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WATERFOWL AND RELATED INVESTIGATIONS
IN THE PEACE ATHABASCA DELTA REGION
OF ALBERTA, 1949

by
J. Dewey Soper

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Table of Contents

	<u>Page</u>
Introduction.....	1
Environmental Conditions.....	4
The Waterfowl Population	
1. Lake Claire-Mamawi Section.....	9
2. The Athabasca Delta.....	16
Gunners and Hunting Conditions.....	23
Waterfowl Transect Statistics.....	25
Annotated List of Wildfowl.....	42
Literature Cited.....	62
Figures 1 to 14.....Following Page.....	63
Map.....at back.....	

Wildlife Management Bulletins are produced to make available to wildlife administrators the information contained in reports which are submitted by officers of the Canadian Wildlife Service.

The reports do not, in most cases, cover extensive studies and are not written primarily for publication. Recommendations arising from the studies are not included.

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INTRODUCTION

The Peace-Athabasca Delta region is the greatest waterfowl nesting area in the Mackenzie River drainage basin and one of the most important in the Canadian Northwest. It is also distinguished as a waterfowl rendezvous and a gunner's paradise owing to the spring and autumn concentrations of ducks and geese.

Wildfowl investigations carried out in this region in the past were incidental and not specifically concerned with the waterfowl resources. More information, particularly more comprehensive data on autumn waterfowl populations, was desired. Accordingly I was instructed by the Wildlife Division of the Department of Resources and Development to carry out, in September and early October, 1949, a broad investigation of waterfowl populations present in the Delta during the autumn migrations.

Information regarding degree of abundance, preferred areas, foods, and reproductive success of the waterfowl was required. The various aspects of hunting pressure in the area were to be examined.

The survey was timely. Once remote, the territory can now be reached by aircraft. From year to year, an increasing

number of sportsmen from the "outside" are visiting the Delta, where little competition, large concentrations of birds and an early open season greatly improve the hunter's chance of a maximum legal kill.

On the morning of September 2, 1949, I travelled from Edmonton via C.P.A. airliner to McMurray airfield, and thence, by a smaller, pontoon-equipped 'plane that touched at several points along Athabasca River, to Fort Chipewyan, arriving there in early afternoon.

Previous arrangements had been made by the Department to furnish me with equipment and assistance. Promptly that afternoon, Patrolman Herbert Spreu (Wood Buffalo Park) arrived in Chipewyan with the government M.B. Aspen, the cabin motorboat that was to be used throughout the investigations. High wind and rough water prevented departure on September 3, but on the 4th a successful crossing from Chipewyan to the mouth of Embarras River was made. A waterfowl transect was run immediately from Lake Athabasca via Embarras River, Fletcher Channel and Athabasca River to the headquarters residence of Patrolman Spreu, 27th Baseline, Wood Buffalo Park.

A small barge was rigged to be propelled by M.B. Aspen and used as a floating and quickly movable camp while travelling. It was furnished with a canvas cover, wood-burning stove for warmth and cooking, rough bunks, cupboard, and table. In all sorts of weather it was an unqualified success as a headquarters camp.

During the weeks that followed intensive and detailed waterfowl investigations were carried out over all navigable waters of Athabasca Delta. Weather conditions were favourable and enjoyable except for a few days during the second week of

September. At that time the atmosphere was raw and cold and some delay was experienced as a result of snow storms (Fig. 3). The work was also handicapped to an appreciable extent by low water-levels. Some of the small lakes of the delta were virtually dry and others so low that navigation by canoe was impossible. This condition was worse at the end of the season of investigation than in the beginning.

It was originally planned to conduct all preliminary and basic investigations by boat and canoe--preferably making two coverages by the transect method, to be followed by transect check-ups from the air. Unfortunately, however, coverage of Lakes Mamawi and Claire by boat or canoe could not be made because of shallow water, so operations in that area were confined to aircraft.

The second coverage of the delta by watercraft transects was commenced on September 21. Practically every transect established earlier was re-run. Owing to lower water the coverage was not quite so complete, nor repeated in exactly the same order.

It was disappointing that a repeat coverage of Richardson Lake could not be carried out because water-levels in Athabasca and Richardson Rivers declined so far before the second coverage was attempted on September 23, that navigation was impossible even in an empty paddling canoe. The same kind of handicap prevented reaching other lakes directly west of Richardson Lake where waterfowl were said to be plentiful.

Transect data are given in a following section of this report. Actual field transects numbered 25, the first 11 of which were "ground" transects in the Athabasca Delta from September 4

to 11. All the aerial transects (Nos. 12 to 15 inclusive) were made on September 19. Transects Nos. 16 to 25, inclusive, were repeats to secure comparative data on the first coverage of the Athabasca Delta. This second coverage was finished by the end of September at the Warden's residence, 27th Baseline, Wood Buffalo Park.

In early October I returned to Edmonton by monoplane from Embarras Airport. This is an emergency wilderness depot for aircraft equipped with wheels or pontoons beside Athabasca River, about 38 miles southwest of Chipewyan.

During the investigations and related activities referred to above, miles travelled were as follows: by aircraft, 910; by motor boat and camp-berge, 380; by freighter canoe and outboard motor, 334; on foot, approximately 50; total 1,674 miles.

ENVIRONMENTAL CONDITIONS

The Peace-Athabasca Delta region, including the whole lake-lowland country to Lake Claire's western extremity, is a unit geologically and otherwise. A study of the physical conditions indicates that Lake Athabasca at one time extended westward unbrokenly to about the present west shore of Lake Claire. Since glacial times, great changes have taken place. Enormous quantities of silt have been discharged into the area by the Peace and Athabasca Rivers. Wide reaches of the earlier Lake Athabasca have become silted up, creating far-reaching, muddy lowlands, marshes, myriads of shallow ponds and lakes, and sluggish streams. The relatively shallow Mamawi, Claire, and Baril Lakes, and other bodies of water are remnants of the former west end of Lake Athabasca.

Most of the changes mentioned above derived from the action of Peace River, but Athabasca River also, has caused, and is causing, vast alterations. The amount of transportation and deposition of deltoid materials staggers the imagination. It would appear that in an early geological period a large bay existed in Lake Athabasca southwest of Bustard Island extending wide-open to the sandhills south of Richardson Lake. It is now almost completely filled with sediment and it constitutes the present-day delta of the Athabasca River. Yearly, more and more silt is being poured into the area. Vast deposits are slowly filling up Lake Athabasca off the mouths of the various channels southeast of Chipewyan, making the western extremity of the lake shallow from the mouth of Embarras River to the principal outlet at Riviere des Rochers.

More than half the total area of the Delta region is occupied by the numerous lakes, ponds, streams, and channels. Three large lakes--Claire, Mamawi, and Baril--cover a large part of the area in Wood Buffalo Park. In the Athabasca Delta the lake area is relatively less, but a maze of streams and channels is highly characteristic.

On the whole the country is dreary of aspect, being low, featureless and monotonous. Most of the land is no higher than from a few inches to a few feet above normal lake level (699 feet a.s.l.). Much of the shoreline is permanently swampy.

An outstanding characteristic of the region is the muddy, or occasionally sandy and often wide margin of rivers, channels, and lakes. Exceptions are the Precambrian areas along the west shore of Lake Athabasca, the granitic north side of the same lake

and the limestone outcrops on the west shore of Lake Claire north of Birch River.

Typically, a fringe of horsetail (Equisetum) and willows (Salix) occurs along the waterways, behind which is a belt of balsam poplar (Populus balsamifera) mixed with various shrubs. It is in these narrow wooded tracts that many species of ducks such as Mallards, Pintails, Shovellers, Teals, Scaups, and Baldpates, make their nests. Low and poorly drained areas may sustain black spruce (Picea mariana), dwarf birch, Labrador tea, and other bog vegetation. Where the land is higher, aspen poplar (Populus tremuloides), white spruce (Picea glauca), and white birch (Betula papyrifera) may occur, and occasionally in the southwest fringes of Athabasca Delta, balsam fir (Abies balsamea).

Behind the deceptive, usually narrow, border of poplars and willows there are often open, swampy marsh areas, in some places only a narrow fringe, in others quite extensive. Fine examples of such marshlands are seen at various places around Lakes Mamawi and Claire, along Prairie River, at the mouth of Birch River and scattered about in Athabasca Delta.

From the point of view of a wildfowl investigator the marshes are most exciting. Wide lush seas of grass are interspersed by small ponds and marshy lakes, and here waterfowl are likely to be most abundant. This is the typical habitat of such marsh nesting species as the Canvas-back, Redhead, Ruddy Duck, and American Coot and of large numbers of surface-feeding ducks. The vegetation of the marshes includes the hard-stemmed bulrush

(Scirpus validus), cattail (Typha latifolia), marsh cane (Phragmites communis), and whitetop (Fluminea festucacea). Occasionally these are associated, but more often one or two species occur locally to the exclusion of the others (Figs. 9 and 10).

In the water areas of the region as a whole, there is a prolific growth of subaquatic plants. Several species of pondweeds (Potamogeton), among them gramineus, Richardsonii, vaginatus, foliosus, and praelongus, are abundant. In many places a boat or canoe could be forced through the water only with difficulty because of underwater growth, and an outboard motor was rendered useless. Other native water plants include the arrowhead (Sagittaria), meadow grass (Poa), slough grass (Beckmannia), spike-rush (Eleocharis), water milfoil (Myriophyllum), mare's tail (Hippuris), and, less commonly, scattered patches of duckweed (Lemna). In some localities the yellow waterlily or spatterdock (Nymphoanthus) is well represented. A botanical survey would no doubt reveal a much larger number of typical delta plants, some of which would be valuable as waterfowl foods, as are the species mentioned.

Undoubtedly the wealth of nutritious subaquatic and emergent plants has had much to do with making this region a great waterfowl rendezvous.

The climate is typical of the northern interior, with relatively short, warm summers and long, cold winters. Under average conditions ice at the mouths of the Peace and Athabasca Rivers breaks up in late April or early May. Ice may drift back and forth in Lake Athabasca until early June.

Freeze-up occurs from about mid-October to early November. On October 16, 1949 shore ice formed on Lake Athabasca and Athabasca River and Delta channels froze over on October 28. Milder weather came and the river reopened again on November 10, was clear of ice for four days, and froze over for the winter on November 21.

