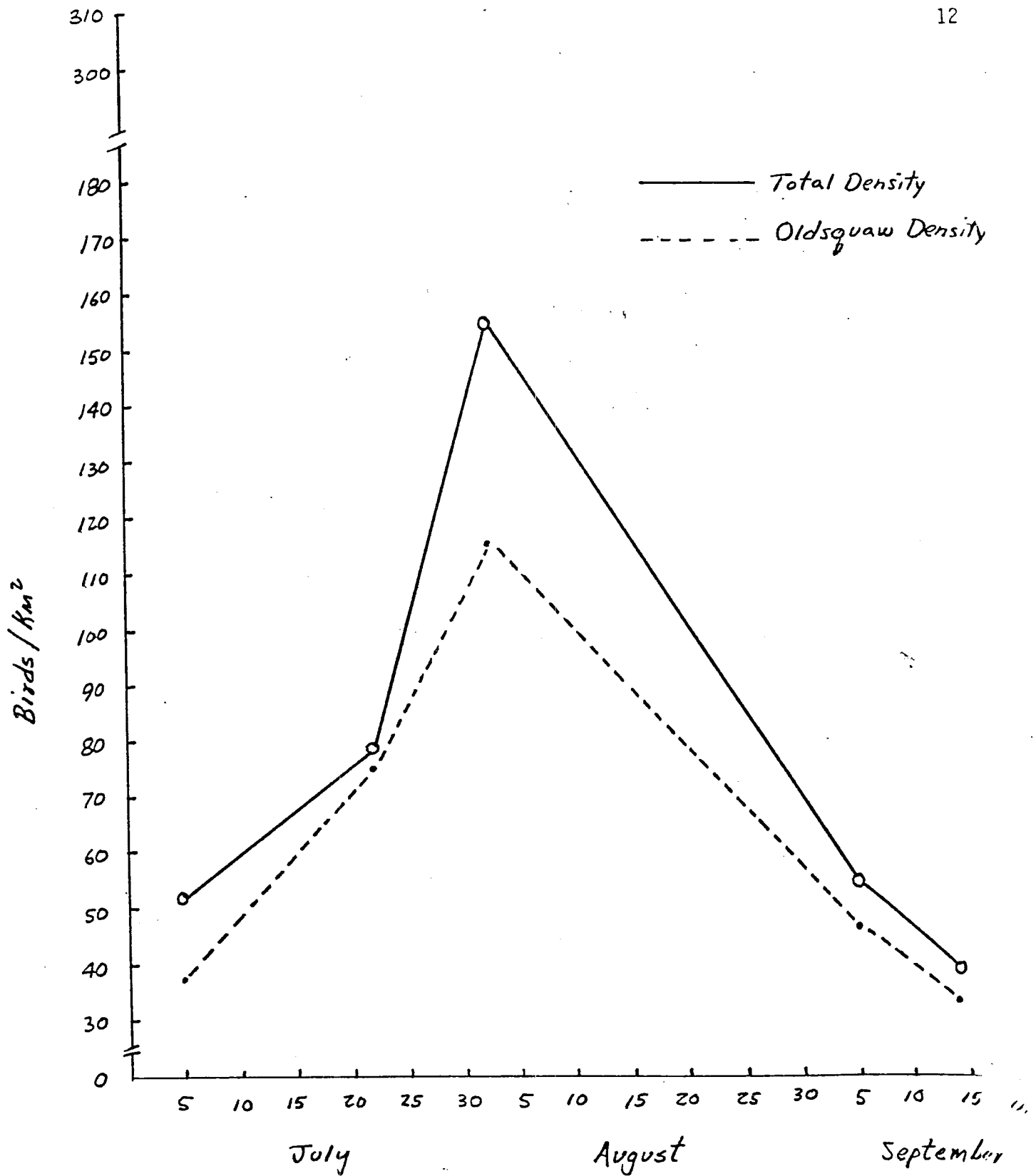


Fig. 2. Estimated bird populations using the coastal lagoons of the Arctic National Wildlife Range, Alaska, July-September 1978. Figures are based on aerial transect surveys. Solid line indicates total population; dashed line indicates Oldsquaw population.

