C. Dorset

Waterfowl Surveys in Labrador-Ungava

1970, 1971, 1972

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INTRODUCTION

Historically, Labrador-Ungava has presented logistic problems which have limited the effectiveness of most waterfowl surveys. Survey design, to a large degree, has been based on the availability of fuel and other support materials. Little attention has been given to the various factors affecting the waterfowl productive capability of the area. This report records our attempt to relate waterfowl distribution and densities to the biophysical characters of Labrador-Ungava.

A second objective of the study was to establish baseline waterfowl data for the watersheds which will be affected by the Churchill Falls (Labrador) Corporation's hydro-electric development. These data will be used to determine the impact of large area flooding on waterfowl populations.

The paper includes information collected in western Labrador during breeding pairs and brood surveys in 1970 and 1971 and a breeding pairs survey in 1972. A breeding pairs survey was also conducted in northern Labrador and northeastern Quebec in 1970.

Although we discuss only waterfowl in this paper, all surveys were designed to inventory caribou *Rangifer tarandus*, osprey *Pandion haliaetus* and bald eagle *Haliaeetus leucocephalus* populations as well. Data on these species will be published in the future.

STUDY AREAS

(a) The Lake Plateau

An analysis of small game licence returns (Inder and Gillespie in press) indicated that an area west of Goose Bay produced a significant number of waterfowl, particularly black ducks *Anas rubripes*, common scoters *Oidemia nigra*, surf scoters *Melanitta perspicillata*, and Canada geese *Branta canadensis*. The licence return data, however, failed to pinpoint the productive areas. An examination of surficial and bedrock geology maps of Labrador-Ungava suggested that the major drift belts, particularly those of western Labrador (the "Lake Plateau" of Tanner 1944) had the greatest productive potential. An exploratory flight of the area in June, 1969, indicated significant waterfowl densities. It was therefore decided to begin our work in an area of about 22,000 square miles on the Lake Plateau. This area was also of interest because of the large amount of waterfowl breeding habitat that will be inundated by the Churchill Falls project. Approximately 1,700 square miles of predominantly shallow island-studded lakes and associated bogland will be flooded. The total reservoir area will encompass approximately 3,700 square miles.

The Lake Plateau lies in the southeastern bow of the huge drift-belt crescent which extends from south of Fort Chimo through Atikonak

Lake and swings west then north to an area between Nichicun and Lac Bienvielle (Map 2). The Plateau is generally at a lower elevation than areas outside the crescent but the difference in level is never large. The relief is slight with low-lying areas, important for waterfowl, varying in elevation from 1,500 to 1,900 feet.

The drift belt crescent displays perhaps the greatest abundance of water bodies in Labrador-Ungava. Most of these are shallow, island-studded lakes which are flooded depressions in the drift sheet and bedrock. Along the western border of the Lake Plateau, the lakes parallel the bedrock structure.

The Lake Plateau lies within the Labrador taiga zone of the boreal forest formation (Hustich, 1945). Open crowned lichen-spruce woodlands occupy about 50 per cent of the area. Fens, bogs, and small water bodies occupy low-lying areas and arctic-alpine plant communities are found on the higher hilltops.

In order to develop a more complete inventory of Labrador-Ungava and to pinpoint areas for future investigation, a breeding pairs survey was conducted in 1970 on a 50,000 square mile area north and east of the Lake Plateau (Map 1C). The area was divided into two units: the North Unit and the Northeast Unit.

