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Occasional Paper
Number 89
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Cover photo: California Gulls at Egg Island, near the Slave Delta, Great Slave Lake (S.A. Alexander)

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Abstract

We documented the diversity, abundance, distribution, and nesting chronology of the colonial waterbirds of Great Slave Lake in 1986–1995. We also reviewed all available historical information.

Nine species bred annually on the lake. In declining order of abundance, they were California Gull, Herring Gull, Common Tern, Mew Gull, Arctic Tern, Ring-billed Gull, Caspian Tern, Parasitic Jaeger, and Bonaparte's Gull. Hundreds of Black Terns also nested in nearby marshes. To our knowledge, these 10 species are not sympatric anywhere else in North America. We also assessed the status of 15 other species reported on and near the lake, such as the American White Pelican and Franklin's Gull.

We recorded approximately 6300 nests and 2350 adult probable nesters at nearly 230 island-nesting sites during a series of surveys throughout the lake. We also identified many new nesting sites and revisited previously known nesting sites during supplementary surveys, mainly in the North Arm. There was an average of 27 nests per island-nesting site, and the largest colony, Egg Island near the Slave Delta, supported more than 730 nests. Known changes in abundance at some sites are briefly discussed. Substantially fewer colonial waterbirds breed on this lake than on large Nearctic lakes farther south, but Great Slave Lake may support the largest freshwater community of colonial waterbirds in the Northwest Territories.

Nesting birds were particularly abundant along the east shore of the North Arm (40% of all nests) and in and near the Simpson Islands (25%), where myriad islands and productive wetlands and shallows occur. Birds were least abundant in the East Arm, where water is deep, the shores are rocky, and inshore wetlands are few. Seven species are at or near the northern limits of their known Nearctic breeding ranges on Great Slave Lake.

The different species had varied chronologies of arrival, nesting, and departure. Some gulls arrived as early as mid-April, when the snow began to melt. Most eggs hatched in late June and early July, when insects that fell or were blown on the water surface were superabundant. The small, mainly insectivorous species left mostly in the second half of August, when early frosts began to occur. The large species left as late as early November, when wetlands and shallows had been frozen for some time.

In light of significant climate warming trends in the western Northwest Territories and concerns about increasing levels of contamination in the Mackenzie River watershed, these waterbirds are potentially important bioindicators of environmental change and health.

Résumé

Nous avons fait une étude sur la diversité, l'abondance, la distribution et la chronologie de nidification des oiseaux aquatiques coloniaux du Grand Lac des Esclaves, entre 1986 et 1995. Nous avons aussi révisé tous les documents historiques disponibles à leur sujet.

Neuf espèces nichèrent chaque année dans le lac. Elles sont, en ordre d'abondance décroissant, le Goéland de Californie, le Goéland argenté, la Sterne pierregarin, le Goéland cendré, la Sterne arctique, le Goéland à bec cerclé, la Sterne caspienne, le Labbe parasite et la Mouette de Bonaparte. Des centaines de Guifettes noires nichaient aussi dans les marais avoisinants. Il n'y a pas d'autres régions en Amérique du Nord où ces 10 espèces sont sympatriques. Nous avons aussi révisé le statut de 15 autres espèces observées dans le lac et ses environs, dont le Pélican d'Amérique et la Mouette de Franklin.

Nous avons relevé environ 6 300 nids et 2 350 adultes nicheurs probables à plus de 230 îles or groupes d'îles lors d'une série d'inventaires d'un bout à l'autre du lac. Nous avons aussi trouvé plusieurs nouvelles colonies et revisité plusieurs colonies déjà connues lors d'inventaires supplémentaires surtout dans le Bras du Nord. Il y avait en moyenne 27 nids par île ou groupe d'îles, et la plus grosse colonie, Egg Island, près du delta de la rivière des Esclaves, comprenait plus de 730 nids. Des changements dans l'abondance des oiseaux à quelques endroits sont brièvement discutés. Si l'on compare avec d'autres grands lacs néarctiques plus au sud, il y a peu d'oiseaux aquatiques coloniaux dans ce lac. Toutefois, il s'agit peut-être de la plus importante communauté en eau douce dans les Territoires du Nord-Ouest.

Les nids étaient particulièrement abondants le long de la rive est du Bras du Nord (40 % des nids), et dans les

îles Simpson et leurs environs (25 %), où les îles sont innombrables, et où les marais et les eaux peu profondes abondent et semblent productifs. Par contre, il y avait très peu d'oiseaux dans le Bras de l'Est, où les eaux sont profondes et où les rives sont rocheuses et dépourvues de marais. D'autre part, sept espèces sont à ou près de la limite septentrionale de leur aire de reproduction néarctique dans ce lac.

Les chronologies de l'arrivée, de la nidification et du départ variaient parmi les espèces. Les premiers goélands arrivaient dès la mi-avril, quand la neige commençait à fondre. L'éclosion des oeufs se produisait principalement à la fin de juin et au début de juillet, lorsque les insectes apportés par le vent étaient très abondants sur la surface de l'eau. Les petites espèces principalement insectivores partaient normalement dans les deux dernières semaines du mois d'août, dès les premières gelées. Les plus grosses espèces étaient présentes jusqu'au début de novembre, après que l'eau ait gelé à plusieurs endroits.

Étant donné l'importance du réchauffement climatique dans l'ouest des Territoires du Nord-Ouest, et les préoccupations au sujet de la pollution de l'eau dans le bassin du fleuve Mackenzie, ces oiseaux pourraient être d'importants indicateurs biologiques des changements qui ont lieu dans ce lac, et de sa santé.

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Foreword

In 1970, the late William L. McDonald, a renowned geological engineer and knowledgeable ornithological observer for the Great Slave Lake region, told me a story about the local extermination of the Ring-billed Gull from the Yellowknife area. Apparently, a nesting colony on Latham Island — an island in Yellowknife Bay, within the city limits of Yellowknife — was regularly visited throughout the 1940s on July 1st by people who collected eggs for use in festivities associated with Canada Day celebrations. The species is now recovering locally, although ring-bills are still not nesting on Latham Island.

Unfortunately, many, if not most, causes of large-scale fluctuations in avian populations are not so obvious. In fact, as humankind's effects on the environment accelerate, the causes are becoming increasingly subtle and complex. It is only through objective, thorough, and long-term studies, such as exemplified in this work, that we are given the future opportunity to assist in the detection of causes of avian population change, such as ozone depletion, contaminants borne from remote sources, global climate change, and disturbance from increasing human uses of Great Slave Lake. The real value of this documentation will become increasingly apparent as time goes by.

Robert G. Bromley
Yellowknife, October 1994

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1.0 Introduction

1.1 Objectives

Two of North America's largest lakes — Great Slave Lake (GSL; 28 500 km^2) and Great Bear Lake (31 800 km^2) — occur in the Northwest Territories. Unlike other large lakes farther south, their communities of colonial waterbirds have remained largely unknown until now.