The following table, showing maximum, minimum and extreme temperatures at Fort Chipewyan in the year 1900, is quoted from Preble's North American Fauna, 1908:

Month	Mean	Mean	Extremes		Monthly Mean
	Daily Max.	Daily Min.	Max.	Min.	
January.....	- 5.4	-18.9	12.5	-36.0	-12.2
February.....	- 7.7	-22.2	7.0	-42.0	-14.9
March.....	13.9	- 5.6	41.0	-39.5	4.2
April.....	49.4	29.6	66.0	8.5	39.5
May.....	61.8	41.9	70.0	25.5	51.8
June.....	68.1	48.5	81.0	35.0	58.3
July.....	70.0	51.0	79.0	38.0	60.5
August.....	68.3	47.7	83.0	31.5	58.0
September.....	55.5	37.6	68.0	24.0	46.6
October.....	43.4	28.0	58.0	15.0	35.7
November.....	16.7	1.7	40.0	-18.0	9.3
December.....	12.8	- 2.7	29.0	-34.0	5.5
Year			83.0	-42.0	28.5

THE WATERFOWL POPULATION

1. Lake Claire - Mamawi Section

The Peace-Athabasca Delta region is the only nesting tract of primary importance for game ducks in the Mackenzie River drainage basin. The Lake Claire marshes support a per-square-mile duck population about nine times as great as that of the Slave or Taltson Deltas, and nearly twice that of the Mackenzie Delta.

Besides being a breeding environment of outstanding merit, it is a great migrational clearing house. Since time immemorial this part of the country has been a favourite stopping-place of migrating ducks and geese. Legions of the birds regularly resort to the region to feed and rest. It is on the direct route from the Mississippi-Missouri drainage region to the far north.

Although the region is a geological unit, for present purposes it may be said to consist of two divisions, the Athabasca Delta area and the Lake Claire-Mamawi area, the former being about 300 square miles in extent and the latter 1,700 square miles. The Embarras River may be taken as the dividing line between the two areas.

Superficially, the two divisions of the region have similar habitat conditions and the specific composition of the waterfowl populations is practically identical. However, the Lake Claire-Mamawi area is really much superior to the Athabasca Delta. In some seasons it has twice as many ducks per square mile.

Previous to 1949 the writer had visited the Lake Claire - Mamawi area during the spring and summer seasons, and had formed some estimates of the waterfowl populations. In the late summer of 1932, the Riviere des Rochers, the Chenal des Quatres Fourches, and Lake Mamawi were examined, and a generous breeding aggregate of Mallard, Shoveller, Green-winged Teal, Baldpate, and American Golden-eye was observed. Canada Geese were noted daily and in early September fairly large flocks of Lesser Snow Geese were seen arriving.

In 1933 a waterfowl reconnaissance was carried out along a route that included Quatre Fourches, Lake Mamawi, Prairie River, and Lake Claire as far west as the delta of Birch River. Along Rocher River and nearby lakes the species of ducks mentioned above and also, in favourable tracts, Pintails, Buffleheads, Redheads, Ruddy, and Lesser Scaup ducks were numerous, if not actually abundant. Coots were nearly everywhere. Horned and Red-necked Grebes and Sora Rails were numerous.

Along the shores of Lake Mamawi the marshes teemed with ducks. Blue-winged Teals were first seen here in marked numbers. The Prairie River area proved to be an ideal breeding ground-- willow flats, with moist grasslands, marshes, and weedy lakes. Nesting was general, and thousands of ducks were seen. Mallards and Pintails were most abundant.

Along the west shore of Lake Claire, where limestone bedrock outcrops, the shore is more elevated, with sandy beaches; there ducks became scarcer. The Birch River delta, on the other

hand, had an abundance of wildfowl and, on June 24, approximately 2,000 ducks were observed on a lake two miles in width and four miles long. This delta, extending as far south as Pointe de Roche--about 70 square miles in area--is believed to have had a population of 5,000 to 8,000 game ducks at that time. Along the river above the delta there was a good duck population which included American Golden-eyes.

Waterfowl numbers along the southeastern shore of Lake Claire eclipsed anything previously encountered. More than 2,500 ducks were counted along four miles of the shoreline of Welstead Lake. Apparently no Canada Geese were present at that time.

Throughout the central areas of Lakes Claire and Mamawi comparatively few ducks of any species except Surf Scoters were seen.

In May, 1945, the main Peace River lowlands were visited. The season was dry, many lakes and sloughs were empty, and the waterfowl population was much reduced. Only occasional shallow ponds remained of Lake Mamawi; the rest of its floor was either grass-grown bottoms or mud-flats. Lake Claire was said to be in very poor condition, although an extensive shallow area remained in mid-lake, surrounded by mud-flats up to a mile or more in width.

In spite of adverse conditions, local residents informed me that during the spring migrations thousands of waterfowl had visited the areas where water remained.

In June, 1948, Robert H. Smith and Robert P. Allen, of the U.S. Fish and Wildlife Service, ran aerial transects in the Lake

Claire district and in the Athabasca Delta. In the marshes adjacent to Lake Claire, 22.5 square miles of an estimated 800 square miles of the same habitat type were sampled. An average density of 50.7 ducks per square mile was obtained, and the total duck population was estimated to be 40,560. The order of abundance of the species was: Mallard, Pintail, Shoveller, Baldpate, Lesser Scaup, Blue-winged Teal, Redhead, Canvas-back, White-winged Scoter, Gadwall, Green-winged Teal, Buffle-head, Ruddy Duck, and American Golden-eye.

Robert H. Smith and Charles Lawrence re-surveyed the Lake Claire marshes in the summer of 1949, again by the air transect method. This time the population of ducks was found to be 254.6 per square mile, a substantial increase over 1948. The increase was partly accounted for by the presence of large flocks of male Mallards, Pintails, and Shovellers.

In September, 1949, the writer found water-levels of the region still not fully recovered from drouth, but sufficiently so to provide a fairly good waterfowl environment and an excellent collective total of ducks.

As mentioned earlier, it was impossible to run ground transects in the Lake Claire-Mamawi section. Consequently, only aerial transect data were obtained. Over Lake Mamawi a course was flown along the east and north shores to Prairie River. The Lake Claire transect roughly followed the north shore from Prairie River northwest to about the 29th Baseline, thence parallel to the west shore to and over Birch River Delta, and along the south shore to

a point about three miles northeast of McIvor River. No effort was made to differentiate species of ducks, but only to secure a total count of ducks and a count of the various species of geese.

Ducks and geese were abundant during the aircraft operations on September 19. In the six square miles sampled in Lake Mamawi, 3,115 ducks and 1,460 geese were observed--an average of 762.5 ducks and geese per square mile.

These birds were plentiful along the north and east shores of the lake, and geese, especially, in the northwestern portion. Certain parts of the south shore were also well populated. Both ducks and geese avoided the deeper open water. Ducks were more conspicuous in the off-shore shallows which were darkened in places by the flocks. Geese were more inclined to choose the open points, bars, and flats along the shoreline.

The 20.5 square mile sample in Lake Claire yielded 12,775 ducks and 3,843 geese, or an average population of 810.7 ducks and geese per square mile.

This is roughly seven to eight times the density recorded by Smith and Lawrence in the same area during the nesting season. The enormous increase is the result of normal factors. Thousands of ducks had been hatched and matured in the interim and others had flocked in from higher latitudes. There had also been a great autumn influx of Canada, Lesser Snow, and White-fronted Geese. Geese are absent from the Lake Claire-Mamawi lowlands during the

nesting season. Local Canada Geese do not appear until late August and Arctic-breeding geese arrive somewhat later.

The wildfowl concentrations were even more marked on some parts of Lake Claire than on Lake Mamawi. Huge gatherings of ducks and flocks of geese numbering many hundreds of individuals were seen. The flashing white plumage of the Lesser Snow Geese was very conspicuous, particularly in flight.

Great concourses of both ducks and geese were met with along the very irregular northern shoreline of Lake Claire.

The west shore north of Spruce Point exhibited a poverty of wildfowl; the few ducks and geese were widely scattered. In spectacular contrast was Birch River Delta which teemed with waterfowl of many kinds. Thousands of birds were feeding, or loafing, along the outer shores, or on the lakes and channels of the inner delta. It was necessary at times to use great care to avoid flying the Fox Moth into dense, rising flocks.

Similar concentrations were noted along many sections of the extreme south and southeast margins of the lake, where abundance was somewhat more marked than along the north shore. A similar relative abundance had been seen in the late spring and early summer of 1933. The southern part of the lake is evidently a greater favourite with wildfowl at any season.

The locality south and east of Pte. de Roche was especially notable for its numerous flocks of Canada and Lesser Snow Geese. Every few minutes large groups rose in alarm from the flats. No Ross's Geese were noted and only occasional White-fronted Geese. The mid-section of this lake, too, was apparently destitute of

waterfowl of all kinds. It is clear that the birds avoid the central area, and gather in large concentrations in shallow, off-shore waters and on adjoining mud-flats and grasslands.

Ducks and geese were widely abundant in Welstead Lake and neighbouring bodies of water, including the cluster of small lakes immediately to the north, flanking the southeast shore of Lake Claire. All this is remarkably choice waterfowl territory northward to Hilda Lake and Prairie River.

It was somewhat of a surprise to note, from southeast Lake Mamawi across country to the lower Embarras River, that the waterfowl aggregate was relatively low. Superficially, general conditions in that area are similar to those found elsewhere in the region where waterfowl were very abundant. However, the overall population was good. The count on an 8.75 square mile sample was 1,050 ducks, 110 Canada Geese and 600 Lesser Snow Geese, an average of 201.1 ducks and geese per square mile.

Until recently no satisfactory estimate of waterfowl populations in the Lake Claire-Mamawi area was possible. The data acquired by Robert H. Smith and co-workers, and the transect data obtained in September, 1949, now make it reasonable to attempt such an estimate. It appears that the mean summer population is about 55 birds per square mile in an effective nesting habitat of 800 square miles. The estimated total population would be between 40,000 and 50,000 ducks in the summer breeding season.

The autumn population, greatly increased by reproduction and the influx of migrants, with an apparent average of 600 ducks

and geese per square mile, would be 480,000. The transects were run in exceptionally well-populated areas, but even if the estimate is halved the September population still would be close to a quarter of a million. In my estimation this is easily possible.

Strangely enough, considering its proximity to good waterfowl areas, the natives claim that Baril Lake is poor and unimportant as a waterfowl producer and as a stopping place for the birds during migration. In view of these assertions and the limited time at our disposal, it was not examined.

2. The Athabasca Delta

The Athabasca Delta is the second largest active delta in northwestern Canada, being exceeded in size only by the delta of Mackenzie River. The alluvial lowlands extend south to Richardson Lake, east to the sandhills south of Big Point, and north to Lake Athabasca.

In general, it may be said that the main mass of the wildfowl migration enters the Athabasca Delta during the latter half of April and early May and that the breeding population becomes generally engaged in nesting from about mid-May until the early part of June.

Floods, or an abnormal prolongation of the period of high water, may have a seriously adverse effect on the nesting schedule. This happened in 1948 when large parts of the Delta were still under water in early June and nesting was widely thwarted or delayed. A normal season occurred in 1949; a good hatch was reflected by the pronounced increase in the summer aggregate

reported by Smith and his associates. Eight broods of young ducks were observed by them during a flight over the Athabasca Delta on June 12.

These authors estimated the summer duck population in 1948 to be 25.5 ducks per square mile and, in 1949, 53.9 ducks per square mile - a strong upward trend. On this basis the Delta had a total duck population of 16,000 in the latter year. Most notable increases were made by Mallards, Pintails, and Shovellers, the three species that led in order of abundance.