September (Appendix A-1, A-2). The difference was primarily due to the preference of Oldsquaws to feed and rest near the barrier islands instead of in the middle of the lagoon. East of Barter Island, such a pattern was not apparent with 175.6 birds/km<sup>2</sup> near the barrier islands and 208.7 birds/km<sup>2</sup> in mid-lagoon on 5 August, and 31.5 and 35.5 birds/km<sup>2</sup>, respectively, on 5 September. Because the lagoons west of Barter Island are generally wider and more segmented, currents, water qualities, and food distribution may differ more between mid-lagoon and near the barrier island than in the much narrower lagoons E. of Barter Island. Farther W., at Simpson Lagoon, Johnson (1979) determined that about 78% of the Oldsquaw abundance was concentrated near the south shore of the barrier islands in 1978, and that a similar pattern occurred there in 1979 (pers. comm.).

In 1979, maximum densities occurred in late-July, when 310.8 birds/km<sup>2</sup> were observed along the transects 200 m south of the barrier islands (Table 6). The 1979 density figure cannot be extrapolated to the entire surface area of the lagoon system because of the major differences in density occurring between mid-lagoon, and near the barrier islands. (No mid-lagoon transects were flown in 1979.) As in 1978, the dominant species was Oldsquaw, which comprised 96% of total bird density in the late-July transects, 94% in the early-August transects, and 73% in the early-September transects. Also, total density declined from late-July/early-August to September, which was similar to the pattern in 1978. A trend consistent in both years was an increase in Glaucous Gull density toward mid-September, which was also observed at Simpson Lagoon (Johnson 1979). Species Composition in 1979 was similar to that of 1978 (Table 5 and 6).

In early-July and early-August of 1978, lagoon transects east of Barter Island showed higher numbers of birds than those transects west

Table 6.

Summary of 1979 bird population data for the coastal lagoons of the Arctic National Wildlife Range, Alaska. Based on aerial transects east and west of Barter Island which have been pooled for the entire coast from the Canning River delta to the U.S.-Canada Border. Densities are given in birds/km<sup>2</sup> (not adjusted for visibility).

Species	July 29	August 1	Sept. 7-10	Maximum Count	Maximum estimated 1979 Population in Lagoons and Barrier Islands
Yellow-billed Loon	0.02		0.02	2	20
Arctic Loon	0.02		0.20	9	100
Red-throated Loon	0.10	0.05	0.18	10	200
Loon species	0.12	0.03	0.15	16	
Whistling Swan				2	20
Brant	0.15		0.85	39	10,000
Snow Goose	0.04			4	10,000
Goose species				6	
Pintail	0.24			24	100
Duck species	0.13			84	
Scaup species	0.16			16	1,000
Common Eider	0.02			2	4,000
King Eider		0.03		1	1,000
Eider species	0.12	0.41	0.15	20	
Oldsquaw	299.01	97.88	49.69	30,891	40,000
Common Scoter	0.01			1	20
Surf Scoter	0.24	0.08		24	500
Scoter species	1.11	0.08	2.47	113	
Red-breasted Merganser	0.09			9	100
Phalarope species		2.02		78	10,000
Small Shorebird	4.96	0.52	1.65	506	
Medium Shorebird	0.75	1.24		76	
Large Shorebird		0.10		4	
Shorebird species	0.54	0.05		55	1,000
Black-bellied Plover	0.03			3	
Jaeger species	0.01		0.02	1	100
Glaucous Gull	2.54	1.24	8.35	379	500
Arctic Tern	0.40	0.03		41	200
Black Guillemot	0.03			1	10
Snow Bunting	0.01		0.04	2	1,500
Total No. of Species	18	8	8	22	
Total No. of Individuals	31,503	4,010	2,896	32,421	
Total Density (birds/km <sup>2</sup> )	310.84	103.76	63.77		
Total area sampled (km <sup>2</sup> )	101.5	38.6	45.4		



of Barter Island (Appendix A-1, and A-2). The pattern was opposite in September 1978, with transects west of Barter Island showing the higher numbers. In July and September of 1979, the greatest number of birds was observed on the transects E of Barter Island. No change in rank between E and W transects was detected in 1979 as in 1978.