Northern lakes, covered with ice for five to six months per year, are not known to be particularly productive ecosystems. However, with thousands of hectares of shallows and wetlands enriched by postglacial sedimentation and fertilized by dozens of tributaries, GSL, the major source of the Mackenzie River (Fig. 1), provides more than marginal waterbird habitat. Tens of thousands of waterbirds of approximately 100 species have been recorded there. Moreover, this lake supports an assemblage of colonial waterbirds comprising several species whose status is poorly known in the Northwest Territories and which are of interest to the Committee on the Status of Endangered Wildlife in Canada.

The objectives of this project were to document the diversity, abundance, distribution, and nesting chronology of the colonial waterbirds that breed on GSL. We also reviewed the status of all colonial waterbirds reported on the lake in the past. This project began in 1986, and preliminary results have been reported elsewhere (McCormick and Sirois 1988; Sirois et al. 1989, 1991a; Sirois and Seddon 1990).

We hope that this atlas will assist further studies on GSL and its waterbirds, while providing a background for future surveys on Great Bear Lake and other lakes in the Northwest Territories. We also hope that it will be a valuable companion to publications on the colonial waterbirds of other large Nearctic lakes to the south.

1.2 Historical Records

> The specimens obtained on Sir John Franklin's two Expeditions furnish almost the whole of our authentic information of the Ornithology of the interior of the Fur-countries . . . The collection made on the first Expedition was formed in the several springs of 1820, 21 and 22, on the Saskatchewan, at Fort Enterprise, and on Great Slave Lake respectively; and in the autumn of 1822 at York Factory (lat. 57), Hudson's Bay. (J. Richardson, Introduction to *Fauna Boreali-Americana* [Swainson and Richardson 1831])

Samuel Hearne was apparently the first skilled naturalist (see Houston 1994) to visit GSL, in December 1771 (Tyrrell 1911). However, J. Richardson was the first to report detailed records of colonial waterbirds on and near the lake, when he travelled from Fort Resolution to Old Fort Providence, Yellowknife Bay, and up the Yellowknife River in the 1820s (Fig. 1) (Swainson and Richardson 1831; Houston 1984).

Between 1859 and 1869, hundreds of records and specimens of waterbirds and their eggs were sent from GSL, particularly from Fort Resolution, Old Fort Rae, and Big Island (Fig. 1), to S.F. Baird of the Smithsonian Institution by the "Mackenzie River Collectors" (e.g., Ross 1862). The collections, which constituted the first large-scale scientific study undertaken in Rupert's Land, were coordinated by R. Kennicott, an American naturalist, and carried out with the help of Hudson's Bay Company personnel and northern native residents (Baird et al. 1884; Lindsay 1991, 1993).

In the following 125 years, the colonial waterbirds of GSL and nearby areas were reported by numerous authors (Russell 1898; MacFarlane 1908; Preble 1908; Seton 1908; Wheeler 1912; Harper 1914; Bent 1921; Williams 1922; Blanchet 1925; Fairbairn 1931; Soper 1942, 1950, 1952; Höhn and Robinson 1951; Scotter and Erickson 1963; Stewart 1966; Weller et al. 1969; Kelsall et al. 1971; Trauger and Bromley 1976; B.C. Research 1978; Allen and Ealy 1979; Thompson et al. 1979; Godfrey 1986; McCormick and Sirois 1991; Sirois et al. 1991b; Sirois and Fournier 1993, Bromley and Trauger, n.d.). However, there has been no comprehensive survey of the lake until now.