In early September, 1949, there was a notable scarcity of waterfowl on the rivers and channels of the Delta, a scarcity not only of individuals (3.1 to 6.5 per lineal mile in the first three transects) but also of species. Only Mallards and Blue-winged and Green-winged Teals were recorded with any marked frequency. The scarcity of ducks was very noticeable in the main channel of Athabasca River, and continued to be so during the period of observation, although it is said that Mallards are sometimes locally plentiful there in autumn. Later transects revealed a higher per lineal mile average for both ducks and geese because migration from the north had commenced.

A conspicuous feature was the greater abundance of waterfowl at, or near, Lake Athabasca than inland. On September 11, when transects 4, 5 and 6 were run in the northern fringe of the Delta, averages of 57,603 and 403 per lineal mile, as compared with an overall average of 5.3 on the first three southern channel transects, were obtained. Richardson Lake (Transect 7) was very good, but its average of 103.3 per lineal mile was several times lower. Again in Transect 9, the average increased

as Lake Athabasca was approached; from Galoot Lake to the mud-flats at the mouth of the Embarras River the figure rose to 651.3 ducks and geese per lineal mile.

In some areas along Lake Athabasca the waterfowl aggregate was nearly as good as the best in the Lake Claire-Mamawi area. The finest displays of geese in the former locality were seen on the mud-flats from the mouth of Embarras River to Big Point and farther east, but these flocks never equalled the best of those observed in Lake Claire. Geese were seldom seen in the Athabasca Delta away from the mud-flats referred to above, except for flocks flying over; at times during the migration period, however, considerable numbers of geese resort to Galoot, Big, Grey Wavey, and Richardson Lakes, and perhaps other bodies of water in the Delta.

On September 17 a transect from Lake Athabasca via Quatre Fourches to Lake Mamawi gave an average of 79.6 waterfowl per lineal mile. This was much superior to the interior of the Athabasca Delta, but much inferior to the vicinity of Athabasca Lake.

On September 19 (Transect 15) noticeably large numbers of ducks were observed from the air in the Athabasca Delta. The count was 6,116 ducks, 14 Canada Geese and 270 Lesser Snow Geese on the 22-mile transect. This gave an average per lineal mile of 293.2 and per square mile of 1,172.7, the highest results obtained from the air in the whole study region.

Transect 15 was flown over an especially rich area from Bog and Grey Wavey Lakes via Big Lake to Goose Island, Athabasca

Lake. It was in the same locality that waterfowl counts ran highest on the ground transects. At the time of the flight, ducks and geese were particularly abundant in Big Lake, and on the mud-flats along the northern margin of the Delta. Several thousand Canada and Lesser Snow Geese were present from the vicinity of Goose Island eastwards along the flats, only a fraction of which could be rightfully included in the transect records.

Large numbers of geese are reported to visit sandy spits and bars in the vicinity of Old Fort Point and Old Fort Bay, to obtain gravel. Taking advantage of this regular habit, residents have shot hundreds of geese in these places, especially in autumn.

Second coverage of the Athabasca Delta was commenced on September 21. Initial population figures were much higher than on the first coverage. As the work proceeded a marked gradual decline took place, with the result that the average for the second coverage was less than for the first (45.3 as compared with 75.0).

The decline could be sensed during the course of the work without reference to the transect data. It was obvious that considerable numbers of ducks and geese were gradually leaving the area. Not many flocks in migration were actually observed; possibly large numbers were departing at night.

It is asserted that geese are not now so numerous in Athabasca Delta as they were a number of years ago. It is believed that this may be partly owing to decline in the continental goose population and, also, to greater concentration of the birds,

during the autumn migrations, in southern Wood Buffalo Park where there is less hunting pressure.

It was noted that the number of geese present on the delta mud-flats at Lake Athabasca fluctuated markedly from time to time. This may have been due to weather conditions, to migrations in from the north and out to the south, or to local hunting having caused a flight from the favoured mud-flats westward to the comparative safety of the Lake Claire-Mamawi area.

In the late September survey the highest waterfowl count was 177.7 per lineal mile secured on Transect 19. Except for 32 Canada Geese, the total count was composed of ducks. Again the largest numbers were seen in the vicinity of Lake Athabasca--in this instance from Indian Village, via Big Point and Goose Channels, to Goose Island. It had become quite normal to find the largest concentrations in this area. On some occasions many hundreds of geese and thousands of ducks were observed. Not all of them came within the transect to be recorded.

Most ducks were resorting to the grasslands, marshes, mud-flats, weedy bays and channels well in from the open lake, but nearly all of the geese were far out on the wide open flats like the one illustrated in Figure 14. This wise procedure made it impossible for hunters to approach without being detected. I had hoped to secure good photographs of the large flocks in this section of the delta, but all attempts ended in failure. The geese invariably took flight at a distance of many hundred yards.

The lowest average secured in the latter part of September was 19.5 ducks to the lineal mile on Transect 23. This included

the 22 miles of Athabasca River between the upper forks of Embarras River and the 27th Base Line warden residence. Low as the above figure is, however, it is approximately three times greater than the count secured along this river about three weeks earlier. Nearly all the birds were Mallards and American Golden-eyes, the former species being vastly in the majority.

It is difficult to obtain a reliable estimate of the total autumn waterfowl population of the Athabasca Delta from the data available. Reckoning from an average canoe transect width of 100 yards on the channels and the average of 61.8 waterfowl per lineal mile (Table A), the average population per square mile was about 1,090. It is calculated that no more than one-third of the Delta, or 100 square miles is water. On this basis the total population was 109,000.

If the air transect figure of 1,172 per square mile is used as an overall average for the approximately 100 square miles of water in the Delta, the total would be roughly 120,000. It is possible that there were actually that number of birds, or about eight times as many as the estimated summer population. When this is added to the 250,000 total estimated for the Lake Claire-Mamawi area, it appears that well over a third of a million waterfowl were resorting to the Peace-Athabasca Delta region in September, 1949.

When I left the delta in late September, the peak concentrations had passed. However, large numbers of both ducks and geese remain well into October. Normally, there is a gradual departure

rather than a sudden exodus emptying the marshlands over night. An exception to this is very late in the season when the lakes and streams suddenly freeze over and the last birds rapidly disappear together.

Meanwhile there may be an occasional pronounced southward movement of the flocks. Weather conditions may greatly affect flock movements. Some species habitually leave earlier than others. There is also considerable variation in the departure time of a species. Locally bred Canada Geese may leave earlier than birds of the same species that come in from the north and stop over long enough to get needed food and rest.

Early in the winter of 1949 I received information from Patrolman H. Spreu that, on October 21 and 22, a number of ducks were still resorting to the big bay at Moose Point, 26 miles east of Chipewyan. Various-sized groups of Canada Geese and Whistling Swans were also present at that relatively late date. Small flocks of ducks remained along Athabasca River in the last week of October, when drift ice was running in large quantities. The river finally jammed and froze over on the 28th of the month, and no waterfowl were noted by him after that date.

Warden William Braiden, Quatre Fourches, Wood Buffalo Park, informed me in a letter that he saw no geese after October 25; the species last seen was not mentioned, but they were probably Canada Geese. The last ducks observed were Mallards, on October 28. A few Whistling Swans were last seen on the 29th. Mr. Braiden remarked that an Indian mentioned having seen a small flock

of swans at Lake Mamawi on November 3. There is no evidence that any waterfowl lingered in the region after the latter date.

Gunners and Hunting Conditions

As yet, only a moderate number of gunners take part in autumn hunting of waterfowl in the Peace-Athabasca Delta region.

The Lake Claire-Mamawi area lies within Wood Buffalo National Park from which white hunters are excluded by law. The Indians and people of mixed blood who hunted in the area of the Park before the Park was established, and their descendants, still may hunt therein, but they are few in number. I was informed that some are not even adequately equipped with shotguns. The hunting pressure in this area is therefore relatively low and, as previously mentioned, this may be the cause of a reported shift of waterfowl populations to the area, from the Athabasca Delta, at the commencement of the hunting season. The theory is supported by the fact that geese appeared to be more numerous in the former area than in the latter, during the September 1949 investigations.

Of the Athabasca Delta area, about 128 square miles of the eastern part (more than a third of the area) is occupied by Indian Reserve No. 201 from which white hunters are excluded and where hunting pressure is probably quite moderate. The remainder of the area, consisting of a large triangle between the Reserve and the Park, and the Richardson-Dagmar Lakes sector to the south, is excellent shooting-ground open to all licensed hunters in season.

The history of the Delta area shows that for over a century it has been a favourite waterfowl shooting ground. Its

proximity to Fort Chipewyan made it convenient for the purpose. At one time huge kills of ducks and geese were made. The biggest harvests took place in autumn and the carcasses were salted down in barrels for winter consumption. Spring hunting was also common until the passing of the Migratory Birds Convention Act in 1918.

The old settlement of Chipewyan is located on the rocky north shore of Lake Athabasca about 10 miles northeast of the northern extremity of the Reserve. It is the trading centre for a large surrounding region, including the Delta. I was informed that, at present, about 10 white men from Chipewyan regularly hunt waterfowl in the Delta. It was calculated that 25 to 30 non-residents come from as far south as Edmonton and from Fort Smith in the north. Officers of the Royal Canadian Mounted Police from Edmonton have a well-built log cabin hunting lodge on a creek just east of Grey Wavey Lake. This is the only lodge of the kind. Others use tents, or come for only one day's shooting.

The Indian Agent stated that the total Indian and mixed blood population was about 1,000, of which not more than 280 were potential waterfowl hunters. Indian family cabins distributed throughout the region are occupied chiefly in autumn, winter, and spring. Most of the summer is spent by the inhabitants in the settlement.

Resident hunters ordinarily use small boats and canoes in waterfowl hunting. These are usually equipped with outboard motors, which are employed in the rivers and channels. In the smaller streams and shallow lakes, paddles are used. The gunners may

construct simple blinds, or may conceal their boats in the reeds and shoot from the boats. They try to locate a natural fly-way and shoot the birds flying over, a method that frequently succeeds.

Almost all non-resident hunters now use aircraft to reach the region. Most of them land at Chipewyan and complete the trip by boat or canoe. This causes minimum disturbance of the waterfowl. In other cases, pontoon-equipped aircraft come in low over the area and land the gunners right in the Delta. They may go ashore and hunt on foot, or a guide with a boat may meet the party by pre-arrangement to conduct it to a suitable place for shooting.

Approximate flying time from Edmonton is only three hours. It is to be expected that the numbers of hunters flying in for the autumn shoot in the Delta will increase in the future.

Waterfowl Transect Statistics

All numerical data obtained in the Peace-Athabasca Delta region during the September, 1949, investigations are contained in the following tables. These are chiefly transect population figures, but a number of supplementary tables, which are self-explanatory, are included.