(b) The North Unit

The North Unit includes a portion of the northeastern horn of the drift-belt crescent, the Labrador Trough and the Eastern Labrador Plateau. The physiography of the area occupied by the glacial drift follows the description given for the Lake Plateau. The vegetative cover may be described as an ecotone between the boreal forest and Arctic tundra. Lichen-heath covers an increasingly greater proportion of the uplands towards the north, while lichen woodlands are confined more to the valleys. The section of the Labrador Trough in the North Unit is typically a ridge-and-valley relief with northwest-southeast trending ridges. It varies from 15 to to 50 miles in width and extends northwest from Schefferville almost to Leaf Bay (about 250 miles). In the south the valleys are normally drift-filled while in the north sand and other alluvial materials are present. The principal cover in the south is open lichen woodland, a large portion of which has been burned in recent years. On the higher slopes these woodlands give way to lichen-heath. String bogs occur locally. Alder and willows line the lake and water courses. The eastern Labrador Plateau, in this unit, is a near perfect rock-plain. The cover is largely lichen-heath tundra.

(b) The Northeast Unit

The Northeast Unit includes most of the Eastern Labrador Plateau and the southern portion of the northeast Labrador massif which contains the Torngat, Kiglapait and Kaumajet Mountains. West of Nain, bold rugged hills separate the coast from the Eastern Labrador Plateau. Northwest of Nain the mountains rise sheer from the sea to summits above 5,000 feet, a few miles from the coast. The cover is largely tundra lichen-heath with sparse lichen-woodland in the river valleys.

METHODS

The surveys of the Lake Plateau (three spring breeding pairs surveys and two summer brood surveys) were flown with helicopters. Due to logistic problems and budget restrictions different types of helicopters were used. All helicopter surveys were flown at an altitude of approximately 200 feet above the terrain. The breeding pairs surveys were all flown in a Bell 206 Jet Ranger, the 1970 brood survey in a Bell G2, and the 1971 brood survey in a Hiller 12E. There was considerable variation in the speeds and range capabilities of the different machines. Both the Bell G2 and Hiller 12E were limited to a speed of 60 m.p.h. and could fly about 2 hours between fuelings. The Jet Ranger could cruise at approximately 100 m.p.h. for about 3 hours. We generally carried an additional ½ hour's fuel on the floats of the Jet Ranger. The higher

speed of the Jet Ranger was an advantage when survey lines took us over the larger ice-covered lakes and unproductive forest zones. An average speed of 50-60 m.p.h. was flown over potential waterfowl areas on all surveys. The use of different types of machines may have affected our observations but we feel the effects were minimal.

The 1970 breeding pairs survey of Northern Labrador and Quebec was flown with a piston driven deHavilland Beaver at an average speed of 100 m.p.h. We used this type of aircraft, rather than a helicopter, because of the need for greater range capability due to a lack of available fuel and a need for additional power when flying in the mountainous area, particularly on the east coast. In 1970, we attempted to maintain an altitude 300 feet above the terrain, but in northern Labrador this was frequently impossible. In some areas it was not safe to follow the predetermined flight lines across the mountains and instead fault structures were used as access routes through the mountains.

The helicopter and airplane crews consisted of a pilot and two observers.

The observation distance for the helicopter surveys was calculated by noting the extremes at which waterfowl could be seen and identified over different cover types. These distances were then measured on the ground. Although there was considerable variation,

because of different cover types, the mean observation distance was 1/8 of a mile on either side of the aircraft.

It was not possible to field check the strip width for the deHavilland Beaver flights in the same manner. Checks were made, however, at the airports and a 1/5 of mile strip on both sides of the aircraft was used in 1970.

The helicopter surveys were based at Churchill Falls but flights were also made out of Wabush and Schefferville. All of the deHavilland Beaver flying on the North Unit in 1970 was from Schefferville. The two northernmost lines on the Northeast Unit originated from Nain, while the southern lines were flown out of Hopedale. It was necessary to cache fuel for the helicopter surveys but not for the deHavilland Beaver survey of 1970.

The Lake Plateau was divided into 7 blocks according to watersheds and the flooding plans of the Churchill Falls project. These blocks were used during all surveys although the sampling intensity within blocks varied.