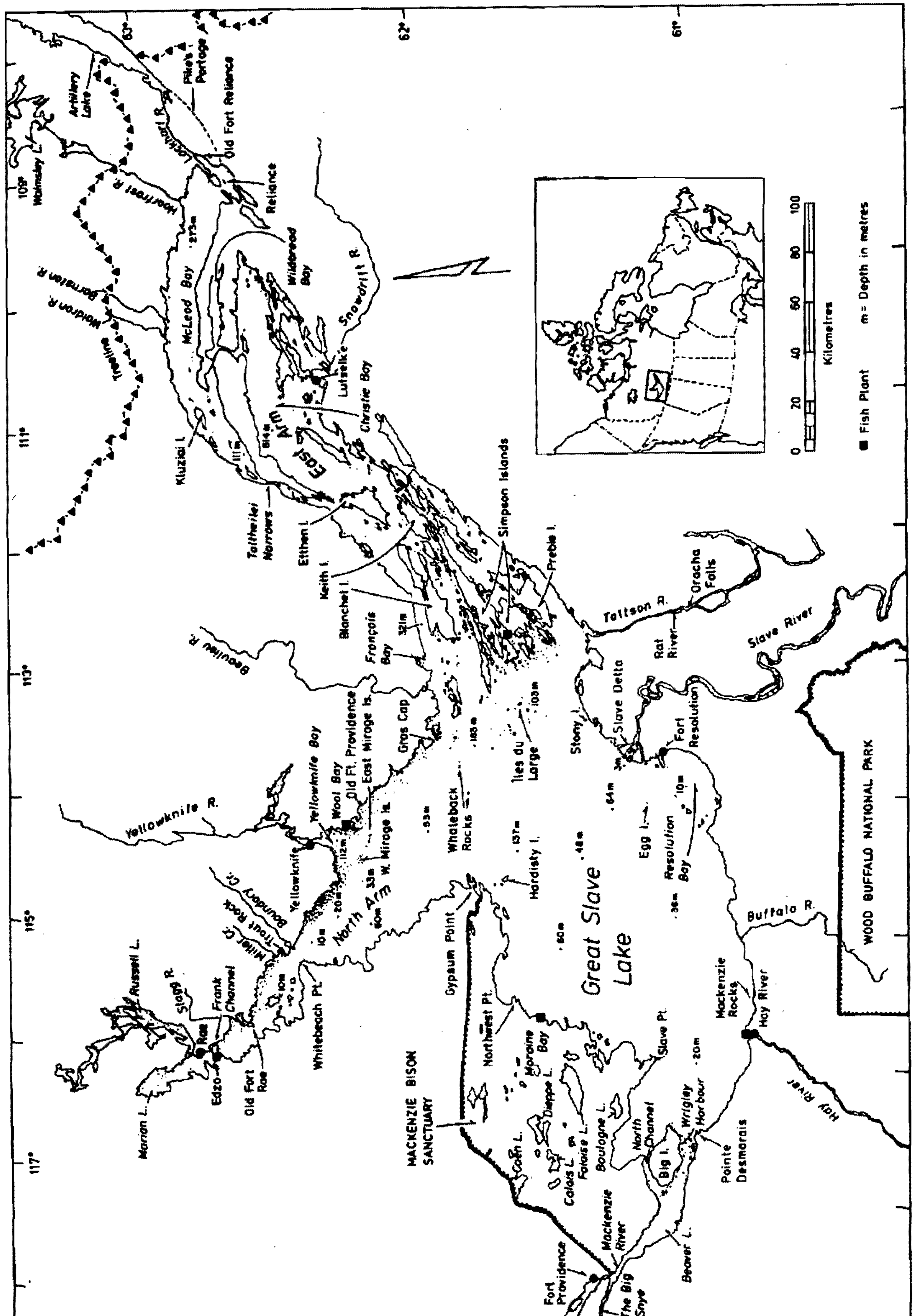


Figure 1.
Great Slave Lake, Northwest Territories

2.0 Study area

2.1 Surrounding ecozones

With an area of 28 500 km^2, GSL is North America's fifth largest lake (Anon. 1989). It is a remnant of glacial Lake McConnell, a much larger lake that covered lowlands on the northwestern margin of the Canadian Shield, between Great Bear Lake and Lake Athabasca, in the late Pleistocene (Craig 1965). The total area draining into the lake is approximately 960 000 km^2, more than one-tenth of the total land area of Canada (Rawson 1947).

The lake's eastern half is surrounded by the Taiga Shield ecozone, and its western half, by the Taiga Plains ecozone (Wiken 1986; Ecological Stratification Working Group 1993). The area occupied by the Slave and Taltson river deltas represents the northernmost extension of the Boreal Plains ecozone (Fig. 2). As a rule, forest cover is denser along the western shores of the lake and on nearby islands, where soils are better developed, than on its eastern shores and nearby islands, where there is little or no soil.

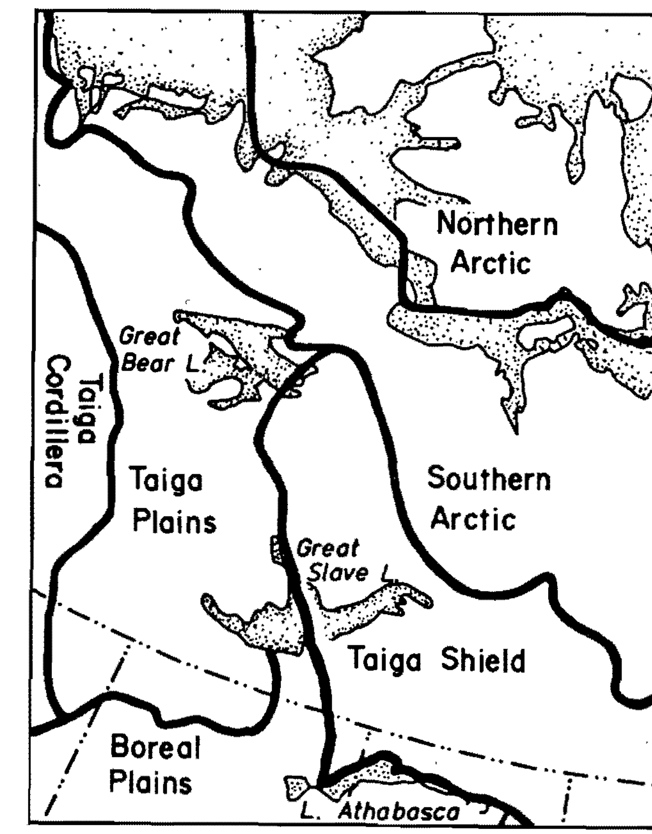
Islands are numerous and vary in size from a few square metres to several square kilometres. Most islands occur in the lake's eastern half. For example, along the east shore of the North Arm, there are up to 70 islets per square kilometre near Yellowknife Bay. Also, islands occupy about 30% of the East Arm (Rawson 1950). Conversely, only a few dozen islands occur in the lake's western half. Most islands rise 3–5 m above water level, but several of the East Arm's large islands feature cliffs 300 m above water level.

GSL also has a very irregular shoreline, which results in countless peninsulas and bays of varying sizes. Its shoreline is approximately 3000 km long, and that of its islands about 1600 km (Rawson 1950). In addition, tens of thousands of marshes, ponds, and lakes occur near the lake.

2.2 Climate

A dry, continental, boreal climate prevails over most of the lake (Environment Canada 1989), but subarctic conditions prevail in much of the East Arm. Mean daily temperatures at Yellowknife are 28.8°C in January and 14.2°C in July (Environment Canada 1993). Summers are short but days are long, with 20 hours of

Figure 2
Terrestrial ecozones in the Great Slave Lake region



sunlight in June. The mean annual number of frost-free days ranges from 90 to 110. The mean date of last frost in the spring ranges between 30 May on the west shore and 20 June in the East Arm, and the mean date of first frost in the fall for the whole region is 10 September (Burns 1973). However, localized frosts occur approximately one month before that date each year.

2.3 Ice Conditions

> Tuesday, June 9 [1789] . . . The Lake is covered all over with ice . . . Monday, June 15. About Noon the wind veered to the

> Westerd and uncovered our Netts, and cleared a Passage to the opposite Islands. We raise our Netts very much broken and not many Fish. Struck our Tents loaded and embarked at Sun Set (from *The Journals and Letters of Sir Alexander Mackenzie* [Lamb 1970])

> The season has been extraordinarily late this year; 'tis only three days since that the lake froze so that we could put down our nets under the ice at "Round Island." (from a letter from J. Lockhart to R. Kennicott, Fort Resolution, 21 November 1864 [Lindsay 1991])

GSL is entirely covered by ice during five to six months each year, and ice thickness can reach almost 2 m by 1 March (Rawson 1950). In the North Arm, meltwater begins to appear on nearshore ice after 15 April, and ice-free water usually appears nearshore and around islands in early May. By 20 May, small shallow bays and channels are usually ice-free, and shoreleads can be 50 m wide. At the end of May, most large bays are clear of ice, ice-free channels along the shores can be over 1 km wide, and large leads have usually developed offshore. However, most of the lake remains covered with ice until June.

In early June, large areas of open water normally occur off the Slave and Taltson rivers, as well as in the Simpson Islands and at the north end of the North Arm (Fig. 3), but large rafts of ice may persist in central GSL until mid-June. In the East Arm, ice usually persists into July, particularly in McLeod and Charlton bays. Residual ice pans may occur in McLeod Bay as late as 8 July (Kelsall et al. 1971). In some years, breakup may be delayed by one to two weeks (Fig. 3). During 1986–1995, breakup was noticeably late in 1988, 1990, and 1992.

Ice usually reappears in wetlands and shallow bays by mid-October, and large bays are usually ice-bound in early November. Open waters may persist offshore into December (Sirois 1991) and even January (Kelsall et al. 1971).