Transects run on streams could be no wider than the streams which, of course, varied considerably in width. In every instance the whole breadth of the stream **was** included in the waterfowl count. The calculations are therefore based on lineal miles, rather than square miles. In lake work with boats an estimated 220-yard wide strip was used. Only in the aerial transects when visibility was good was it deemed practical to utilize the standard 440-yard sample strip. Under these circumstances calculations could be made in either lineal miles or square miles.

Ground Transects

First Coverage

TRANSECT	No. 1		No. 2	
	Sept. 4 & 5 72 miles		Sept. 7 16 miles	
Species	Count	% of total	Count	% of total
Common Mallard	223	48.3	48	96.0
Baldpate	4	.9		
Pintail	12	2.6		
Green-winged Teal	4	.9	2	4.0
Blue-winged Teal	122	26.4		
Lesser Scaup	1	.0		
White-winged Scoter	19	4.2		
Canada Goose	59	12.8		
Lesser Snow Goose	18	3.9		
Total	462	100.0	50	100.0
Average ducks and geese per lineal mile		6.4		3.1

No. 1 - From the mouth of Embarras River via "Cross" Channel, Fletcher Channel, Big Eddy and the Athabasca River to the 27th Base Line warden residence.

No. 2 - From Athabasca River downstream 16 miles on Embarras River.

Ground Transects
First Coverage
(cont'd)

TRANSECT	No. 3		No. 4	
	Sept. 8 41 miles		Sept. 11 16 miles	
Species	Count	% of total	Count	% of total
Common Mallard	107	42.3	585	63.9
Baldpate			62	6.8
Pintail	17	6.7	15	1.6
Green-winged Teal	68	26.9	151	16.5
Blue-winged Teal			8	1.0
Shoveller			12	1.3
Canvas-back			2	.2
Ruddy Duck	2	.8		
Unidentified ducks	14			
Canada Goose	55	21.7	37	4.0
Lesser Snow Goose			43	4.7
White-fronted Goose	4	1.6		
Total	267	100.0	915	100.0
Average ducks and geese per lineal mile		6.5		57.2

No. 3 - From forks of Embarras and Athabasca Rivers downstream on the latter and along nine miles of Goose Island Channel.

No. 4 - From forks of Big Point Channel and Goose Island Channel down the former to Indian Village.

Ground Transects
First Coverage
(cont'd)

TRANSECT	No. 5		No. 6	
	Sept. 11 8 miles		Sept. 11 3 miles	
Species	Count	% of total	Count	% of total
Common Mallard	225	42.9	240	59.4
Baldpate	54	10.3	44	10.9
Pintail	59	11.3	25	6.1
Green-winged Teal	34	6.5	12	3.0
Blue-winged Teal	6	1.1	2	.5
Shoveller	7	1.3	8	2.0
Canvas-back			4	1.0
Lesser Scaup	18	3.6		
American Golden-eye	8	1.5	30	7.5
Buffle-head			5	1.2
White-winged Scoter			8	2.0
Unidentified Ducks	4,300		805	
Canada Goose	94	17.9	26	6.4
Lesser Snow Goose	20	3.6		
Total	4,825	100.0	1,209	100.0
Average ducks and geese per lineal mile	603		403	

No. 5 - From Indian Village via Big Point Channel and Goose Island Channel to Goose Island.

No. 6 - From Big Point Channel northeast via Indian Village to Big Point and one mile north into Lake Athabasca.

Ground Transects
First Coverage
(cont'd)

TRANSECT	No. 7		No. 8	
	Sept. 12 15 miles		Sept. 13 17 miles	
Species	Count	% of total	Count	% of total
Common Mallard	51	6.2	138	19.0
Baldpate	105	12.9	96	13.3
Pintail	11	1.3	54	7.4
Green-winged Teal	11	1.3	201	27.8
Blue-winged Teal	4	.5		
Redhead	15	1.8		
Ring-necked Duck	10	1.2		
Canvas-back	297	36.5	165	22.6
Lesser Scaup	32	3.9	38	5.2
American Golden-eye	38	4.6	23	3.3
Buffle-head	128	15.7	2	.3
White-winged Scoter	31	3.8		
Surf Scoter	4	.5		
American Merganser	10	1.2		
Unidentified ducks	734		442	
Canada Goose	29	3.7	6	.8
Lesser Snow Goose	40	4.9	2	.3
Total	1,550	100.0	1,167	100.0
Average ducks and geese per lineal mile	103.3		68.6	

No. 7 - From mouth of Richardson River on Big Point Channel three miles up the former and a 12-mile circle in Richardson Lake.

No. 8 - In narrow channels west of Fletcher Channel and part of a small lake in Township 110, Range 7.

Ground Transects
First Coverage
(cont'd)

TRANSECT	No. 9		No. 10	
	Sept. 13 6 miles		Sept. 14 9 miles	
Species	Count	% of total	Count	% of total
Common Mallard	164	8.8	184	38.3
Baldpate	24	1.3	16	3.3
Pintail	86	4.6	26	5.4
Green-winged Teal	85	4.6	136	28.3
Blue-winged Teal	18	1.0	6	1.2
Canvas-back			5	1.0
Lesser Scaup	65	3.5	35	7.3
American Golden-eye	80	4.3	63	13.1
Buffle-head	6	.3		
White-winged Scoter	14	.7	2	.4
Unidentified ducks	2,066		366	
Canada Goose	300	16.1	8	1.7
Lesser Snow Goose	1,000	54.8		
Total	3,908	100.0	847	100.0
Average ducks and geese per lineal mile	651.3		94.1	

No. 9 - From Embarras River up Galoot Creek to Galoot Lake and return and thence down Embarras River to Lake Athabasca.

No. 10 - From Embarras River through channels to Fletcher Channel (east of Galoot Lake) and down the latter channel to Lake Athabasca.

Ground Transects
First Coverage
(cont'd)

TRANSECT		No. 11	
		Sept. 17	
		7 miles	
Species	Count	% of total	
Common Mallard	114	32.4	
Pintail	2	.6	
Green-winged Teal	46	13.2	
American Merganser	2	.6	
Unidentified ducks	205		
Canada Goose	182	51.8	
Lesser Snow Goose	6	1.4	
Total		557	100.0
Average ducks and geese per lineal mile		79.6	

No. 11 - From Lake Athabasca west on a channel to Chenal des Quatre Fourches and thence southwest to Lake Mamawi.

Aerial Transects - September 19
(Transect width - 440 yards)

TRANSECT	No. 12		No. 13		No. 14		No. 15	
	24 lin. miles 6 sq. miles		82 lin. miles 20.5 sq. miles		35 lin. miles 8.75 sq. miles		22 lin. miles 5.5 sq. miles	
Species	Count	% of total	Count	% of total	Count	% of total	Count	% of total
Ducks, all kinds	3,115	68.1	12,775	76.9	1,050	59.7	6,166	95.6
Canada Goose	736	16.1	1,838	11.1	110	6.2	14	.2
Lesser Snow Goose	650	14.2	1,995	12.0	600	34.1	270	4.2
White-fronted Goose	74	1.6	10	.0 +				
Total	4,575	100.0	16,618	100.0	1,760	100.0	6,450	100.0
Average ducks and geese per lineal mile	190.6		202.6		50.3		293.2	
Average ducks and geese per square mile	762.5		810.7		201.1		1,172.7	
<p>No. 12 - From extreme southwest angle of Lake Mamawi along east and north shores to Prairie River, thence along Prairie River to Lake Claire.</p> <p>No. 13 - From Prairie River along north, west and south shores of Lake Claire to a point three miles northeast of McIvor River.</p> <p>No. 14 - From a point three miles northeast of McIvor River, northeast and east to Embarras River at approximately 58°34' N.</p> <p>No. 15 - From Embarras River at approximately 58°34' N., south over Bog and Grey Wavey Lakes and north-east over Big Lake to Goose Island.</p>								

Ground Transects
Second Coverage

TRANSECT	No. 16		No. 17	
	Sept. 21 22 miles		Sept. 21 18 miles	
Species	Count	% of total	Count	% of total
Common Mallard	343	56.7	494	50.1
Baldpate			8	.8
Pintail	33	5.5	28	2.8
Green-winged Teal	63	10.4	125	12.6
Blue-winged Teal			3	.3
Canvas-back	2	.3		
Lesser Scaup	18	3.0	114	11.6
American Golden-eye	119	19.7	211	21.4
Buffle-head			4	.4
White-winged Scoter	5	.8		
American Merganser	2	.3		
Unidentified ducks	50			
Ross's Goose	20	3.3		
Total	655	100.0	987	100.0
Average ducks and geese per lineal mile		29.8		54.8

No. 16 - From Galoot Creek, Embarras River,
to Fletcher Channel and up Fletcher
Channel via Big Eddy to the mouth of
Richardson River.

No. 17 - From mouth of Richardson River down
Big Point Channel to Indian Village.

Ground Transects
Second Coverage
(cont'd)

TRANSECT	No. 18		No. 19	
	Sept. 21 3 miles		Sept. 22 4.5 miles	
Species	Count	% of total	Count	% of total
Common Mallard	82	24.3	150	58.1
Pintail	5	1.5	15	5.8
Green-winged Teal	6	1.8	19	7.3
Lesser Scaup	4	1.2	21	8.2
American Golden-eye			21	8.2
Unidentified ducks			542	
Canada Goose	200	59.3	32	12.4
Lesser Snow Goose	40	11.9		
Total	337	100.0	800	100.0
Average ducks and geese per lineal mile		112.3		177.7

No. 18 - From "The Willows" (southwest of Indian Village) to mud-flats at mouth of Big Point Channel.

No. 19 - From Indian Village via Big Point and Goose Island Channels to Goose Island.

Ground Transects
Second Coverage
(cont'd)

TRANSECT	No. 20		No. 21	
	Sept. 22 14 miles		Sept. 22 7.5 miles	
Species	Count	% of total	Count	% of total
Common Mallard	512	50.6	137	33.1
Baldpate	18	1.8	3	.7
Pintail	45	4.5	13	3.1
Green-winged Teal	158	15.7	155	37.5
Blue-winged Teal	3	.3	9	2.2
Lesser Scaup	114	11.3	73	17.6
American Golden-eye	154	15.2	24	5.8
White-winged Scoter	4	.4		
American Merganser	2	.2		
Unidentified ducks	107		76	
Total	1,117	100.0	490	100.0
Average ducks per lineal mile		79.8		65.3

No. 20 - From Lake Athabasca along Goose Island Channel to Big Point Channel.

No. 21 - On first channel east of Big Point Channel, from forks to forks of the former channel with the latter.

Ground Transects
Second Coverage
(cont'd)

TRANSECT	No. 22		No. 23	
	Sept. 23 3 miles		Sept. 28 22 miles	
Species	Count	% of total	Count	% of total
Common Mallard	40	28.8	349	81.2
Baldpate	2	1.4		
Pintail	21	15.1		
Green-winged Teal	22	16.0		
Ring-necked Duck			3	.7
Lesser Scaup	4	2.8	5	1.2
American Golden-eye	50	35.9	70	16.2
Surf Scoter			3	.7
Unidentified ducks	53			
Total	192	100.0	430	100.0
Average ducks per lineal mile		64.0		19.5

No. 22 - From Big Point Channel along Richardson River to Richardson Lake.