As a matter of convenience, we used the Universal Transverse Mercator grid system as superimposed on the Department of Mines and Technical Survey 1: 250, 000 map sheets to delineate block boundaries and to determine sample units. During the 1970 breeding pairs survey

we decided to sample the northern 1.5 miles of randomly selected 10,000 meter square units. The number of units (henceforth called sample replicates) per block was proportional to the total area of the blocks. This design allowed for two systems of sampling:

(1) Sample replicates 1.5 x 6.2 miles (9.3 square miles) were flown in an attempt to arrive at a total waterfowl count. Generally six evenly spaced east-west lines were flown within each replicate. In replicates which fell in areas which were obviously poor waterfowl habitat (e.g. large frozen lakes and dry closed-crown forest) fewer passes were made. For the Lake Plateau we had 58 replicates (539 square miles) for a sampling rate of 2.5 per cent.

(2) A strip census was conducted while flying between replicates and from base to replicates. We flew 1,750 miles in this manner using a strip width of ¼ mile (438 square miles) for an overall sampling rate of 2.0 per cent.

In the 1970 brood surveys we were unable to duplicate the intensity of sampling in the replicates because of range limitations of the G2 helicopter. Also analyses of the 1970 breeding pairs survey data, as will be explained later, indicated that for the more important species such intensive sampling was not necessary. Consequently, during the 1970 brood survey each replicate was traversed once and

all observations were treated as a strip census. A total of 1, 792 miles (488 square miles) were flown for a sampling rate of 2. 1 per cent.

In 1971, program funding permitted only a limited breeding pairs survey. Sixty-five per cent of the Lake Plateau was strip censused with a Jet Ranger at a rate of 1. 8 per cent. Areas excluded contained both optimum and marginal waterfowl habitat along the north and west borders of the Plateau. During the 1971 brood survey the distribution and number of sample replicates per block was changed in an attempt to improve our sampling of habitat types, and to increase our information about future flooded areas. Sample replicates were increased to 80 and were distributed uniformly within blocks. Three passes were made through each replicate and, as in 1970, the data were included as part of the strip census. One thousand nine hundred and eighty-four miles were flown for a sampling rate of 2. 3 per cent.

In the 1970 breeding pairs survey of the North Unit, lines were flown at 20 mile intervals north-south out of Schefferville. In the Northeast Unit lines were flown east-west from Nain and Hopedale. On the two uppermost circuits, in this unit, we were unable to maintain our intended 20 mile interval because weather delayed the survey and we ran out of flying time. Other deviations from a straight flight line were generally made to check out likely caribou areas and to avoid dangerous flying conditions.

In 1972 an abbreviated breeding pairs survey, similar to that of 1971, was flown over the Lake Plateau but no brood survey was conducted.

RESULTS LAKE PLATEAU

Breeding Pairs Survey

The sample replicate and strip census systems used in the breeding pairs survey of 1970 provided comparable densities for total Canada geese, black ducks, and puddle ducks. Similarly they provided comparable densities of paired Canada geese, black ducks, puddle ducks and total diving ducks (Table 1). There were, however, discrepancies in the densities of total common goldeneye *Bucephala clangula*, red-breasted merganser *Mergus serrator* and scoter using the two systems. The strip census, which produced higher total bird densities, covered a higher proportion of large lakes and running streams where non-breeding and migrating divers were concentrated. Those concentrations of divers were also more conspicuous.

During subsequent surveys we decided to strip census rather than attempt to obtain total counts in the replicates because the date of both systems were comparable, particularly for the more important species, and also because of funding limitations. We did, however, continue to use the 9.3 square mile replicates as focal points for flight

line planning in order to have well defined units which could be used for comparative purposes in later years to access the impact of the Churchill Falls project.

The number of Canada geese on the Lake Plateau during the spring surveys almost doubled from 1970 to 1971 and then remained about the same from 1971 to 1972 (Table 2). Extrapolation of these figures gives a total spring goose population of 12,800 in 1970, 24,200 in 1971 and 27,700 in 1972 on the Lake Plateau. The percentage of paired birds was fairly consistent ranging from 31 per cent in 1970 to 24 per cent in 1972.