2.4 Depth, water levels, and turbidity

GSL is largely oligotrophic, which is particularly evident in the East Arm (Rawson 1950). However, the large inflow of mineral-laden water from the Slave River, which accounts for 80–90% of the water that flows into the lake (Cheng and Bennett 1975), has an important moderating effect on its oligotrophy (Rawson 1950).

The mean depth of the lake's main basin is 41 m, and its maximum depth is 163 m. In the East Arm, Christie Bay has a maximum depth of 614 m (Fig. 1), which is the deepest freshwater basin in North America (Rawson 1950). Conversely, water is very shallow at the north end of the North Arm and near the Slave Delta.

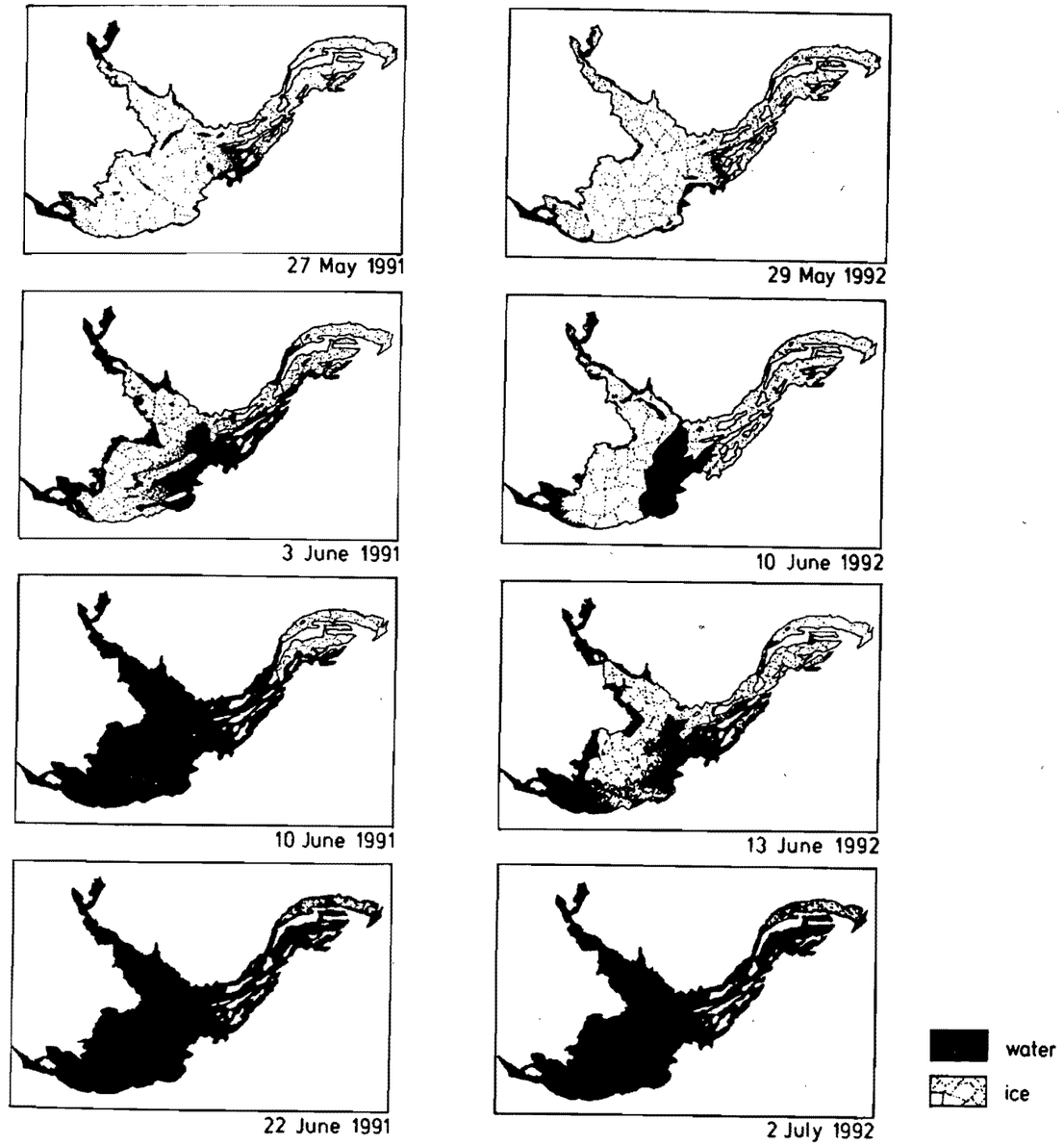
Fluctuations in water levels do not usually exceed 50 cm between summer and winter, particularly since the construction of the Bennett Dam on the Peace River in British Columbia in the 1960s (Environment Canada 1990). Kemper (1972) determined that the construction of the dam did not have major impacts on the lake, but significant environmental changes upstream, in the Peace–Athabasca Delta (Anon. 1971; Townsend 1975; Jaques 1990; Carbyn et al. 1993), suggest otherwise. Development of hydroelectric facilities on the Taltson River (Fig. 1) during the same period and the diversion of the Tazin River — the main tributary of the Taltson River — in northern Saskatchewan in the 1930s may have had some impacts on GSL as well (see Anon. 1975).

Transparency, as indicated by Secchi disc readings, varies widely from a usual range of 0.1–1 m near the Slave Delta, 0.8–5.7 m in the main basin, and up to 17 m in McLeod Bay, East Arm (Rawson 1950). Water is particularly turbid near the mouths of the Slave and Taltson rivers and at the north end of the North Arm. In the latter case, water is so shallow that waves constantly disturb bottom sediments.

2.5 Human Presence

GSL is largely surrounded by wilderness, but it is also among the most heavily used water bodies in the Northwest Territories for subsistence, residential, recreational, commercial, and industrial purpose. There are seven communities near the lake (Fig. 1), with a total of 22 000 people, 17 000 of whom live in Yellowknife. The lake has been fished commercially since 1945 (Keleher 1972; Low et al. 1989). Except for a few farms near Hay River, there is no agriculture in the region. Human presence has increased noticeably on the lake in the last decade, while this study was taking place. Currently, industrial activities on the shores of the lake are restricted to two gold mines at Yellowknife and a port at Hay River. Industrial development in the upper Mackenzie River watershed, in northern Alberta and British Columbia, may affect the lake's wildlife in the future.

Figure 3
Ice breakup, Great Slave Lake, 1991 and 1992 (data from National Oceanic and Atmospheric Administration)



3.0 Methods

Given the size of GSL and the means at our disposal, we were unable to survey the entire lake in one breeding season. Thus, we conducted numerous primary and supplementary surveys over portions of GSL during 1986–1994. Observations of interest recorded in 1995 were also reported.