No. 23 - From 27th Base Line along Athabasca River to Embarras River.

Ground Transects
Second Coverage
(conc'd)

TRANSECT	No. 24		No. 25	
	Sept. 28 40 miles		Sept. 29 35 miles	
Species	Count	% of total	Count	% of total
Common Mallard	939	61.2	374	34.5
Pintail	41	2.7	25	2.3
Green-winged Teal	145	9.5	38	3.5
Shoveller	2	.1		
Redhead			4	.4
Ring-necked Duck	42	2.7	48	4.4
Canvas-back	5	.3		
Lesser Scaup			53	4.9
American Golden-eye	340	22.1	355	32.8
Buffle-head	2	.1		
Unidentified ducks	38			
Canada Goose	6	.4	186	17.2
Ross's Gbse	13	.9		
Total	1,573	100.0	1,083	100.0
Average ducks and geese per lineal mile		39.3		30.9

No. 24 - From Athabasca River down Embarras River to "Cross" Channel at southeast angle of Galoot Lake.

No. 25 - From "Cross" Channel up Fletcher Channel to Big Eddy and thence up Athabasca River to Embarras River.

Table A

Summary of Waterfowl Populations
Observed on Ground Transects.

Transect No.	Miles	Waterfowl (Geese and Ducks)	Average per lineal Mile
1	72	462	6.4
2	16	50	3.1
3	41	267	6.5
4	16	915	57.2
5	8	4,825	603.0
6	3	1,209	403.0
7	15	1,550	103.3
8	17	1,167	68.6
9	6	3,908	651.3
10	9	847	94.1
11	7	557	79.6
First Coverage	210	15,757	75.0
16	22	655	29.8
17	18	987	54.8
18	3	337	112.3
19	4.5	800	177.7
20	14	1,117	79.8
21	7.5	490	65.3
22	3	192	64.0
23	22	430	19.5
24	40	1,573	39.3
25	35	1,083	30.9
Second Coverage	169	7,664	45.3
Summary	379	23,421	61.8

Table B

Summary of Waterfowl Populations
observed on aerial transects,
September 19.

Transect No.	Lin. Miles	Sq. Miles	Waterfowl (Geese and Ducks)	Average per Lineal Mile	Average per square Mile
12	24	6	4,575	190.6	762.4
13	82	20.5	16,618	202.6	810.7
14	35	8.75	1,760	50.3	201.1
15	22	5.5	6,450	293.2	1,172.7
Summary	163	40.75	29,403	170.4	721.5

Table C

Relative abundance of species of ducks;
boat and canoe transects only; unidentified
ducks not included.

Species	Number	Per cent
1. Common Mallard	5,499	49.10
2. American Golden-eye	1,586	14.17
3. Green-winged Teal	1,481	13.23
4. Lesser Scaup	595	5.32
5. American Pintail	533	4.76
6. Canvas-back	480	4.29
7. Baldpate	436	3.89
8. Blue-winged Teal	181	1.62
9. Buffle-head	147	1.31
10. Ring-necked Duck	103	.92
11. White-winged Scoter	83	.74
12. Shoveller	29	.26
13. Redhead	19	.17
14. American Merganser	16	.14
15. Surf Scoter	7	.06
16. Ruddy Duck	2	.02
Total	11,197	100.00

Table D

Relative abundance of species of geese.

Species	Number	Per cent
Lesser Snow Goose	4,684	53.69
Canada Goose	3,918	44.92
White-fronted Goose	88	1.01
Ross's Goose	33	.38
Total	8,723	100.00

Table E

Relative abundance of ducks and geese.

	Number	Per cent
Ducks, all species	44,101	83.49
Geese, all species	8,723	16.51
Total	52,824	100.00

ANNOTATED LIST OF WILDFOWL

1. WHISTLING SWAN. Cygnus columbianus (Ord).

These magnificent birds regularly visit the Peace-Athabasca Delta region in spring and autumn. The information shows they definitely favour the Lake Claire-Mamawi area rather than the Athabasca Delta, but they may be common in either. Fair numbers have been seen on Lake Claire, Old Fort Bay and the flats along the channels southeast of Fort Chipewyan.

Spring arrivals take place from mid-April to early May and spring departures from two to three weeks later. Solitary individuals may be seen well into June. Autumn time of arrival is from the third week in September; peak numbers are reached about the end of the month. They stay late; in 1949 flocks were still present at Old Fort Bay on October 22 and a park warden reported seeing them near Lake Mamawi on October 29. The last report in that year was by an Indian who stated he saw them at Lake Mamawi on November 3 when ice had covered all streams and small lakes.

Swans are now much less abundant than formerly. Few were seen during the September 1949 investigations.

2. TRUMPETER SWAN. Cygnus buccinator Richardson.

This species was once common in northern Alberta and Mackenzie District. It is nearly extinct, but there is circumstantial evidence that a few may still migrate through the Delta, possibly in association with the more plentiful Whistling Swans. However, there is no recent positive evidence in this respect.

3. CANADA GOOSE. Branta canadensis (Linnaeus).

Canada Geese are common as migrants into the Delta during spring and autumn and as summer residents nesting on higher terrain in Wood Buffalo Park. They usually arrive between the 15th and 25th of April. Many of those observed may be Lesser Canada Geese, B.C. leucopareia, and probably it is often this subspecies that is seen migrating from the Delta region in the latter part of May. The local birds disperse to the breeding grounds and begin nesting in early May. Downy juveniles have been observed in late May and early June.

Small flocks, perhaps family groups, of summer residents and the young of the year begin to converge on the Delta region from the nesting grounds in August. A park warden reported fair numbers in such groups along the north shore of Lake Mamawi, August 13 to 15, 1949. Several hundred were seen at the extreme northwest angle of the lake.

Immigration from the north begins in early September. By September 11, 1949, geese were present along the Delta shore of Lake Athabasca in flocks of 30 to 50 which, when disturbed, sometimes merged into larger flocks containing hundreds. In the Lake Claire-Mamawi area they were perhaps even more plentiful. On September 17, flocks of 25 to 100 in a movement that lasted several hours were seen at Fort Chipewyan flying into the Delta. During aircraft operations on September 19 large numbers were observed. They were most plentiful at Lake Claire.

On September 25 a marked emigration from the Delta was observed all along the lower Athabasca River. Similar flights took place on the 28th and 29th. However, some geese remained in

the Delta into October, and they were seen at Old Fort Bay as late as October 22.

The species was second in order of abundance of geese in the September 1949 investigation and made up 44.92 per cent of the total number of geese, being exceeded in abundance only by Lesser Snow Geese.

4. WHITE-FRONTED GOOSE. Anser albifrons (Scopoli).
Local name: Grey Wavey.

Geese of this species are regular spring and autumn visitors. Compared with Canada Geese and Snow Geese they are not, and apparently have never been, common. In the transect count of geese in 1949 they made up only 1.01 per cent of the total. They are said to favour certain areas, e.g. Grey Wavey Lake.

They arrive in the Delta from late in April to as late as the middle of May. In some seasons the vanguard is already leaving the Delta at the latter date.

In 1949, the first autumn immigrants were observed on September 8 when a group of four was seen at the forks of the Embarras and Athabasca Rivers. Two more flocks, one of nine and the other of 17, were seen on Lake Mamawi, September 9 and 10. During the air transect on September 19, only 84 were observed-- 74 on Lake Mamawi and the rest on Lake Claire. It is known that flocks may continue to arrive until mid-October, at which time southward migration may have already begun.

The last observation of White-fronted Geese by the writer in 1949 was on September 21, but they are known to remain in the Delta in some cases until freeze-up. It is said that they are very wary and few are taken by the hunters.

5. LESSER SNOW GOOSE. Chen hyperborea (Pallas). Local name: White Wavey.

This is the most abundant species of geese in the spring and autumn migration periods, making up more than half the population of geese in the Delta at that time (53.69 per cent in the 1949 survey). Their massed white plumage makes a striking spectacle when they concentrate in large flocks on lakeshore and mud-flats.

The earliest record known to the writer is for April 27, 1932, at Spruce Point, Lake Claire, when flocks aggregating hundreds were observed. The latest spring observation by me in this region was at Fort Smith on May 22, 1933 when a flock of 40 was seen flying north. Stragglers at Lake Claire until the end of May have been reported.

Autumn migrants were first observed in 1949 on September 4. Apparently the peak population occurred during the third week of that month. During the aerial transects the largest flocks were seen at Lake Claire, and relatively large flocks were noted on the north shore of Lake Mamawi and in the Goose Island sector of Lake Athabasca.

Migrants in large numbers may continue to arrive from the north until early October, as was the case in 1933. Southward emigration was observed on September 20, 1949, while apparently immigration was still taking place. It is not known when the principal emigrant flights occur; evidently there is no mass exodus, but a gradual withdrawal from late September until mid-October.

6. BLUE GOOSE. Chen caerulescens (Linnaeus). Local name: White-headed Wavey.

Only rare stragglers occur in the Peace-Athabasca Delta, usually in association with Lesser Snow Geese. One was taken near Chipewyan October 9, 1907; three were shot in the same locality between 1922 and 1932; and one was taken in the Athabasca Delta September 15, 1934--the last definite record of occurrence. The known occurrences thus average about one per decade.

7. ROSS'S GOOSE. Chen rossi (Cassin). Local names: Scabby-nosed Wavey; Galoot.

The Peace-Athabasca Delta region is the most important known stopping place of this species in Canada. It is believed that almost all the existing flocks visit there in spring and autumn migrations to and from the breeding grounds at Perry River, N.W.T. The latest evidence suggests that the total number of the species is only about 2,000. Its position may therefore be described as precarious.

The favoured rendezvous are believed to be the southern part of Lake Mamawi, "Galoot" Lake near the mouth of the Embarras River, and Richardson Lake. "Galoot" is the Indian name for the species, which may be significant. They are reported to have visited this lake in thousands, at one time, and to have been slaughtered there in considerable numbers in both spring and fall. A provincial game guardian informed me that important concentrations occur on the south and southeast shores of Richardson Lake. They may also be seen on Limon Lake, or flying between these two lakes and Frenzie Lake. Although some time was spent by the writer in the

locality, none were observed there. An Indian of the locality stated that "Galoots" are seen on Richardson Lake in both spring and autumn.

They appear to reach the Delta about mid-May and to leave it about the end of the month, although they have been seen as late as June 10. They fly off northeasterly, flocks from Lake Mamawi occasionally passing directly over Fort Chipewyan. Deviations from the migration route seem to be rare but there are records, or oral reports, of stragglers at Slave and Taltson River Deltas, Big Island, Fort Providence, Yellowknife Bay in Great Slave Lake, and Anderson River.