Puddle duck densities remained fairly constant during the three breeding pair surveys. The total estimated population ranged from 11,800 to 14,500 of which 3,600 to 4,000 were classified as mated pairs. Black ducks represented from 75 to 84 per cent of the total puddle ducks and from 65 to 79 per cent of the mated pairs.

Diving duck populations showed very erratic fluctuations from 1970 to 1972. Residents of the Churchill Falls area reported a decline in the common goldeneye population prior to our first survey, which indicated a population of 8,400 on the Lake Plateau. This increased somewhat in 1971 and then declined to about 1,300 in 1972. The decline was accompanied by an influx of an estimated 5,500 lesser scaup

Aythya affinis in 1972. Prior to 1972 the few scaup on the Plateau were greater scaup *Aythya marila*.

The red-breasted merganser population dropped considerably from about 12,400 in 1970 to 2,300 in 1971. Their numbers increased to 5,900 in 1972. Common and surf scoters also declined from 1970 to 1971 and then increased slightly in 1972 (Table 2). We estimated there were about ten times as many surf scoters as common scoters on the Lake Plateau.

Brood Surveys

In 1970 the young birds observed were quite small and it is possible that, at the time of the survey, some clutches had not yet hatched. We therefore delayed the start of the 1971 brood survey by five days. This delay, combined with an earlier break-up and vegetative season in 1971, produced significantly more sightings of broods compared to those of 1970 (Table 3).

Summer population estimates for the Lake Plateau have been calculated from the data of Table 2. In 1971 there were 30% fewer Canada geese using the area than in 1970. The 1970 population was estimated to be 36,500 while the 1971 population was 25,600. The difference can be explained by the differences between years in the initiation of break-up and the onset of the vegetative season on the Lake Plateau

and the area north of it. With the delay in 1970 the birds appear to have been held up in migration and higher than normal densities of non-breeding moulting Canada geese were observed. The densities of Canada geese from the 1971 breeding pairs survey and brook survey are quite close (Table 2).

Population estimates of black ducks on the Lake Plateau during the 1970 brood surveys were 9,800 and 10,800 respectively. The population estimates of black ducks during all 5 surveys were remarkably similar, varying between 9,300 and 11,300.

The erratic behaviour of diving ducks, noted in the breeding pairs surveys, is also present in the between years' brood survey data (Table 2). Common goldeneye population estimates increased 33%, red-breasted merganser decreased 20% while common and surf scoters increased 100%. There does not appear to be any relationship between the relative numbers of diving ducks seen during breeding pairs surveys and brood surveys.

Table 2 also includes calculated pair densities. These observations are of little value at this time of the year as the males and females of most of the species, with the exception of the Canada goose, separate and do not share parental care of the broods. This was particularly evident in the black duck data.

There was a significant shift in the distribution of black ducks between the breeding pairs survey and the brood survey. If the Churchill Falls-Esker road is selected as an arbitrary division of the Lake Plateau into northern and southern halves, the breeding pairs data suggest an even distribution of this species throughout the area. However, the brood survey data provide a ratio of almost 6: 1 with the heaviest density located in the northern half. An examination of the relative frequencies of flock size during the brood surveys indicates the use of the northern half as a post-breeding moulting area by black ducks.

Results North Unit

Breeding Pairs Survey 1970

The North Unit, covering an area of 19, 000 square miles, provided Canada goose and black duck densities comparable to those of the Lake Plateau in 1970 (Tables 3 and 5). The estimated total numbers of Canada geese and puddle ducks for the area were 14, 600 and 10, 800 respectively. Black ducks represented 95% of the puddle ducks. The density of paired Canada geese was somewhat lower than on the Lake Plateau but the density of mated black ducks was essentially the same (Tables 2 and 4). Total diving duck density and the density

of mated pairs were considerably lower in the North Unit than on the Lake Plateau. A declining gradient of waterfowl densities from east to west within this unit was noted (Maps).