Several phenomena could explain the interesting reversal in spatial density pattern observed between early July 1978 and early September 1978: 1) differing configurations of the two lagoon systems -- more continuous barrier islands with numerous large river mouths east of Barter Island and a more broken chain of barrier islands with large stretches of unprotected beach open to the Beaufort Sea west of Barter Island; 2) differing ice-distribution--the ice in the narrow, river-influenced lagoons east of Barter Island went out 2-3 weeks earlier than west of Barter Island; 3) changing distribution of Oldsquaw food resources which may or not be related to the above. The invertebrate food sources of Oldsquaw in the ANWR lagoons were probably not uniformly distributed but rather variable in distribution because of the changing state of their planktonic and epibenthic habitats. Indeed, considerable spatial and temporal variability in mysid and amphipod abundance was observed in Simpson Lagoon (Griffiths and Dillinger 1979). It is therefore likely that the observed changes in bird distribution (the predominance of which were Oldsquaws) were largely caused by the changing locations of invertebrate concentrations which in turn were controlled by the many interrelated physical factors.

The lagoon systems were extremely important to waterfowl using the coastal areas of ANWR, providing early open water during break-up, and sheltered feeding and molting areas during summer and fall. Bird use of the lagoons was variable over space and time. On the ANWR, typical mid-lagoon densities at the height of Oldsquaw molt were 30-70 birds/km<sup>2</sup>,

a fifth to half the maximum densities observed near the barrier island shoreline. Individual lagoons may have large rafts of feeding Oldsquaws, while adjacent lagoons may be depauperate of birds at the same time; some mudflats will have flocks of foraging shorebirds and gulls, while others will not. Bird use of individual lagoons in the ANWR varied annually as well as seasonally. Farther west, Johnson (1979) also found considerable variation in densities of Oldsquaws. In 1977 he observed up to 1345 Oldsquaws/km<sup>2</sup> in Simpson Lagoon, but in 1978 densities were more uniformly distributed--about 115-268 Oldsquaws/km<sup>2</sup> along the Beaufort Sea coast from Harrison Bay to Demarcation Bay. An individual lagoon, therefore, may be extremely important one year, and less important the next with the entire lagoon system serving to maintain large numbers of waterbirds each year during the migration, molting, and staging periods.

#### Nearshore Waters

Bird use of the nearshore waters of the Arctic National Wildlife Range was low. Maximum densities occurred in late-July, with approximately 3 birds/km<sup>2</sup> (Table 7). Densities dropped to about 2 birds/km<sup>2</sup> by mid-September. Oldsquaws predominated in both the July and September transects. Other common species were Common Eider and Glaucous Gull. Much of the bird use of nearshore waters is probably spillover from the more densely populated coastal lagoons (Johnson 1979, Divoky, pres. comm.).

Along the ANWR coast, Frickie and Schmidt (1974) reported 4.7 birds/km<sup>2</sup> in mid July of 1974. They also noted a predominance of Oldsquaws. Their transects extended 19-29 km (12-18 mi) seaward of the mainland coastline, and provided a good estimate of density with respect to distance from shore:

Distance from shore (mi)	0-1	1-2	2-3	3-4	4-5	5-9	9-10	10-11
Percent of all observations	8.4	4.5	6.1	6.2	56.1	0	3.1	15.6

Table 7

Summary of bird utilization in near-shore Beaufort Sea waters along the Arctic National Wildlife Range coastline, July and September 1978. Data are from aerial transects flown approximately 0.5 km offshore of barrier islands and seacoast. Densities in birds/km<sup>2</sup> (not adjusted for visibility).