On the return flight probably few of them reach the Peace-Athabasca Delta again before mid-September, although a flock of 26 was reported at Prairie River on September 6, 1949. The next recorded observation in that year was a small group associated with Lesser Snow Geese along the southeast shore of Lake Mamawi on September 14. None were observed during the waterfowl investigation until September 21, when a flock of 20 was noticed southeast of Goose Island; no more were recorded until September 28 when two small flocks, totalling 30, were seen near "Galoot" Lake.

The main autumn exodus possibly occurs during the second week of October. A gradual withdrawal extending over several days, is more likely than a mass movement.

8. COMMON MALLARD. Anas platyrhynchos Linnaeus.

This is the most abundant species of ducks in the Peace-Athabasca Delta region during either the breeding season or the

migration periods. Smith and associates placed it first in order of abundance in both 1948 and 1949. The species made up 49.10 per cent of the duck total counted in September, 1949.

They are the earliest, or among the earliest, to arrive in the spring. They have been seen at Fort Chipewyan as early as April 6. The average time of arrival is from April 14 to April 18. Nesting commences about mid-May. The writer has seen downy young near Lake Mamawi as early as June 16 and broods are common a little later. Late spring may delay the time of arrival, but for some pairs nesting and hatching may not be abnormally late in such years.

The large number of summer residents is further augmented by autumn immigration in September and early October, when they become common on all streams and channels, marshy ponds, lakes, and mud-flats. Numerous large flocks were observed between Goose Island and Big Point.

Mallards may stay very late. When the lakes freeze over, many resort to the streams where they may remain until drift-ice is running. In 1949 the last ducks of the year, presumably Mallards, were observed on the Athabasca River November 13; before that time the river had frozen over once and opened again in milder weather. These late-lingering ducks were, of course, only stragglers.

9. GADWALL. Anas streperas Linnaeus.

This species is rare in the Peace-Athabasca region. Preble did not find it there in 1908, nor was it positively identified by

the writer during the Wood Buffalo Park investigations 1932 to 1934. Smith and Lawrence, 1949, placed the Gadwall low in order of abundance in the Lake Claire marshes. In September, 1949, it was not positively identified, but two entries in the daily record book refer to what were probably Gadwalls. Both records were made in the Athabasca Delta.

10. BALDPATE. Mareca americana (Gmelin).

Although much less numerous than Mallards, Baldpates are quite common in the study region. Smith and associates placed them fourth in order of abundance in 1948 and sixth in 1949. In the September 1949 investigations the species ranked seventh (3.89 per cent of the duck total).

The vanguard usually arrives in late April, but sometimes the main flight is not noted until early May. It breeds in fair numbers throughout the Delta region and suitable adjoining country. Juveniles a day or more old were often noted during the latter part of July, 1933, in Wood Buffalo Park.

In autumn the species is well distributed on sloughs, lakes, streams and backwater channels. It occurs sometimes in pure flocks, oftener in association with other surface-feeding ducks. The few migrants from the north do not cause a noticeable increase in numbers. It was most numerous in mid-September, with some decline noted about the 20th. The birds were present in small numbers until the end of the investigation, September 30. No definite departure dates are known, but they are presumed to remain in the region in some cases until mid-October.

11. AMERICAN PINTAIL. Anas a. tzitzihua (Vieillot).

During investigations from 1932 to 1934 the writer found the Pintail to be exceeded in numbers only by the Mallard. Smith and associates placed it second in order of abundance in both 1948 and 1949. In September, 1949, it was fifth (4.76 per cent of all ducks). Obviously, the relative status had been altered by autumn immigration.

Large flocks of Pintails were seen in early September and during the aerial transects on September 19. After that they were not observed in conspicuously large numbers, although sizeable groups were noted, September 22 and 23, in the Big Lake - Goose Island Channel area. Fair numbers usually remain in the region until the second week in October, and somewhat longer in late autumn seasons.

12. GREEN-WINGED TEAL. Anas carolinense (Gmelin).

These little Teals are fairly well distributed in the Delta and surrounding territory during the breeding season, but in some large areas of the interior uplands they are seldom noted. During the summers of 1932 and 1933 they were most frequently noted in the Prairie River area, along the southeast shore of Lake Claire, and in the Birch River Delta. Smith and Lawrence found them seventh in order of abundance in 1949 and noted a positive increase in numbers over 1948.

In 1933 the first downy young were noted along the Quatre Fourches on June 16, but nests with all eggs unhatched have been found north of the Peace on July 17 and downy young two or three days old on July 20. Average hatching date appears to be about July 1.

In the first week of September, 1949, few Green-winged Teals were observed, but in other years they have been common in late August and early September in areas both north and south of the Peace. From September 8 to the end of the month they were fairly common in most localities. The species ranked third in order of abundance (13.23 per cent of the duck total). There was great variation in local abundance, which may have been due to environmental factors, or merely to casual variations in movement and dispersal. In some small areas it was the most abundant species; in others, it was totally absent.

The species is hardy. It is likely that the majority leave the Delta region before October 10, but they have been seen in mid-October and some may tarry until freeze-up.

13. BLUE-WINGED TEAL. Anas discors (Linnaeus).

In 1932 and 1933 this species was noticeably scarce in most of Wood Buffalo Park and the distribution was singularly spotty. In the Lake Claire-Mamawi area the birds were more numerous, but still far from being either plentiful or evenly distributed. Downy young were first observed on June 9. Smith and associates ranked the species sixth in order of abundance in 1948, and fifth in 1949, with little actual increase in the total number.

In September, 1949, the species was eighth in order of abundance (1.62 per cent of the duck total). Moderate numbers were noted during the second week of the month; before and after that time only stragglers were seen, and long distances were travelled without seeing any. During the last seven days of the

month none were seen, although in a former season they were noted as late as October 5, which is probably close to the average time of departure from the region.

14. SHOVELLER. Spatula clypeata (Linnaeus).

In 1932 and 1933 this species was common south of the Peace River. Hundreds of mated pairs were observed in June, 1933, from Lake Athabasca west to Birch River Delta. Nesting is probably general about the first week in June. Downy young, estimated to be a week old, were first noted in 1933 on June 29.

In June, 1933 this species was third in order of abundance. Smith and associates gave it the same ranking in June, 1948, and June, 1949, although the aggregate was larger in the latter year. In September, 1949, it was twelfth, representing only .26 per cent of the duck total. Only 29 individuals were observed and days passed without a single record. Obviously, most of the Shovellers must have left the Delta before the end of August. They may have gone south, or merely concentrated in some other northern area. It is known that at least a few do tarry in these latitudes until early October.

15. REDHEAD. Aythya americana (Eyton).

Few of this species were noted in 1932 and 1933 and no nesting data were secured. Smith and associates gave it seventh place in order of abundance in 1948, and eighth in 1949. In September, 1949, it was thirteenth (.17 per cent of the total of ducks). Only 19 in all were seen, the last on September 12.

16. RING-NECKED DUCK. Aythya collaris (Donovan).

This species is thinly distributed in the region. In

1932 and 1933 in extensive areas in Wood Buffalo Park it was not recorded, e.g., in the area west of Lake Athabasca and south of the Peace. Smith and Lawrence do not list it for 1948 or 1949. Small numbers occur in the uplands north of the Peace in Wood Buffalo Park. A female with 10 downy young a few days old was noted on Murdoch Creek, Wood Buffalo Park, June 22, 1932. In this latitude egg-laying may commence about the end of May.

In September, 1949, it was tenth in order of abundance (.92 per cent of all ducks). Small numbers were seen at wide intervals and sometimes days passed without a single identification. They were seen occasionally so late in September that it is likely some of them stay in the Delta region until October. More October information is desirable.

17. CANVAS-BACK. Aythya valisineria (Wilson).

The Canvas-back is only moderately common as a summer resident. It is widely distributed but is usually found only in certain areas. In June, 1933, it was commonest around Lake Mamawi, along the southeast shore of Lake Claire and in the Birch River Delta. The Athabasca Delta was not examined in 1932 and 1933, but it is understood that Canvas-backs may nest there in favoured habitats such as the area including Grey Wavey and Bog Lakes.

Smith and Lawrence placed this species tenth in order of abundance in 1949 while noting an increase over 1948. No breeding or nesting data are available.

In September, 1949, 480 in all were seen. The species was sixth in order of abundance and made up 4.29 per cent of the total. The largest number recorded in a single day was 297 at Richardson

Lake (Transect 7), September 12. On the following day, 165 were seen on a creek west of Fletcher Channel near Bog Lake. Many were immatures that probably were hatched in near-by marshes; most of them could not fly and merely dived deep in the water as the canoe passed.

During the aerial transects, September 19, a few Canvas-backs were noted at several points in the district west of Birch River Delta. On the ground transects in Athabasca Delta after that date, few were seen, the last record being for September 29 at Embarras River. No reliable information concerning the final autumn departure date of the species was secured, but its scarcity toward the end of September indicates that most had gone during the third week of that month.

18. GREATER SCAUP DUCK. Aythya marila (Linnaeus).

More frequently than not, identification of this species at a distance cannot be certain owing to intergradation with A. affinis, with which it frequently associates in travel. No positive record was secured in 1932, or 1933, although in June of the latter year a few Scaups were tentatively listed as marila. Smith and associates listed the two species together in 1948 and 1949.

Again in September 1949, there was no reliable listing of marila although a number of the Scaups seen probably belonged to this species. Circumstances prevented attempting to collect birds for detailed examination.

In spite of the lack of positive evidence there can be little doubt that the species is moderately represented in the Delta, particularly during spring and autumn migrations. As it is a late

autumn emigrant it is likely that fair numbers remain until the last part of October.

19. LESSER SCAUP DUCK. Aythya affinis (Eyton).

The "Bluebill" is fairly abundant and well distributed in the region under review. In June, 1933, it was common in the marshes near Revillon Coupe and Chenal des Quatre Fourches, in Lake Mamawi, and west from that lake.

Many Scaups may arrive in late April, but all the existing records are for the first and second week of May--most of them later than May 10.

Smith and Lawrence placed the Scaups fourth in order of abundance in June, 1949. In September they were also placed fourth--still in the same relative abundance, although a marked increase in numbers had then taken place. In that month Lesser Scaups made up 5.32 per cent of the total number of ducks. They were plentiful in some Athabasca Delta areas, where scattered individuals or small groups commonly associated with other species were observed. A large flock was noted near Goose Island and another at Richardson Lake. Several flocks seen on Lake Claire during the aerial transects on September 19 were listed as unidentified ducks, but were probably Scaups.

As the numbers of the species tapered off in late September it is likely that emigration had begun. However, fair numbers may remain until mid-October or later.

20. AMERICAN GOLDEN-EYE. Bucephala c. americana (Bonaparte)

This species breeds abundantly in favourable localities and is fairly uniformly distributed in the Delta region and near-by

upland areas. It is a highly characteristic river duck. Normally it first appears about the third week in April, but the majority probably arrive late in April or early in May. Small flocks may sometimes be seen in late May flying north along the Slave River.