Results Northeast Unit

Breeding Pairs Survey 1970

The lowest waterfowl densities recorded in the three breeding pairs survey of 1970 were recorded in this area that comprised 31, 000 square miles. The number of Canada geese and black ducks in this unit were estimated to be 3, 700 and 1, 200 respectively (Table 4). We did not include waterfowl seen in coastal waters in those estimates and, undoubtedly, we underestimated waterfowl numbers because of the hazardous flying conditions encountered in much of the area. However we believe the counts reflect the relatively low productive capability of the unit compared to the other two units.

Within the Northeast Unit there was an increase in waterfowl densities from north to south (Map 3). Exception to that gradient were Canada goose densities observed on the second northernmost circuit (NE2). That was the result of a local concentration in the vicinity of Indian House Lake. Another exception was observed on the southernmost circuit (NE6) where fewer than expected waterfowl were seen. Virtually no ducks were seen north of 56^{o}N in the unit.

DISCUSSION

The original hypothesis developed during flights over different areas of Labrador between 1967 and 1969 was that the waterfowl capability of different areas was related to landform. We noted that the larger concentrations of waterfowl, particularly from late spring to early fall, were located in areas of major glacial drift deposits. Those deposits seemed particularly suited for the development of small island-dotted ponds and bogs. Conversely, we noted relatively few waterfowl on the Eastern Labrador Plateau or on the Labrador massifs that are best described as rock deserts.

While reviewing the literature on the area we placed particular emphasis on landform and surficial geology. Considerable material was made available through the McGill Sub-Arctic Research Laboratory at Schefferville, Quebec. The basis of our work was the biophysical study of Labrador-Ungava by Kenneth Hare (1959) and the detailed landform maps (Scale 1: 506, 800) that were prepared as base maps during the study by Hare's group. Those maps also show a close correlation to the physiognomic cover-type association.

The ultimate goal of this work is to devise a method of stratified sampling based on the information of Hare's detailed maps and thereby improve the efficiency of surveys in Labrador-Ungava where waterfowl densities are generally low.

Early reports on waterfowl distribution and abundance, by Crissey, Glover and Noltemeier (1954), Noltemeier and Hanson (1955), and Evans (1956) refer to waterfowl distribution relative to forest types. Unfortunately they do not cite their references for forest classification and the classification does not agree with the work we have reviewed. Specifically, their classification lumps open boreal forests and forest tundra which we have found differ appreciably in waterfowl productive capability. The former is considerably more productive than the latter.

A waterfowl capability rating is suggested following Hare's cover-types (by moisture requirements and physiognomy with characteristic terrain associations) (Table 5). Although Hare (1959) provides twenty cover-types only 8 were significant for the support of waterfowl. In order of importance these are:

1. High - bog (B), fen (N).
2. Moderate - bog complex of permafrost areas (BC), alder and willow thickets (A).
3. Low - sedge shrub tundra (SG), muskeg (SM), encroachment (E), burned area (F).

There are obvious exceptions to this classification, e. g. the rivers of the peninsula which support broods and moulting birds, and

the alluvial plains of the coastal fiords which support significant numbers of moulting birds.

The Labrador-Ungava Peninsula north of the 52nd parallel has been mapped at a scale of 1: 506, 800. Twenty-seven cover-type map sheets depict that area. To date we have only spot-checked selected areas on those maps but the relative waterfowl densities recorded fit reasonably well within the classification.

Anomalous densities were recorded in some situations but in most cases an explanation could be found. For example, during the 1970 breeding pairs survey of the North Unit abnormally high densities of waterfowl were found in the southwest corner of the unit along the flightlines of circuits N1 and N2, (Map 3). Those densities were probably due to the delay in break-up that year. Instead of dispersing northwards the birds held up, temporarily, in the headwaters of the Koksoak and Whale River watersheds. Later flights failed to locate comparable densities. Similarly, the south eastern extremity of circuit N4 (Map 3) in the same unit produced high densities. This can be explained by the circuit having included a part of the more productive Lake Plateau. The former, which falls in the 'low to moderate' capability class classification showed densities considerably lower than those observed earlier while the latter remained about the same - relatively high.