We conducted thorough primary surveys with a motorboat in various portions of the lake (Fig. 4, Appendices 1 and 4) in late June and early July, soon after breakup, but before 5 July to avoid disturbance when large numbers of vulnerable nestlings were present. During these surveys, two observers examined all potential nesting islands. We may have missed some islands, particularly where single pairs nested in treed nearshore areas. The surveys began in the morning and continued into the late evening. Flocks of gulls and terns usually signalled the presence of a nesting island, whose location was determined on large-scale topographical maps.

Small nesting islands were often numerous and in very close proximity to one another. Thus, in order to generate legible small-scale maps for this atlas, we defined a nesting site as all nesting islands within 1 km^2. Each 1-km^2 nesting site was usually centred on a cluster of nesting islands or on islands with the most birds. We used the term "nesting site" rather than "colony" because single pairs were common and because what constituted a colony was often unclear. Nonetheless, we used the term "colony" in the text where appropriate. For the purpose of this atlas, we also recognized as colonial species waterbirds (e.g., Bonaparte's Gull *Larus philadelphia* and Parasitic Jaeger *Stercorarius parasiticus*) that did not always nest colonially but that associated regularly with colonial species.

We recognized two types of nesting sites: confirmed and probable. Confirmed nesting sites were those with active nests. At these sites, we made total ground counts of active nests. We minimized disturbance to nesting birds by keeping our visits as short as possible. Where we observed noticeably more adults than the corresponding number of active nests (assuming two adult birds per nest), we recorded the surplus number of adults as probable nesters. These may have included nonnesters, failed early nesters, and late nesters. As suggested by Hanssen (1982), our single nest counts at each nesting site likely underestimated the actual nesting population by as much as 20% (Wanless and Harris 1984).

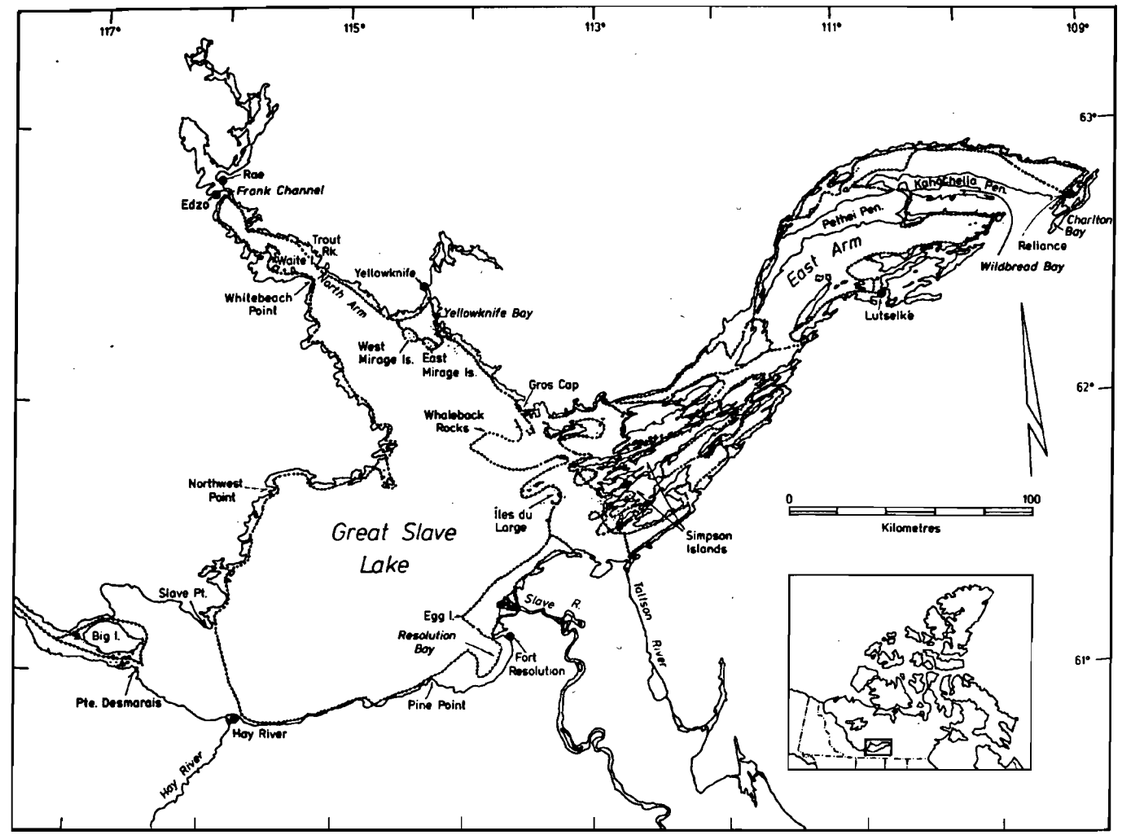
Probable nesting sites were islands or groups of islands where we did not find active nests but where adult birds exhibited territoriality. There, we recorded the number of probable nesters. Probable nesting sites also included a few islands where birds were seen to be nesting, but where we did not land to count nests for practical reasons (e.g., large waves, very shallow water, etc.) and where we had to estimate the number of probable nesters from the boat.

We recorded countless miscellaneous observations during supplementary surveys by motorboat, kayak, floatplane, bicycle, ski, and foot between April and November throughout the study period. During these, we revisited known nesting islands in the North Arm to monitor site tenacity and nesting chronology (Appendix 2) and to document changes in the numbers of nesting birds between years. Supplementary surveys also included flights over remote areas with marginal habitat to determine if surveying by boat was warranted and searches of water bodies near GSL, accessible from the road or by kayak, to find marsh-nesting Black Terns *Chlidonias niger*.

We estimated the total number of birds, nests, and nesting sites using only data collected during primary surveys. We assumed that the population of each species was stationary during the study period and that there were no major changes in the distribution of birds between areas and years. However, repeated surveys in the North Arm have shown that the number of birds may change widely at some nesting sites between years (Appendix 3). The numbers of nests and birds that we report constitute a coarse population estimate rather than a thorough census.

We pooled data collected during primary and supplementary surveys to generate the distribution maps of each species, thus depicting their broadest known distribution on the lake. We also used these pooled data to calculate the mean number of nests per nesting site and to identify the 20 largest colonies during the study period. All island-nesting sites identified during primary and supplementary surveys were tabulated and mapped (Appendices 3 and 4). We also included in the distribution maps of each species, and in Appendices 3 and 4, records collected in 1978 by Allen and Ealy (1979) at four sites (149–152) in Wildbread Bay, East Arm, and by B.C. Research (1978) at nine sites (16, 20–27) in the Slave Delta – Resolution Bay area. This was done to depict the

Figure 4
Approximate route followed during primary surveys



broadest known distribution of each species and because logistics or bad weather prevented us from surveying these areas thoroughly.

At a few sites where Common Terns *Sterna hirundo* and Arctic Terns *S. paradisaea* occurred together, where there was confusion about the relative abundance of each species, or where we could not identify nests and eggs with reasonable certainty, we recorded them as Arctic/Common terns.