During June and early July, 1933, the species was commonly distributed from Lake Athabasca west to Birch River. Along the latter it was the most plentiful species of ducks. Egg-laying evidently commenced during the second or third week in May, as downy young were first noted on June 16.

Smith and Lawrence placed the Golden-eye twelfth in order of abundance in 1949. In the September investigations it ranked second and made up 14.17 per cent of the total. It was more or less common everywhere, but much more numerous in some areas than in others. On the waterways it was often the most abundant species. The small groups, or large flocks, have a characteristic habit of rising and flying to settle ahead of the canoe, a manoeuvre they repeat until they finally tire of it and double back overhead.

Writing with regard to americana in an earlier paper (1942), p. 38), I remarked: "In the period from late September until October 16, 1932, many thousands were observed in various-sized 'rafts' on Slave River, the lower Peace, Riviere des Rochers, and the west end of Lake Athabasca. Flocks were reported on Slave River up to November 6."

These large concentrations of American Golden-eyes are among the genuinely stimulating waterfowl spectacles in the North.

21. BUFFLE-HEAD. Bucephala albeola (Linnaeus).

No wildfowl is more characteristic of northern rivers than this species but during the nesting season it is relatively less numerous in the Delta than in rivers and lakes of upland regions and its numbers are less at that time than during the autumn migration period when there is a considerable influx from the north.

The Buffle-heads arrive in late April or early May and may stay for a time before continuing the northward flight. Summer residents begin to nest in late May; the first young were seen on June 25, 1933. The natives call them "Wood Ducks" because of their fondness for heavy forest and their habit of nesting in hollow trees.

Smith and Lawrence ranked this species last in order of abundance in June, 1949. This would not be the case if a count were made on the higher ground north of the Peace or, presumably, in the Birch River and Mountain district to the south. In September it was ninth in order of abundance (1.31 per cent of the duck total), and still not really abundant.

The best count was made on September 12 at Richardson Lake--a locality where they were very common. In many other areas they were scarce or absent. During late September, days passed in which no Buffle-heads were seen. The last record was secured on September 28 along the Embarras River. Stragglers are known to remain until October 8 or 10.

22. OLD SQUAW DUCK. Clangula hyemalis (Linnaeus).

Considerable numbers of this species are said to travel

through the Delta region in spring. Sometimes they are fairly common along Athabasca River in mid-May. None were positively identified by the writer during investigations in Wood Buffalo Park previous to 1949. This may lead to the conclusion that the northward movement along Athabasca River takes place erratically, and that the main movement goes through western Alberta via Hay Lakes to the Mackenzie and the Arctic nesting grounds. Indirect evidence indicates that returning migrants could reach the Delta by the second or third week of September, remaining in some cases well into October.

23. WHITE-WINGED SCOTER. Melanitta f. deglandi (Bonaparte).

This species occurs sparingly in the Delta, on Lake Athabasca, and in the upland region north of the Peace. It was not seen during the investigations in Wood Buffalo Park in 1932 and 1933. Smith and Lawrence gave it second last place in order of abundance in 1949. During the September investigations it was eleventh (.74 per cent of the total), and 83 in all were counted. The last record of the species was made on September 22.

Records for more northerly regions suggest that the species may continue to inhabit the Delta until the middle of October, but the September, 1949, count indicates that the ranks are drastically thinned before October begins.

24. SURF SCOTER. Melanitta perspicillata (Linnaeus).

Local name: Black Duck.

This Scoter appears to occur only casually in the Delta,

which it reaches in early or mid-May. It is said to be more numerous along the north shore of Lake Athabasca. In June, 1933, small numbers were seen at Revillon Coupe, Chenel des Quatre Fourches, and Lakes Mamawi and Claire. In that particular time and area Surf Scoters were much more common than White-winged Scoters. This seldom seems to be the case in the Delta lowlands, although usual in larger bodies of water such as Lake Athabasca and Great Slave Lake.

Smith and associates did not list this species in 1948 or 1949. In September, 1949, a total of only seven was recorded.

Individual Surf Scoters may remain in the Delta region until about mid-October.

25. RUDDY DUCK. Oxyura jamaicensis (Gmelin).

The Ruddy Duck is very scarce in the Peace-Athabasca Delta which is moderately close to the northern limit of its range. Apparently this limit is the latitude of Great Slave Lake, since the farthest north that specimens have been taken is near Fort Resolution, presumably in the Slave Delta marshes.

From 1932 to 1934 the writer saw few of this species in the region and found them in only two localities - on a small lake south of Revillon Coupe and in the vicinity of park headquarters, Slave River. Strangely enough, none were found in the excellent marshes south of the Peace. Smith and associates noted some examples in 1948 and 1949, but ranked the species low in order of abundance. In September, 1949, they were remarkably rare. Only two were observed--both along the Athabasca River below the Embarras River forks on September 8.

The earliest known spring arrival date of the species is May 12 (at park headquarters). Courtship and nesting activities take place in June. The average date of autumn departure is not known.

26. HOODED MERGANSER. Lophodytes cucullatus (Linnaeus).

This species has been collected at Fort Resolution and noted at a few places on the Mackenzie River, but there is no definite record of occurrence in the Peace-Athabasca Delta region, or in that vicinity. Since it occurs farther north, it may be presumed that it does sometimes pass through the Delta area even if only rarely.

27. AMERICAN MERGANSER. Mergus m. americanus Cassin.

Preble (1901) noted a few ducks of this species at Lake Athabasca and near the mouth of the Chenal des Quatre Fourches. They were seen by Seton in the Athabasca Delta October 11, 1907. None were seen by the writer during investigations in Wood Buffalo Park from 1932 to 1934, which would indicate relative scarcity. During the September, 1949, investigations, 16 were seen in the Athabasca Delta, none of them later than September 22. Seton's observation shows that they do sometimes remain well into October.

28. RED BREASTED MERGANSER. Mergus serrator Linnaeus.

This Merganser has much the same status as the preceding species in the Delta. It is seldom seen there although it breeds widely north to the Arctic coast. Preble noted the species along the lower Athabasca in May, 1903. It is much more plentiful in northwestern Wood Buffalo Park, at Great Slave Lake, and to the north. No positive identification was secured in the Delta by the

writer in 1932, 1933 or 1949.

29. AMERICAN COOT. Fulica americana Gmelin.

The Coot is a common breeder in suitable habitats throughout the Peace-Athabasca Delta. It arrives in late April or early May. In June, 1933, it was widely distributed in the marshlands from Rocher River and Revillon Coupe south to Lake Mamawi and west to Lake Claire, and it was more than ordinarily common in Birch River Delta, at Hilda Lake, and in the southern part of Lake Mamawi. Several nests in which the eggs were hatching were found on June 21. However a number of nests with unhatched eggs were found later in the month and one set collected for the National Museum was relatively fresh. Evidently there is great variation in the time of egg-laying, which probably begins in early June.

During the September 1949 investigations Coots were rather common in parts of the Athabasca Delta. A total of 182 was recorded, about the same as for the Blue-winged Teal. Most of these coots were seen at Richardson Lake and in the marshes between Big Point and Goose Island and near Big Lake. The last was seen on September 23, but in 1933 they were noted by the writer in Wood Buffalo Park as late as October 5.

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ⁱⁱPublished jointly by U.S. Fish and Wildlife Service,
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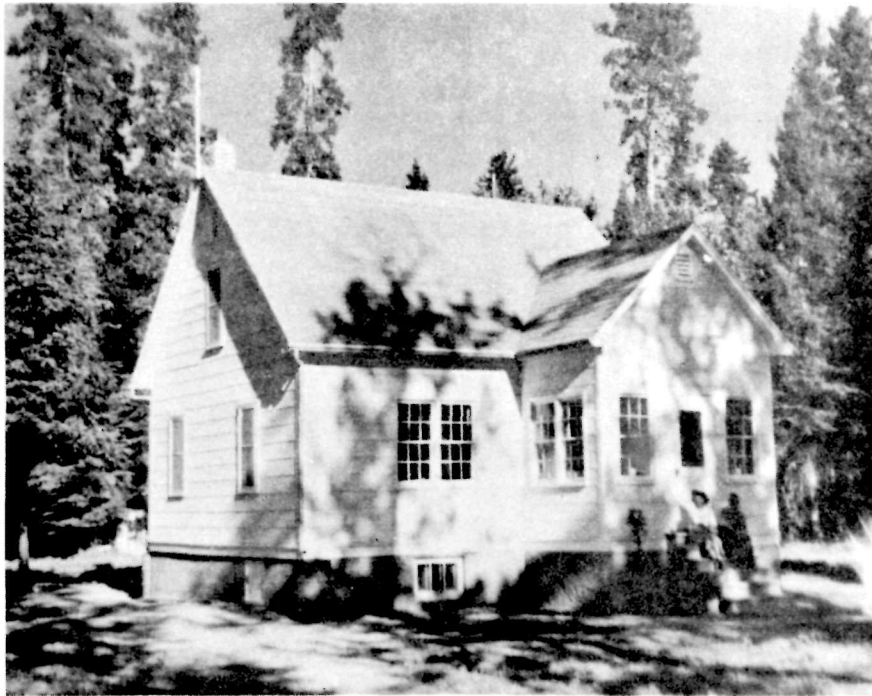


Fig. 1. Park warden's residence, 27th Baseline, Athabasca River, Wood Buffalo Park, Alberta. Used as a base by the writer during part of the investigations in Athabasca Delta. (September 6, 1949.)



Fig. 2. Typical section of Embarras River, south of Mamawi Creek, Alberta, looking northward. Wood Buffalo Park on left. A favourite stream for game ducks. September 7, 1949.



Fig. 3. Goose Island Channel, Athabasca Delta, looking northwest from confluence with Big Point Channel. Shrubbery and trees bent under a $1\frac{1}{2}$ inch load of wet snow. September 11, 1949.



Fig. 4. Main channel of Athabasca River looking west from the vicinity of Richardson Lake outlet. September 12, 1949.

