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USE OF LAKES BY WATERBIRDS IN THE PRUDHOE BAY  
OILFIELDS, 12-13 AUGUST 1974

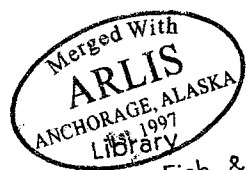
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## USE OF LAKES BY WATERBIRDS IN THE PRUDHOE BAY OILFIELDS

This report appraises populations of postbreeding waterbirds found at lakes in the portion of Arctic Coastal Plain being developed by oil companies near Prudhoe Bay. Bergman (1974) documented the value of large coastal plain lakes to postbreeding waterbirds, specifically arctic loons (Gavia arctica), Canada geese (Branta canadensis), white-fronted geese (Anser albifrons), and oldsquaws (Clangula hyemalis). Therefore, this investigation was initiated to: (1) count waterbirds at lakes in the development area in an effort to determine population baselines; (2) establish an annual index of goose production in the oilfields; and (3) evaluate the effects of development activities and other factors on the distribution of postbreeding waterbirds.

Thanks are due Chip H. Welling and William S. Seegar, both of John Hopkins University, for assistance during the surveys.

### STUDY AREA

Lakes inventoried during this study occur within a 250-square mile zone (Figure 1) bounded on the north by the Beaufort Sea and on the south by latitude 70°06'. The Kuparuk and Sagavanirktok Rivers form the west and east boundaries, respectively. The 71 wetlands that were surveyed comprise approximately 15 percent of the surface area in this region.

The coastal plain in the study area is an unglaciated emergent region of continental shelf having very low relief and poor drainage. Typical relief features are numerous thermokarst lake basins, polygonal ground,