We did not search areas without islands or areas where habitat suggested that there were only negligible numbers of nesting birds. These included (1) the south shore, between Hay River and Pine Point; (2) some bays and channels in the Simpson Islands; (3) the north and south shores of the Pethei Peninsula; (4) the southern half of Charlton Bay; and (5) the north shore of the Kahochella Peninsula (Figs. 1 and 4).

We carried out a thorough literature review and interviews with several informants to assess the status of the species that were not regular breeders and to ensure that important nesting sites were not missed.

4.0 Results and discussion

4.1 Ten regular breeders

4.1.1 Parasitic Jaeger *Stercorarius parasiticus*

> Slave Lake: rare. (Ross 1862)
>
> Specimens were taken . . . at Fort Resolution, Fort Rae. (Baird et al. 1884)
>
> This freebooter breeds rather commonly about the eastern and northern parts of Great Slave Lake . . . In 1901 we first saw this species about some semibarren islands in Great Slave Lake, a few miles north of Stone Island, July 10, when several melanistic individuals were observed . . . Several, including one in the normal white-breasted plumage, were seen . . . The stomach of one of these contained several insects and the bones of a small bird, evidently a young tern; the other had eaten a dragonfly, various beetles and a small fish. Several individuals were seen July 15 near the mouth of the Northern Arm . . . but the species was not afterwards noted. (Preble 1908)

Among the less common breeders (Table 1), this Holarctic species nested on nearshore and offshore exposed islands. The birds' distinctive calls, appearance, and elaborate broken-wing distraction displays rendered them easy to locate, and thus we likely missed few nesting pairs. Pairs usually nested alone on an island, near islands where gulls and terns nested. Nests were always located at or near the highest point of an island, where there was usually little vegetation (e.g., Crowberry *Empetrum nigrum*), and contained one to three eggs, which were laid in a scrape or directly on the rock.

This species did not have a particularly wide distribution and did not nest in the East Arm, although we saw jaegers loafing and foraging there. Nor did it nest along the south and west shores (Fig. 5). In June 1989, as many as nine pairs nested at Îles du Large, an archipelago of exposed islands in the centre of GSL (Fig. 1). The habitat on these islands is somewhat similar to that of the Arctic, where this species usually breeds (AOU 1983; Godfrey 1986). We observed jaegers foraging in nearby lakes but never found a nest there.

Parasitic Jaegers occurred in this region from late May to early September (Appendix 2.1).

4.1.2 Bonaparte's Gull *Larus philadelphia*

> . . . one male, killed at Great Slave Lake, May 26, 1826 . . . This handsome small gull is common in all parts of the fur countries, where it associates with terns; and is distinguished by its peculiar shrill and plaintive cry. (Swainson and Richardson 1831)
>
> Specimens of this Gull and of its eggs were also procured at Fort Resolution, . . . at Big Island, at Fort Rae . . . and at various other points. (Baird et al. 1884)
>
> Kennicott mentions that one was shot by W.L. Hardisty at Fort Resolution, May 18, 1860 . . . While crossing Great Slave Lake, I found it common near Trout Rock, Northern Arm, July 25, and between there and Fort Rae, July 26 . . . (Preble 1908)
>
> . . . between Fort Resolution and Hay River . . . In a few localities Herring and Ring-billed Gulls were plentiful, together with a few Bonaparte's Gulls. (Soper 1950)

We found few nesting pairs of this small Nearctic gull on GSL (Table 1). It usually nested alone on nearshore treed islands, near islands with other nesting larids. At each nesting site, there were one to three nests, which were usually well hidden in trees (e.g., black spruce *Picea mariana,* white spruce *Picea glauca,* jack pine *Pinus banksiana*) 2–10 m above the ground and which were found only after intensive searches. Several pairs likely went undetected, but breeding adults usually performed aggressive and noisy distraction behaviours and territorial displays.

We found this gull in the North Arm, in the Simpson Islands, in the East Arm, and along the west shore, but we confirmed nesting only in the North Arm (Fig. 6). Many confirmed and probable nesting sites in the North Arm were later abandoned, but two pairs found there in 1989 and 1990 nested in the same trees in 1995. We also found one ground-nesting pair on an island in the North Arm in 1995. We had never seen such behaviour before. Overall, this gull occurred only marginally on GSL during the nesting season.

Conversely, Bonaparte's Gulls were fairly common on nearby lakes, including those within Yellowknife city limits, where we readily observed dozens of breeding pairs and tree nests and hundreds of foraging adults and young. Many of these lakes were used year after year. In 1995, one pair nested in a clump of Cattails *Typha latifolia* along the shore of a lake near Yellowknife. We had never found a nest in cattails before.

Bonaparte's Gulls occurred on and near GSL from early May to mid-August (Appendix 2.2). In the North Arm, they were most abundant during spring migration and in late summer. Some years, hundreds of spring

Table 1
Number of nests, probable nesters, and nesting sites recorded during primary surveys (see Methods and Appendix 1).

Species	No. of nests	No. of adult prob. nesters	No. of confirmed nesting sites	No. of probable nesting sites	Largest no. of nests at one site	Average no. of nests per site	SD
Parasitic Jaeger	15	25	15	14	1	1	0
Bonaparte's Gull	6	16	4	6	2[a]	1.29	0.5
Mew Gull	446	722	84	67	54	4.4	6.9
Ring-billed Gull	369	27	19	4	172	28.9	37.8
California Gull	2496	363	53	16	689	42.8	98.9
Herring Gull	1523	641	139	66	89	10.5	13.6
Caspian Tern	236	29	62	19	110	4.9	14.4
Common Tern	685	43	36	7	66	18.5	15.7
Arctic Tern	410	472	66	44	39	5.8	7.4
Arctic/Common terns	103	15	5	1	77	28.8	16.1
Black Tern	See text	See text	8	7	–	–	–
Total[b]	6289	2353	228	13	733	27.2	50.3

[a] Up to three nests per site were found during supplementary surveys.
[b] All island-nesting birds, excluding Black Terns, which nested only in nearby marshes.