Species	Barter Island to Canada		Barter Island to Canada		Barter Island to Canning		Canada to Canning Combined	
	July 22		September 14		September 14		September 14	
	<u>Density</u>	<u>Total #</u>	<u>Density</u>	<u>Total #</u>	<u>Density</u>	<u>Total #</u>	<u>Density</u>	<u>Total #</u>
Yellow-billed Loon	0.02	1					0.01	1
Arctic Loon	0.05	2	0.02	1			0.01	1
Loon sp.	0.21	9	0.02	1			0.01	1
Duck sp.	0.05	2	0.02	1				
Common Eider	0.48	21						
Eider sp.	0.23	10						
Oldsquaw	1.69	74	1.35	59	0.80	31	1.09	90
White-winged Scoter	0.07	3						
Scoter sp.	0.09	4						
Parasitic Jaeger			0.09	4			0.04	4
Glaucous Gull	0.34	15	0.37	16	1.17	45	0.74	61
Arctic Tern	0.07	3						
Black Guillemot	0.05	2			0.03	1	0.01	1
Total No. of species	12		6					
Total	3.35	146	1.87	82	2.00	77	1.91	159
Transect area (Km <sup>2</sup> )	43.8		43.8		38.6		82.4	
Transect width, altitude	400m: 200' AGI		400m: 200' AGI		400m: 200' AGI			

Quite interestingly, the greatest densities occurred in the area 4-5 miles offshore. It may be possible that this phenomenon was caused by ice conditions or nearshore currents.

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# Appendix A-1

Results of aerial bird transects over the coastal lagoon waters of the Arctic National Wildlife Range, Barter Island to Canning River (and Point Thompson Sept. 14), July to September 1978. Densities in birds/km<sup>2</sup>. (Not adjusted for visibility.)

Species	July 5		July 22		August 5		September 5		September 14	
	Density	Total #	Density	Total #	Density	Total #	Density	Total #	Density	Total #
Yellow-billed Loon			0.03	1			0.05	2		
Arctic Loon	0.10	2	0.10	4	0.10	8		1	0.14	6
Red-throated Loon			0.10	4		2	0.05	13	0.02	1
Loon species			0.54	21			0.05	2	0.48	21
Whistling Swan			0.10	4			0.05	5		
Brant								1	0.37	16
White-fronted Goose							0.15	293	1.05	46
Canada Goose								10		
Snow Goose							1.10	2390		
Goose species					15					
Pintail							0.20	14		
Diving duck species	2.59	50	0.03	1	42.80	1500	3.25	3098		
Common Eider	0.88	17								
King Eider	0.10	2	0.08	3					0.05	2
Eider species			0.75	29	0.90	37	1.13	89		
Oldsquaw	34.61	668	75.60	2918	76.60	6588	57.10	21785	34.63	1517
Surf Scoter			0.41	16						
Scoter species			0.18	7						
Red-breasted Merganser							0.55	38		
Unidentified Waterfowl					19			12		
Phalarope							0.05	4		
Small Shorebird							0.65	45	1.71	75
Medium Shorebird					1		0.05	4	0.73	32
Black-bellied Plover							0.05	5		
Parasitic Jaeger			0.03	1						
Jaeger species								1		
Glaucous Gull	3.31	64	2.05	79	1.05	68	1.00	114	4.04	177
Sabine's Gull			0.03	1						
Arctic Tern	0.05	1					0.05	5	0.02	1
Unidentified										2
Total No. of species	7		14		5	8 <sup>1</sup>	17	22 <sup>1</sup>	12	
Total	41.65	804	80.03	3,089	61.45	8,238 <sup>1</sup>	65.53	27,931 <sup>1</sup>	43.24	1896
Total area sampled (km <sup>2</sup> )	19.3		38.6		36.8b.i. <sup>2</sup>	12.7mid <sup>3</sup>	36.8b.i. <sup>2</sup>	36.8mid <sup>3</sup>	43.8	
Transect width, altitude		200m; 100' ASL	400m; 200' ASL		400m; 150' ASL		400m; 150' ASL		400m; 200' ASL	

1. Includes birds seen off transect.
2. Transect 200m S of barrier island.
3. Mid-lagoon transect.

# Appendix A-2

Results of aerial bird transects over the coastal lagoon waters of Arctic National Wildlife Range, Canada Border to Barter Island, July to September 1978. Densities in birds/km<sup>2</sup>. (Not adjusted for visibility.)