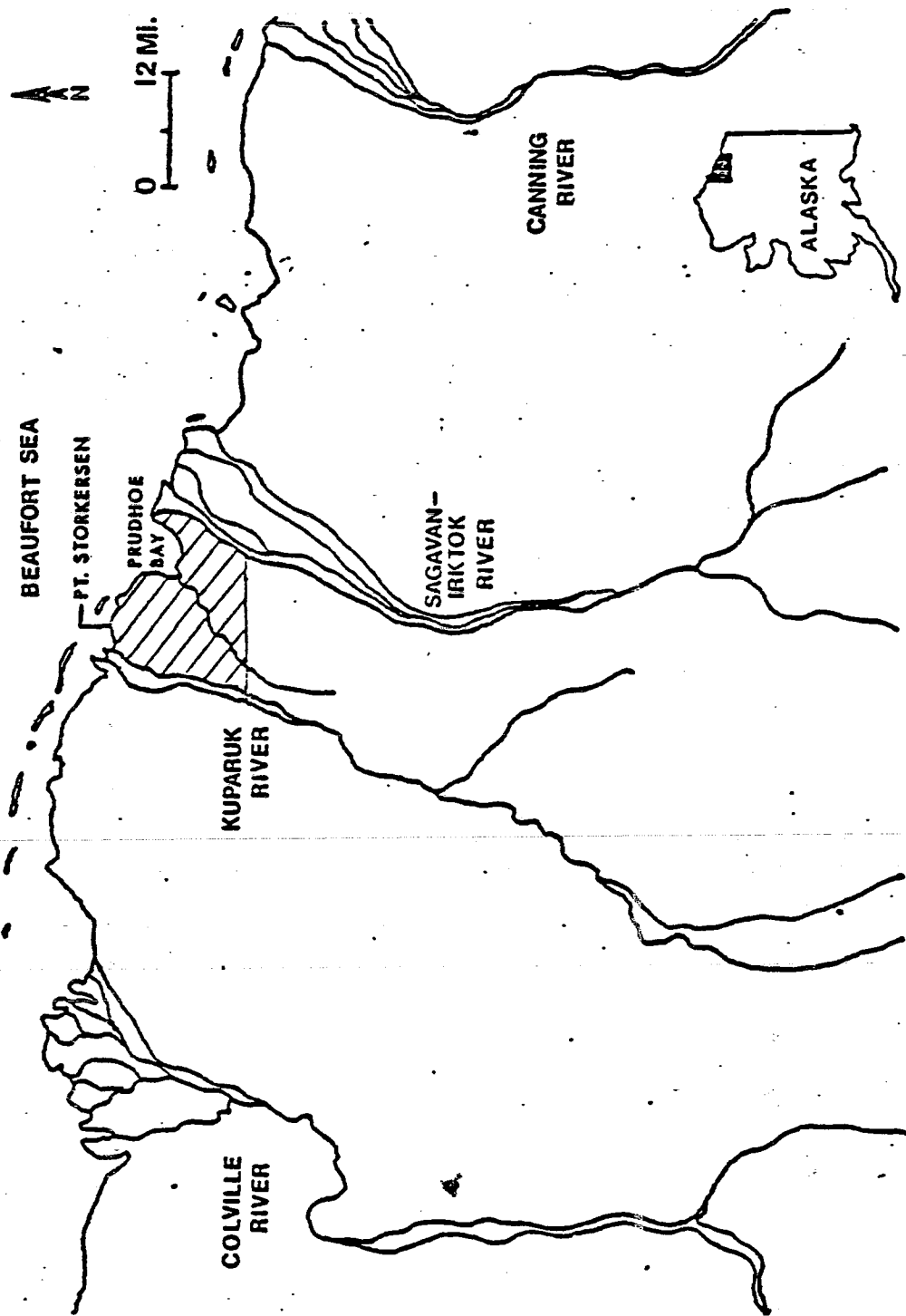


Figure 1. Location of the area (shaded) surveyed for waterbirds near Prudhoe Bay during 12 and 13 August 1974.

ice-cored mounds (pingos), and relief characteristics of streams and gentle slopes (Hussey and Michelson 1966). Elevations in the study area range from sea level at the coast to approximately 100 feet on surface residuals near the southern boundary.

#### METHODS

Seventy-one lakes varying in size from 75 to 1,000 acres were surveyed for birds during 12 and 13 August 1974. The minimum size was selected because Bergman (1974) observed flightless geese and oldsquaws only at lakes larger than 75 acres. Within the study area, only three wetlands were not surveyed that have areas greater than 75 acres.

Each lake was surveyed by flying above the entire shoreline in a Jet Ranger 206 B helicopter. The helicopter was flown at an altitude of 75 to 100 feet and a ground speed ranging from 50 to 90 mph. One observer counted birds on the open water and shore zone and a second observer surveyed adjoining land areas. Absolute counts were made of loons, swans, and geese at the lakes. Counts of oldsquaws, however, were not complete because those birds inhabiting the center of the lake could not be accurately censused. Consequently, numbers of oldsquaws will provide only an index to their population size.

Large scale (1:24,000) U.S. Geological Survey orthographic maps (1970) were used as base maps for the study area and for determining exact distances of lakes to roads and oil facilities. Because additional facilities have been constructed since preparation of the maps, each lake was appraised during the survey for distances to man-caused sources of disturbance.

## RESULTS AND DISCUSSION

## Numbers of Waterbirds

Total numbers of birds observed at lakes appears in Table 1. In general, geese were found along the shore and loons, swans, and oldsquaws were observed swimming.

Table 1. Numbers of adult and immature waterbirds counted at the 71 lakes in the Prudhoe Bay study area during 12 and 13 August 1974.

	<u>Adults</u>	<u>Immatures</u>	<u>Total</u>
Arctic loon	119	7	126
Whistling swan	12	7	19
Canada goose	617	33	650
White-fronted goose	170	8	178
Oldsquaw	1434	—	1434

Goose production in the Prudhoe Bay study area (Table 1) apparently was extremely low during 1974 due to harsh weather in early June. In late May, pairs of white-fronted geese were present on snow-free areas of tundra near Point Storkersen (Figure 1). However, during the first week June, blowing snow and sub-freezing temperatures forced birds off their territories. No production by white-fronted geese was reported by field investigators in the Point Storkersen area in 1974 compared to frequent brood sightings in 1971-1973. Additional evidence of low goose production in the region was failure of both lesser snow geese (Chen caerulescens)

and black brant (Branta nigricans) to nest at traditional colony sites on Howe and Duck Islands, respectively, in the Sagavanirktok River delta.