Figure 5
Distribution of Parasitic Jaegers

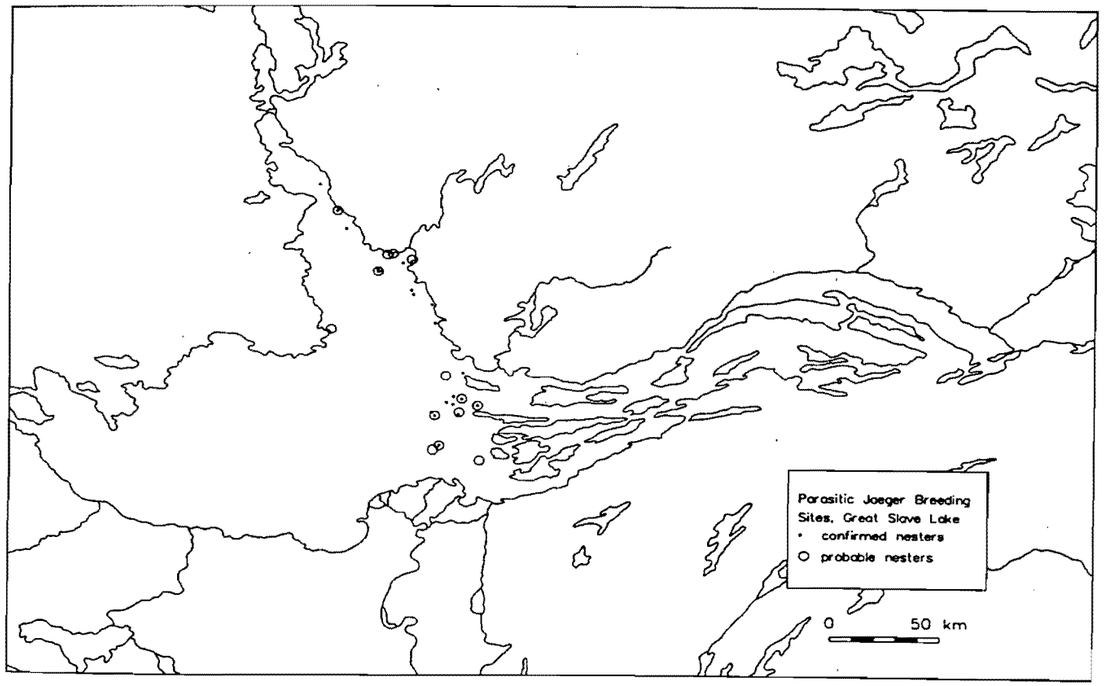
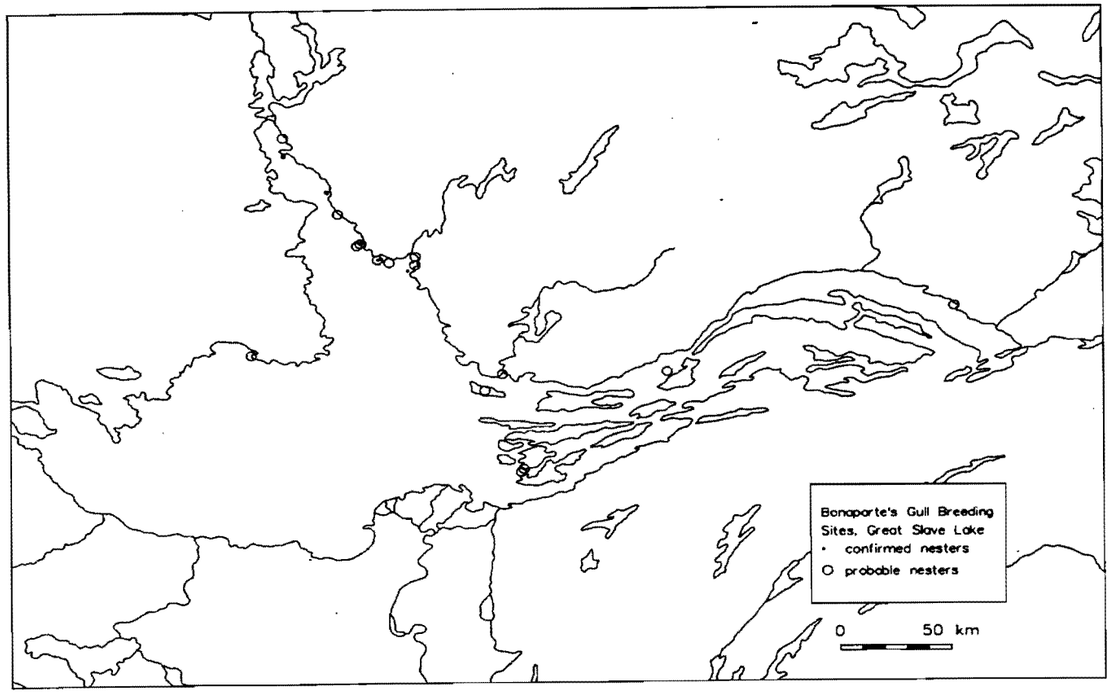


Figure 6
Distribution of Bonaparte's Gulls



migrants loafed and foraged with other larids on the ice and on the water. In late July and early August, dozens of adults and young, and young alone by mid-August, foraged on the water surface or aerially over shallows and inshore wetlands. Most of these birds presumably came from nearby lakes.

4.1.3 Mew Gull *Larus canus*

> Slave Lake: very common. (Ross 1862)
>
> Specimens of this Gull were also secured during the breeding-season on Slave River, at Fort Resolution . . . by Mr. Kennicott; at Big Island by Mr. Reid and by Mr. Ross; at Fort Rae by Mr. Clarke; and at various places by Mr. MacFarlane . . . The eggs in the Smithsonian Collection were taken from Great Slave Lake, . . . Fort Rae, Fort Resolution . . . (Baird et al. 1884)
>
> . . . We did not note it again until July 16 [1901], while sailing among the spruce-covered islands of the Northern Arm . . . between Yellowknife Bay and Trout Rock, when we passed through the breeding ground of a large colony. The birds perched freely on the summits of the spruces, and were noisy and familiar. Many young ones were unable to fly . . . While crossing Great Slave Lake to Fort Rae, I found the species common among the islands of the Northern Arm, July 24 to 26 [1903], and observed many young birds just commencing to fly . . . Three specimens collected May 12 had been feeding on water beetles (*Dysticus dauricus*). (Preble 1908)
>
> In early July it was frequently observed along the south shore of Great Slave Lake." (Soper 1942)

This small Holarctic gull was common but usually formed small colonies (Table 1). Fifty percent of the nesting sites had only one pair, occurring either alone or with other larids (Appendix 3). The birds usually nested on the ground of nearshore treed islands or on bare islets surrounded by treed islands. We found only one active tree nest on the same island in the North Arm in 1992 and 1993. Thus, this gull was less easy to detect than species nesting in large offshore colonies, and we may have missed some. However, the gulls' habit of regularly using treetops as perches markedly increased their visibility.

As suggested by the large number of probable nesters (Table 1), a few hundred more pairs may nest on the lake, presumably when spring is not late. We recorded nearly two-thirds of these probable nesters in 1990, when late spring conditions may have discouraged many adults from nesting. To our knowledge, this is the largest number of Mew Gulls ever reported at one lake in Canada.

On the other hand, we regularly saw nesting and foraging adults on nearby lakes and creeks, where thousands of additional pairs may breed. There, they nested on the ground of small islands and very rarely in trees.