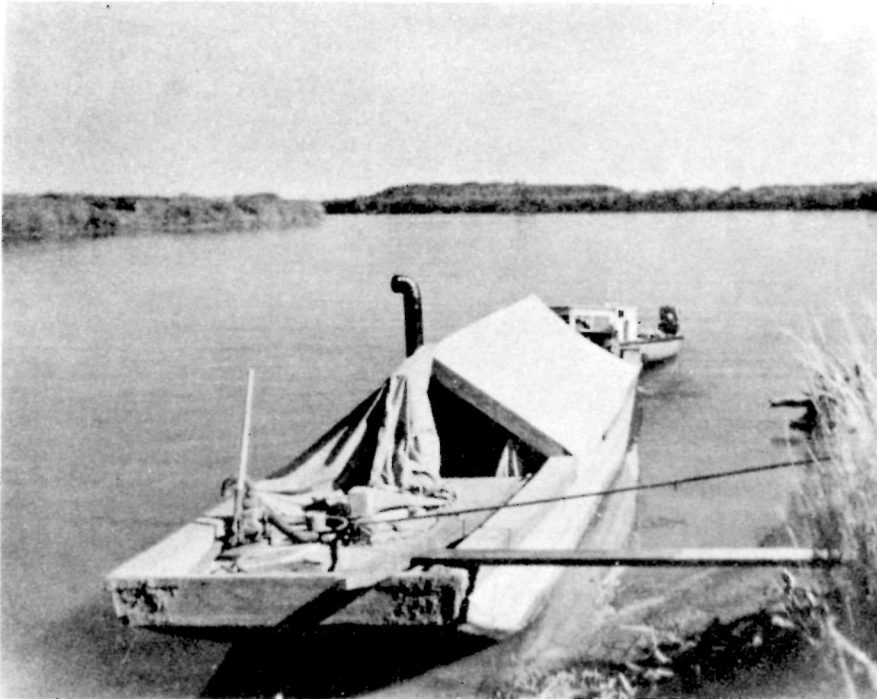


Fig. 5. Departmental motor boat Aspen and camp-barge used as headquarters during waterfowl investigations at the confluence of Athabasca River and channel leading to Richardson Lake. September 12, 1949.

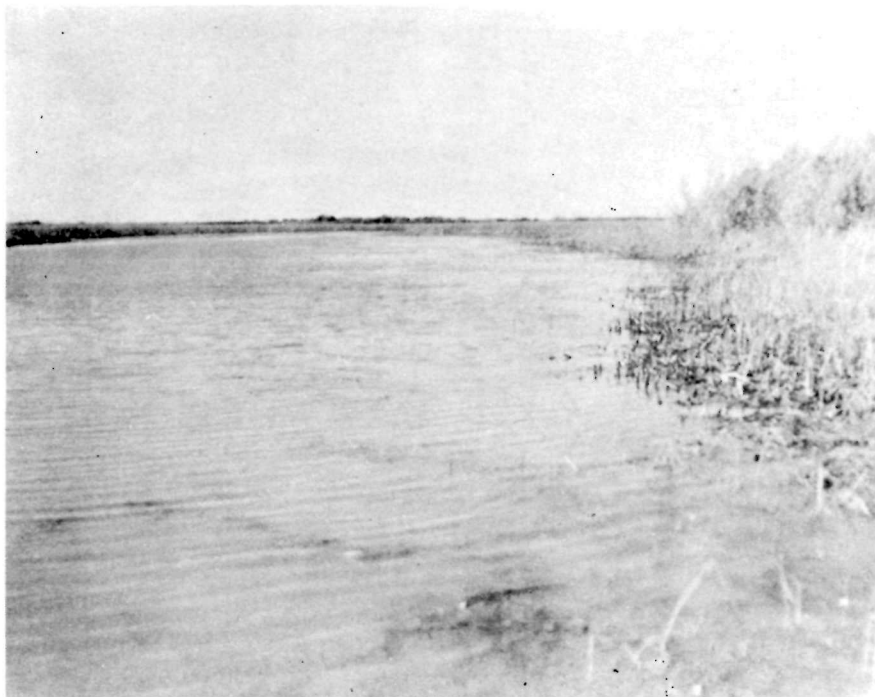


Fig. 6. Typical marshy lake in Athabasca Delta, near Fletcher Channel, in approximate Latitude $58^{\circ} 33' N$. Many species of game ducks and occasional migrating geese frequent such lakes. September 13, 1949.



Fig. 7. View of Fletcher Channel, Athabasca Delta, looking south in about Latitude $59^{\circ} 29'$ N. September 13, 1949.



Fig. 8. Typical section of "Grey Wavey" Lake, Athabasca Delta (Lat. $58^{\circ} 30'$ N.; Long. $111^{\circ} 7'$ W.), illustrating characteristic lowlands, shallow water and mudflats. September 13, 1949.



Fig. 9. "Galoot" Lake, Athabasca Delta (Lat. $58^{\circ} 35'$ N.; Long. $111^{\circ} 6'$ W.), showing characteristic shallow water and growth of whitetop, marsh cane, cattail and other emergent aquatics. Excellent habitat for water birds. September 13, 1949.



Fig. 10. Typical creek or channel in Athabasca Delta, between Embarras River and Fletcher Channel, three miles south of Lake Athabasca, showing common growth of cattail, marsh cane and willows. September 14, 1949.

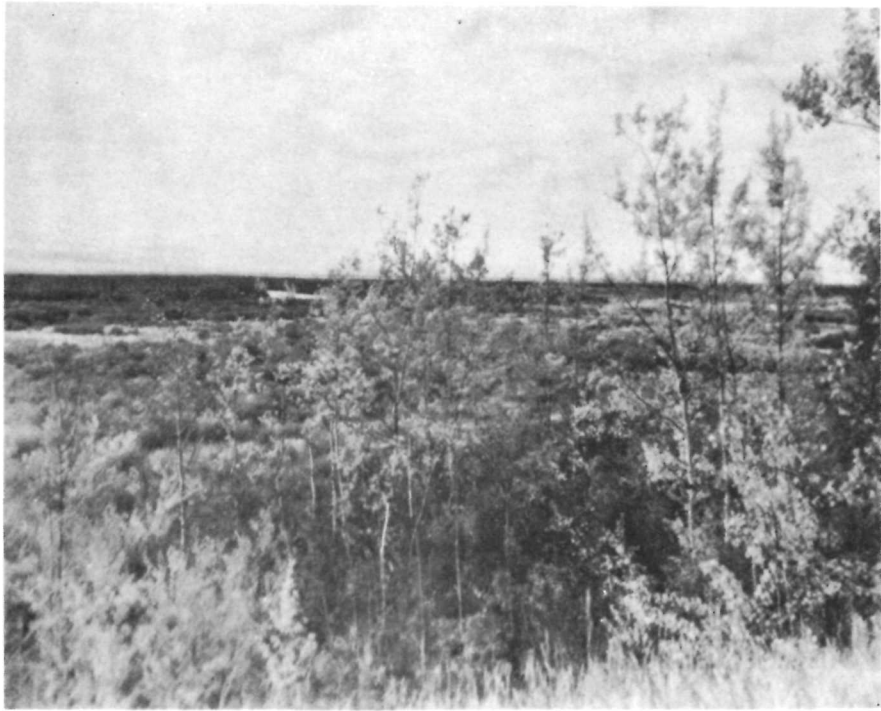


Fig. 11. Scene in the south part of Wood Buffalo Park. Marsh and willow-grown lowlands; Lake Mamawi in far distance. September 18, 1949.



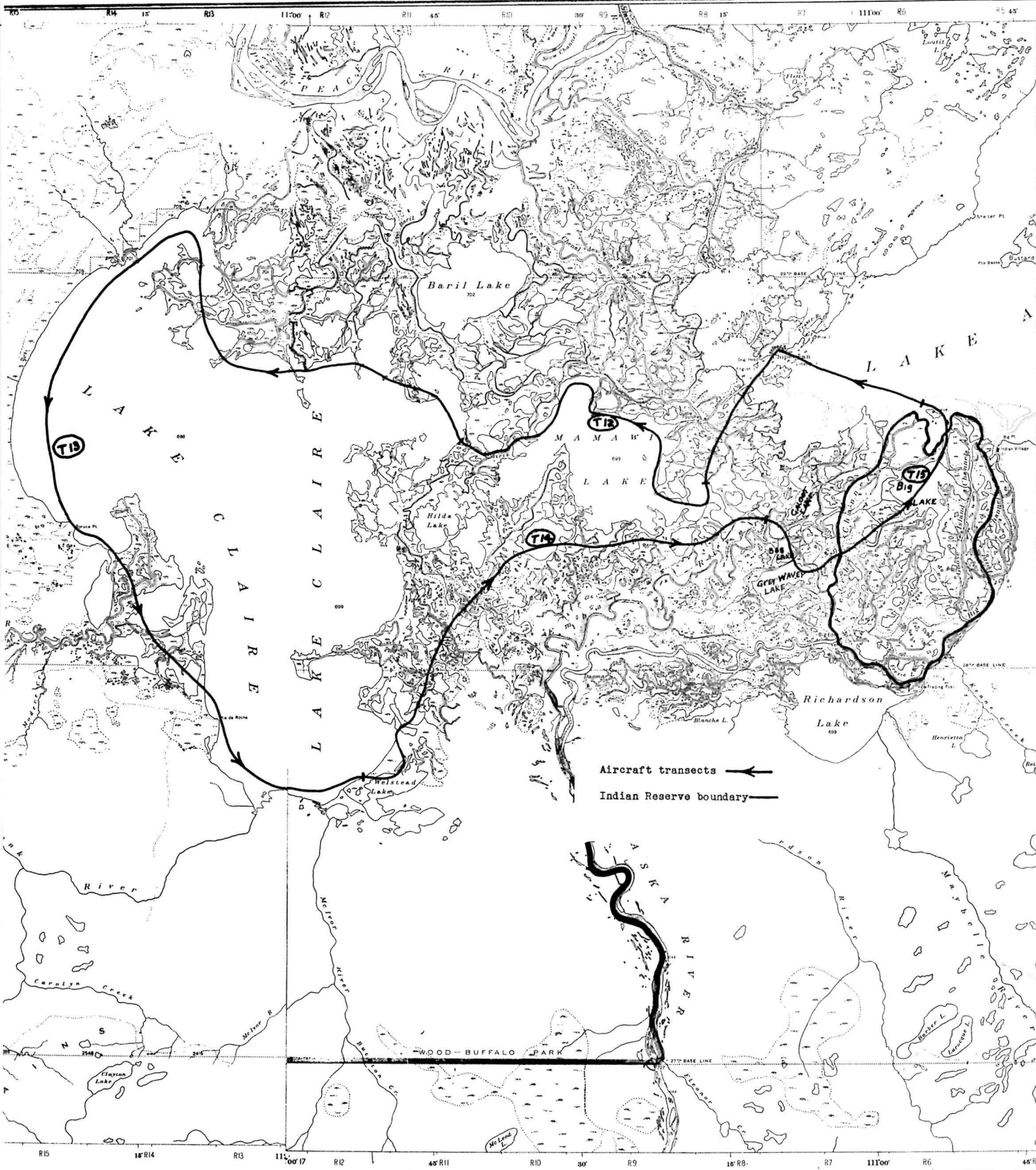
Fig. 12. Quatre Fourches Channel looking south from Government Dog Camp, Wood Buffalo Park, Alberta. In general, a notable area for waterfowl. September 18, 1949.



Fig. 13. Park warden's residence at Government Dog Camp, Chenal des Quatre Fourches, Wood Buffalo Park. Rock ridge in the background. Used as headquarters during part of the wildfowl investigation. September 18, 1949.



Fig. 14. Mud-flats along south shore of Lake Athabasca, looking east from mouth of Big Point Channel towards Old Fort Point. In spring and autumn these flats are frequented by large numbers of ducks and geese. September 21, 1949.



Aircraft transects →

Indian Reserve boundary —