When the data of circuit NE2 of the Northeast Unit (Map 3) were reviewed it was found that the largest number of birds seen were located on an anomalous drift deposit in the vicinity of Indian House Lake. The vegetative cover of that area more closely approaches that of the Lake Plateau-bogs and island-dotted ponds than does the surrounding and less productive area.

The limitations of such an approach to sampling are obvious. The biophysical maps prepared during Hare's (1959) studies are broad and not detailed. Therefore significant areas of small size can be missed during preliminary interpretations. Shegamook Lake, ($54^{o}30'$N. Lat., $61^{o}30'$W. Long.), for example, does not appear as an area of particularly high productivity according to Hare's map yet our survey showed that it supported several hundred waterfowl during the summer of 1971. Our method of survey, in addition, provides at best a subjective index of relative numbers, rather than an absolute measure. Variations in aircraft types and survey crews obviously result in biases that are yet unmeasurable.

Despite those limitations, the use of Hare's biophysical mapping can greatly facilitate the planning of surveys in a low waterfowl density area such as Labrador-Ungava. About one-third (180,000 square miles) of the Labrador-Ungava Peninsula constitutes high waterfowl

capability habitat. High in this context is relative to the overall capability of the peninsula and is not to be compared to areas other than Labrador-Ungava: the average waterfowl density on the Lake Plateau was about 3 birds per square mile.

Using Hare's maps it is possible to eliminate, for extensive survey purposes, areas of low potential and thereby increase the efficiency of the surveys. In the areas of very low potential (the eastern and western plateaux and the Labrador massif) a system of survey following watercourses would probably be most productive. We noted that in such areas birds were frequently found in the slower moving portions of the rivers and relatively few were located in the sparsely vegetated ponds. In most situations this system would also assist navigation as the barren areas lack recognizable landmarks.

Timing of surveys is critical if year-to-year data are to be compared. The results of the spring breeding pairs surveys are obviously influenced by the relationship of the phenology of migration and break-up. Evans (1956) reported the 1956 break-up as one of the latest on record. His comparative table of waterfowl densities for the years 1955 and 1956 reflects the observations we made in 1970, 1971 and 1972. Comparing the two classes he used--probable breeding birds and probable migrants--it is obvious that in 1956 there was a higher proportion of migrants, suggesting late nest

initiation and delayed migration. Using the same criterion on our data, both 1970 and 1972 were late break-up seasons. Although the 1971 survey was carried out about a week to ten days before the 1970 and 1972 surveys the proportion of migrants to breeding birds was about the same as in the other two years. We do not think that breeding pairs surveys can provide data that are comparable from year to year unless survey design and budgeting allow for phenological variations. Evans' (1956) use of the adjective "probable" is a good description of spring population densities as calculated from these surveys.

The 1970 spring breeding pairs data, where we compared two systems of surveys (Table 1), provide further proof that the birds seen at that time of the year may disperse to other areas. This was particularly true of diving ducks. Although there were wide discrepancies in total diving duck densities between the two systems of surveys the densities of mated pairs (probable breeding birds) were reasonably close, except for mergansers, and the mated pair densities were more compatible with the densities of the brood surveys (Tables 1 and 2). Non-breeding moulters and late breeders obviously dispersed to areas outside our study areas.

The late break-up of 1970 appears to have had the opposite effect on Canada goose densities. Following the spring breeding pairs survey there was an obvious influx of Canada geese on to the Lake

Plateau (Table 2). Most of these birds were non-breeding moulters. The densities of the 1971 surveys (a "normal" year) are quite similar (Table 2).

We therefore, conclude that brood surveys provide better indices of the area's capability to support waterfowl. Brood surveys also allow greater flexibility in program planning as the birds are relatively sedentary for a longer period of time than during the spring.