Species	July 5		July 22		August 5		September 5		September 13	
	Density	Total #	Density	Total #	Density	Total #	Density	Total #	Density	Total #
Yellow-billed Loon						3	0.05	3		
Arctic Loon	0.16	4	0.17	9	0.10	9	0.05	8	0.04	2
Red-throated Loon			0.04	2	0.10	11	0.10	8	0.17	9
Loon species	0.20	5	0.15	8		12	0.10	17	0.13	7
Whistling Swan			0.04	2		14				
Brant	5.00	122						8	1.29	70
Snow Goose							0.20	14055	0.09	5
Pintail					0.65	63	0.20	22		
Diving duck species	0.61	15	0.04	2	35.40	4739	1.95	3858	0.41	22
Scaup species	0.20	5	0.46	25	0.10	10				
Common Eider			0.37	20						
King Eider			0.02	1						
Eider species			0.13	7	0.25	251	0.45	66	0.06	3
Oldsquaw	38.45	942	75.69	4095	148.80	24394	27.4	5283	31.61	1710
White-winged Scoter			0.06	3		2				
Surf Scoter	9.59	2	0.24	13		25		2		
Scoter species	1.27		0.07	4		50	0.10	11	0.20	11
Red-breasted Merganser					0.1	3	0.80	142		
Unidentified Waterfowl					1.0	229	0.10	144		
Marsh Hawk	0.04	1								
Phalarope					0.90	105	0.10	1712		
Small Shorebird					0.65	43			0.13	7
Medium Shorebird						2				
Shorebird species					1.15	110	0.30	22		
Parasitic Jaeger						1				
Jaeger species			0.02	1				1		
Glaucous Gull	1.55	38	1.24	67	2.55	396	1.75	315	1.85	100
Sabine's Gull	0.04	1								
Arctic Tern	0.08	2	0.11	6	0.05	6				
Snowy Owl	0.04	1						2		
Snow Bunting					0.15	14				
Total No. of species	13		16		15	23 <sup>1</sup>	15	19 <sup>1</sup>	11	
Total	57.23	1,402	78.85	4,265	191.95	30,492 <sup>1</sup>	33.65	25,679	35.95	1946
Total area sampled (km <sup>2</sup> )	24.5		54.1		64.8b.i <sup>2</sup> 51.3mid <sup>3</sup>		55.3b.i <sup>2</sup> 55.3mid <sup>3</sup>		54.1	
Transect width; altitude	200m; 100' ASL		400m; 200' ASL		400m; 150' ASL		400m; 150' ASL		400m; 200' ASL	

1. Includes birds seen off transect.
2. Transect 200m S of barrier island.
3. Mid-lagoon transect.

## Appendix A-3

Results of aerial bird transects over the coastal lagoon waters of the Arctic National Wildlife Range, Barter Island to U.S.-Canada Border July to September 1979. Densities in birds/km<sup>2</sup> (not adjusted for visibility).

<u>Species</u>	<u>July 29</u>		<u>September 7/10</u>	
	<u>Density</u>	<u>Total #</u>	<u>Density</u>	<u>Total #</u>
Yellow-billed Loon	T	2	T	1
Arctic Loon	T	1	0.2	6
Red-throated Loon	0.2	9	0.2	7
Loon species	0.2	12	0.1	5
Brant	0.3	15	1.1	39
Snow Goose	0.1	4		
Pintail	0.3	15		
Duck species	0.1	6		
Scaup species	0.3	16		
Common Eider	T	2		
Eider species	0.1	7	0.2	7
Oldsquaw	271.8	16,035	56.2	2,022
Common Scoter	T	1		
Surf Scoter	0.4	24		
Scoter species	1.9	113	1.2	42
Red-breasted Merganser	T	2		
Small Shorebird	8.5	499	2.1	75
Glaucous Gull	3.2	188	5.9	212
Arctic Tern	0.4	25		
Black Guillemot	0.05	3		
Passerine	T	1	0.1	2
Total No. of species	15		10	
Total	287.9	16,980	67.2	2418
Total Area Sampled (km <sup>2</sup> )	59.0		30.0	
Transect Width; Altitude	400m; 100 ft.		400m; 200ft.	