The proportion of postbreeding waterbirds counted by surveying only large lakes in the study area differs for each species. Probably most of the adult and young Canada geese in the region are found along lake shores during late July and August. Also, most of the white-fronted geese broods and parents are seen at lakes, but flying adults without young frequently utilize other habitats. Lakes are the principal habitat of nonproductive oldsquaws during the wing-molt, but most adult males undergo a molt-migration to the coastal Beaufort Sea, and females with broods use smaller freshwater wetlands. Arctic loons and whistling swans (Olor columbianus) use several wetland habitats in addition to lakes. In summary, the August lake survey should provide a nearly absolute census of all Canada geese and families of white-fronted geese, and an index of arctic loon, whistling swan, and oldsquaw populations.

#### Factors Influencing Selection of Lakes by Waterbirds

Disturbance. - Based on proximity of lakes to sources of disturbance, lakes were placed in the disturbance classes defined in Table 2. Presumably, greater use of the relatively isolated classes (Classes IV-VI) of lakes by a species indicates the birds are avoiding lakes disturbed by industrial activities.

Table 2. Classes of lakes influenced by different degrees of disturbance in the study area.

<u>Class</u>	<u>Characteristics</u>	<u>No. in Sample</u>
I	Lakes adjacent <sup>a/</sup> to actively used facilities such as living quarters, oil wells, or pump stations.	4
II	Lakes adjacent to roads receiving high vehicle activity or actively used airstrips.	11
III	Lakes adjacent to facilities that are infrequently used.	9
IV	Lakes between 1/4 mile and 1 mile from facilities.	13
V	Lakes between 1 and 5 miles from facilities.	29
VI	Lakes over 5 miles from facilities.	$\frac{5}{71}$

<sup>a/</sup> Adjacent indicates that man-made sources of disturbance occur within 1/4 mile of the lake.

Tables 3 and 4 indicate the white-fronted goose is the only species apparently affected by man-caused disturbance. Mean number of white-fronted geese per lake (Table 3) is one or less for lakes in classes I through IV and five geese per lake for the two least disturbed classes.

Table 3. The mean number of waterbirds per lake found in each lake disturbance class.

Lake Disturb- ance Class	No. of Lakes	Mean No. Per Lake				
		Arctic Loon	Whist. Swan	Canada Goose	White- fr. Goose	Old Squaw
I	4	<1	—	27	—	73
II	11	3	<1	1	1	8
III	9	1	—	8	—	7
IV	13	2	<1	22	1	13
V	29	1	<1	6	5	22
VI	<u>5</u>	<u>5</u>	<u>—</u>	<u>—</u>	<u>5</u>	<u>39</u>
Total	71	2	1	9	3	20

Table 4. Percent of total number of lakes used by waterbirds in each lake disturbance class.

Lake Disurb- ance Class	No. of Lakes	Percent of Lakes Used				
		Arctic Loon	Whist. Swan	Canada Goose	White- fr. Goose	Old Squaw
I	4	25	—	50	—	75
II	11	82	9	18	9	36
III	9	22	—	44	—	44
IV	13	38	15	38	15	54
V	29	55	14	38	24	52
VI	<u>5</u>	<u>100</u>	<u>—</u>	<u>—</u>	<u>40</u>	<u>100</u>
Total	71	54	10	34	17	56



The other species showed no apparent pattern of avoidance or attraction to lakes in the different disturbance classes. Such results are surprising in view of the adverse affects of human disturbance reported for postbreeding Canada geese in the Northwest Territories, Canada (Sterling and Dzubin 1967) and for arctic loons in southwestern Finland (Lehtonen 1970). Preferably, data for assessing human disturbance in this report should have been generated in the years before extensive development began. However, intensive industrial activities have been underway for 5 years and, unfortunatly, comparable bird information for the region does not exist.

Surveys repeating the methods described in this report should be conducted annually for the next 3 years and biannually thereafter. Such data will be necessary for evaluating whether annual fluctuations in numbers of adults and young are related to human disturbance or other factors such as climatic extremes.

Size. - The influence of lake size on use of lakes by waterbirds was evaluated by separating lakes into size classes and tabulating mean number of birds per lake (Table 5) and the percent of lakes used in each class (Table 6). Both Table 5 and 6 indicate that white-fronted geese mainly used lakes smaller than 0.7 square miles in area whereas Canada geese occupied larger lakes, predominantly in the 0.9 to 1.0 square mile size class. Oldsquaws were observed on lakes of all sizes, but most frequently on lakes having areas greater than 0.5 square miles.