Total waterfowl densities on the Lake Plateau varied from 290 birds per 100 square miles to 320 during breeding pairs surveys and between 220 birds per 100 square miles and 260 during brood surveys. The greatest change between breeding survey densities and brood survey densities (25% in 1971) is attributable to fewer Canada geese occupying the Lake Plateau during the moulting period of 1971.

The waterfowl densities recorded on the Northland Northeast Units during the 1970 breeding pairs survey were 185 and 25 birds per 100 square miles respectively. It has already been shown that there was a major but temporary build-up of waterfowl in the southwest corner of the North Unit and the densities recorded during the spring survey were not found in the summer of 1970. A brood survey flown in 1972 expanded the North Unit to the north and west covering an area of 58, 000 square miles. A preliminary analysis of the data collected indicates the waterfowl density was 135 birds per 100 square miles,

down about 30% from the density of spring, 1970. Waterfowl densities on the expanded North Unit were 40% to 50% lower than those recorded on the Lake Plateau during brood surveys and a review of the field data of 1972 indicates that most of the waterfowl observations were made ober the northeastern extensions of the drift belt crescent and in portions of the Labrador Trough.

Our secondary goal in this work was to assess the effects the impoundments, created by the Churchill Falls (Labrador) Corporation, would have on waterfowl. We anticipated that the flooding of areas providing low relief islands would be detrimental to production. This has obviously occurred in the centre of the Lake Plateau (Lobstick Lake) where many of the islands are now under water. The degree of damage to production is not yet measurable from our surveys although, in view of the relatively low densities encountered during our surveys (in terms of other waterfowl producing areas in eastern Canada), its effect on the total production of the peninsula will probably be small.

Certain species may reflect the effects of flooding more than others. One of the interesting results of our surveys was the apparent northeastern extension of the ring-necked duck *Aythya collaris* into Labrador. Our information suggests that flooding will have a detrimental effect on a further extension of the range of this species, which is tied to bogland types of habitat for reproduction (Mendall, 1958),

Hare (1955) described three major areas of bogland - the Lac Joseph bog-complex, the Lobstick-Michikamau bog-complex and the bogs of Ossokmanuan Lake. The latter was flooded with the creation of the first reservoir of the Churchill Falls development in 1962. No ring-necked ducks were found in this flooded area in 1970, 1971 or 1972. However they were found and observed to be breeding in Lac Joseph and Lobstick-Michikamau bogs. With the flooding of the latter it is expected that much of the better breeding habitat will be lost.

Casual observations of the major reservoir (the Smallwood Reservoir) in 1972 suggest that this area may have created a holding area for non-breeding moulting Canada geese. More of these birds were noted during the summer months than in previous years and local reports suggest that the area supported more birds into the fall than usual. It is questionable, at this time, how long this phenomenon will last. The Ossokmanuan reservoir, which has a longer history, does not support any number of Canada geese or waterfowl of any species.

TABLE 1. Comparison of the sample replicates and strip census methods used during the June, 1970 breeding pairs survey of the Lake Plateau.

Species	Sample Replicates 539 Sq. Mi.		Strip Census 438 Sq. Mi.	
	No. Seen	Density Per 100 Sq. Mi.	No. Seen	Density Per 100 Sq. Mi.
Total Birds				
Canada goose	325	60	269	61
Black duck	236	44	204	47
Total puddle ducks[1]	289	54	243	56
Goldeneye	104	19	174	40
Merganser	165	31	258	59
Scoter	312	58	392	90
Total diving ducks[2]	583	108	824	188
Total ducks[3]	946	175	1135	259
MATED PAIRS				
Canada goose	121	22	83	19
Black ducks	71	13	64	15
Total puddle ducks[1]	99	18	85	19
Goldeneye	51	9	26	6
Merganser	48	9	77	18
Scoter	28	5	22	5
Total diving ducks[2]	128	24	125	29
Total ducks[3]	260	48	240	55

[1] Includes green-wing teal, pintail, mallard and black ducks.
[2] Includes ring-necked ducks.
[3] Includes unidentified ducks.