Table 5. The mean number of waterbirds per lake found in each lake size class.

Size Class of Lakes (Sq. mi.)	No. of Lakes	Mean No. Per Lake				
		Arctic Loon	Whist. Swan	Canada Goose	White- fr. Goose	Old Squaw
0.1 - 0.2	22	2	<1	3	2	10
0.3 - 0.4	26	1	<1	10	5	16
0.5 - 0.6	10	3	—	10	2	34
0.7 - 0.8	5	3	1	8	1	16
0.9 - 1.0	6	1	—	31	—	38
- 1.9 -	<u>1</u>	<u>1</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>150</u>
Total	71	2	<1	9	3	20

Table 6. Percent of total number of lakes used by waterbirds in each lake size class.

Size Class of Lakes (Sq. mi.)	No. of Lakes	Percent of Lakes Used				
		Arctic Loon	Whist. Swan	Canada Goose	White- fr. Goose	Old Squaw
0.1 - 0.2	22	50	14	23	14	32
0.3 - 0.4	26	42	12	35	15	58
0.5 - 0.6	10	70	—	40	40	80
0.7 - 0.8	5	80	20	40	20	80
0.9 - 1.0	6	50	—	67	—	83
- 1.9 -	<u>1</u>	<u>100</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>100</u>
Total	71	54	10	34	17	56

Distance to Sea. - Within the study area, none of the species considered in this report appeared to select lakes because of their proximity to the Beaufort Sea (Tables 7 and 8). However, lakes farthest from the sea were only 15 miles distant and this range probably is not large enough to detect actual synergistic effects of the sea on bird distribution. Black brant most commonly occupy habitats adjoining the sea, but only one family of brant was seen during the survey; they were approximately 1/4 mile from the coast.

Table 7. The mean number of waterbirds per lake found at lakes in different distance classes from the Beaufort Sea coast.

<u>Dist. to Sea Class</u>	<u>No. of Lakes</u>	<u>Mean No. Per Lake</u>				
		<u>Arctic Loon</u>	<u>Whist. Swan</u>	<u>Canada Goose</u>	<u>White-fr. Goose</u>	<u>Old Squaw</u>
0 - 2 mi.	14	1	<1	11	1	22
2 - 5 mi.	21	2	<1	3	5	9
5 - 15 mi.	<u>36</u>	<u>2</u>	<u>&lt;1</u>	<u>12</u>	<u>2</u>	<u>26</u>
Total	71	2	<1	9	3	20

Table 8. Percent of total number of lakes used by waterbirds at lakes in different distance classes from the Beaufort Sea coast.

<u>Dist. to Sea Class</u>	<u>No. of Lakes</u>	<u>Percent of Lakes Used</u>				
		<u>Arctic Loon</u>	<u>Whist. Swan</u>	<u>Canada Goose</u>	<u>White-fr. Goose</u>	<u>Old Squaw</u>
0 - 2 mi.	14	29	14	50	14	71
2 - 5 mi.	21	38	1	20	10	38
5 - 15 mi.	<u>36</u>	<u>69</u>	<u>11</u>	<u>36</u>	<u>22</u>	<u>61</u>
Total	71	54	10	34	17	56

## SUMMARY

Waterbirds frequenting the shores and open water of lakes in the Prudhoe Bay area were counted from a helicopter during 12 and 13 August 1974.

Oldsquaws were the most common bird (1434 adults) and Canada geese ranked second in abundance (617 adults and 33 young). White-fronted geese (170 adults and 8 young), arctic loons (119 adults and 7 young), and whistling swans (12 adults and 7 young) were observed regularly. The lake survey seemed to provide a nearly complete census of all Canada geese and families of white-fronted geese, and an index of arctic loon, whistling swan, and oldsquaw populations.

Based on the disturbance class approach used in this study, the white-fronted goose appears to be the only postbreeding waterbird that has been adversely affected by development activities near lakes in the oilfields. Bird surveys conducted before extensive development began in 1969 would have been more effective for evaluating the influence of industrial activities on birds.

Selection of lakes of particular sizes was apparent for geese and oldsquaws. White-fronted geese mainly used lakes smaller than 0.7 square miles in size, Canada geese most frequently occupied lakes in the 0.9 to 1.0 square mile size class, and oldsquaws most commonly used lakes having areas greater than 0.5 square miles.

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