TABLE 2. Lake Plateau Surveys 1970, 1971, 1972.

	Breeding Pairs Survey Densities			Brood Survey[1] Densities	
	1970	1971	1972	1970	1971
Canada goose	61 (19)	115 (35)	132 (32)	174 (3)	18 (7)
Black duck	47 (15)	43 (11)	52 (13)	50 (9)	45 (15)
Total puddle ducks[2]	56 (19)	59 (17)	69 (19)	52 (11)	54 (22)
Common goldeneye	40 (6)	54 (9)	6 (3)	15 (3)	20 (1)
Red-breasted merganser	59 (18)	11 (3)	28 (6)	10 (6)	12 (5)
Common and surf scoter	90 (5)	44 (3)	59 (9)	6 (2)	12 (1)
Total diving ducks[3]	188 (29)	119 (19)	118 (22)	33 (11)	47 (9)

Top figure birds per 100 square miles; bottom figure (in parenthesis) mated pairs per 100 square miles.

[1] Does not include birds of the year.
[2] Includes green-winged teal, pintail, mallard and black duck.
[3] Includes ring-necked duck, greater scaup, lesser scaup, old squaw, goldeneye, merganser and scoter.

TABLE 3. Broods observed during 1970 and 1971 surveys on the Lake Plateau.

	1970		1971	
	No. of Broods	Mean Brood	No. of Broods	Mean Brood
Canada goose	8	3.1	37	5.4
Black duck	12	6.4	15	5.2
Green-winged teal	5	8.2	4	6.5
Pintail	1	3.0	3	4.0
Common goldeneye	1	4.0	3	4.7
Scoter	3	6.0	8	5.3
Scaup			7	4.4
Red-breasted merganser			10	9.0
Ringneck duck			2	5.0
Unidentified duck	1	5.0	6	5.3
Old squaw			3	5.0

TABLE 4. 1970 Breeding pairs survey.

	North Unit (a)	(b)	Northeast Unit (a)	(b)
Canada goose	(77)	15	(12)	4
Black duck	(54)	14	(4)	3
Total puddle ducks	(57)	15	(4)	3
Goldeneye	(10)	2	(7)	1
Mergansers	(5)	2	(1)	1
Scoters	(23)	1	-	-
Total diving ducks	(38)	4	(8)	2
Unidentified	(12)	3	-	-

(a) - birds per 100 square miles.

(b) - mated pairs per 100 square miles.

TABLE 5. Labrador-Ungava cover type classification (after Hare, 1955) with waterfowl capability ratings.

Moisture Series	Cover Type	Physiognomy etc.	Waterfowl Capability
Moist	Sedge Shrub tundra (SG)	Sedges and grasses dominant usually with abundant shrubs; no trees.	1
Wet	Muskeg (SM) or (MC/N)	Open growth of stunted conifers wet moss-covered floor, usually with peat in south (SM) frequently with sedges in north (MC/N).	1
	Bog (B)	Treeless area with sphagnum moss and abundant shrubs. Extensive open water with floating strings of vegetation.	3
	Fen (N)	Sedge-meadow, usually with patches of open water and occasionally with scattered stunted conifers, little sphagnum.	3
	Bog Complex of permafrost areas (BC)	Mixed sedge and sphagnum areas; scattered stunted conifers; soil surface patterned by frost-heaving. Palsa structure common.	2
	Encroachment (E)	Band of vegetation around ponds, lakes etc. as latter slowly fill in.	1
	Alder and willow (A)	Dense thicket, up to 12 feet high, with wet floodable floor. Pure alder thickets also common on high hill tops and in tundra.	2
	Burned area (F)	Depends on age of burn and nature of vegetation before burn. Some regeneration is typical.	1