This gull was somewhat widely distributed (Fig. 7), but 65% of the nests occurred in and near the Simpson Islands. The largest colony (site 198, 1988: 54 nests) was along the east shore of the North Arm, near Yellowknife. In and near the North Arm, numerous single pairs and small colonies have been nesting on the same rocks or islands since 1986.

This gull was most abundant from early May to mid-August (Appendix 2.3).

4.1.4 Ring-billed Gull *Larus delawarensis*

> Four eggs in my collection — two from Labrador, and two from Great Slave Lake. (Baird et al. 1884)
>
> This species occurs in summer north to Great Slave Lake, where it is one of the rarest breeding gulls . . . A.E. Preble and M. Cary noted two near the Desmarais Islands, July 1 [1903]. (Preble 1908)
>
> . . . Augmenting the general interest [of the Big Island area], were many . . . Herring, Ring-billed and Short-billed [Mew] Gulls, Common Terns and other species. (Soper 1950)

This Nearctic gull was among the less common breeders but formed relatively large colonies (Table 1). It often nested on exposed islands and thus was easy to detect. However, we found a large colony (site 263, 1986: 132 nests) on two nearshore islets surrounded by treed islands.

This species had a rather limited distribution (Fig. 8), similar to that of the Common Tern. We recorded 84% of the nests along the northeast shore of the North Arm, where water is shallow, turbid, and ice-free relatively early in the spring. In that area, which we revisited often, the species exhibited little site tenacity and nested on several different islands during the study period (Appendices 3 and 4). For example, there were 172 nests at site 275 in 1991, or approximately half of the lake's population, but there were only eight nests there in June 1988 and none in 1986 (Appendix 3). The total number of active nests fluctuated noticeably in that area as well: from 241 in 1986 to 403 in 1991 and to 268 in 1994. We never observed individuals nesting on nearby lakes.

This breeding population is the northernmost known on the continent (Ryder 1993). However, D.G. Kay (pers. obs.) observed adults and fledged young on Lac La Martre, 80 km northwest of the North Arm, in August 1989. We recorded this gull from late April to late October (Appendix 2.4).

4.1.5 California Gull *Larus californicus*

> Slave Lake: abundant. (Ross 1862)
>
> In the collection of the Smithsonian Institution are numerous examples of the eggs of this species from the neighborhood of Great Slave Lake. Specimens of the birds and eggs were secured near Fort Resolution by Mr. Kennicott, and also by Mr. Mackenzie, . . . and at Big Island by Mr. J. Reid. (Baird et al. 1884)
>
> This western gull is a common breeder about Great Slave Lake . . . abundant about Loon Island, July 14 to 16, where 60 or 70 pairs were nesting . . . In 1903 I noted the California gull at Fort Resolution, July 7, and several times among the islands between Fort Resolution and Fort Rae, July 17 to 26. (Preble 1908)
>
> It was commonly in evidence from Fort Resolution west via Green Island, Ile du Mort, and Sulphur Point to Buffalo River. (Soper 1942)

This Nearctic gull was the most abundant colonial waterbird (40% of all nests) and formed the largest colonies (Table 1). It usually nested on exposed islands and was highly detectable. Half of the nests occurred on three islands (Egg Island near the Slave Delta: 689 nests; Gooseberry Island: 344 nests; and Found Island, near the southwest shore: 299 nests, and the other half were widely distributed among several sites (Fig. 9). In the North Arm, many colonies have been located on the same islands since 1986. We never observed this gull nesting on smaller lakes near GSL.

This breeding population has been described as the northernmost known on the continent (AOU 1983; Godfrey 1986; Jehl 1987). However, this gull occurs in Lac La Martre (J. Sirois, pers. obs.), 80 km to the northwest, where it may also breed. Moreover, MacFarlane (1891) reported that it nested north of Great Bear Lake, near Fort Anderson (68°45'N, 128°26'W), in the 1860s, which was confirmed by Baird et al. (1884) and Preble (1908).

We observed California Gulls from late April to early November (Appendix 2.5).

4.1.6 Herring Gull *Larus argentatus*

> Mr. R. Kennicott found this species breeding on the southern shores of Great Slave Lake. The nests were in great numbers and close together, on a point of a large wooded island. (Baird et al. 1884)
>
> It was common on Great Slave Lake about Fort Resolution, and between there and Fort Rae, during the month of July. On

Figure 7
Distribution of Mew Gulls

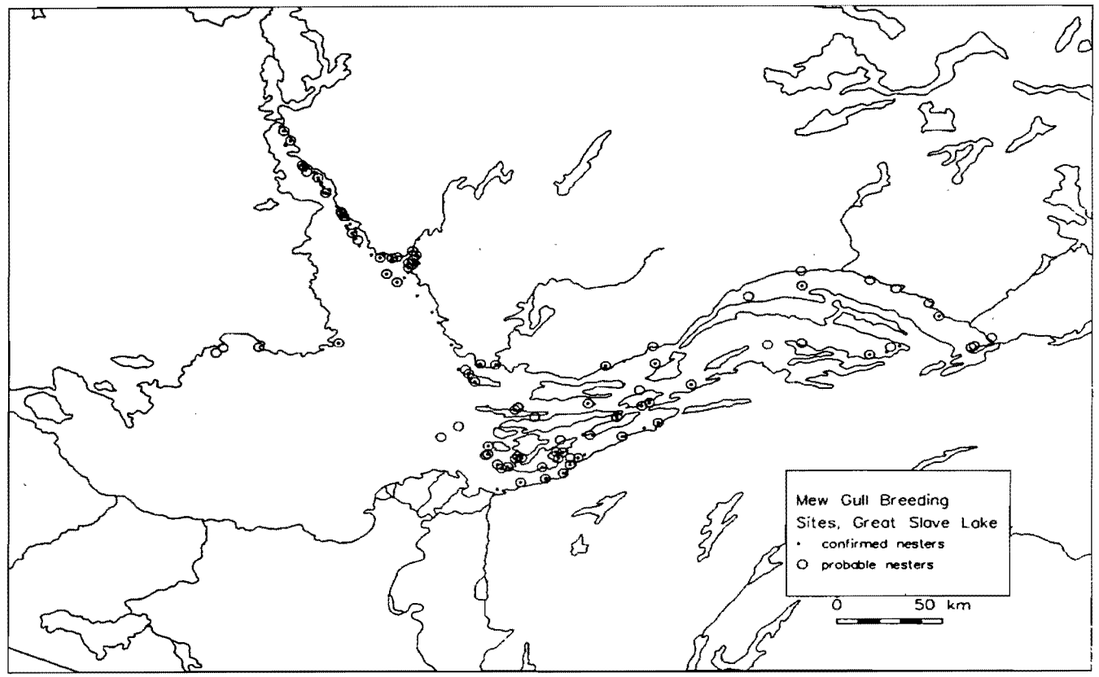
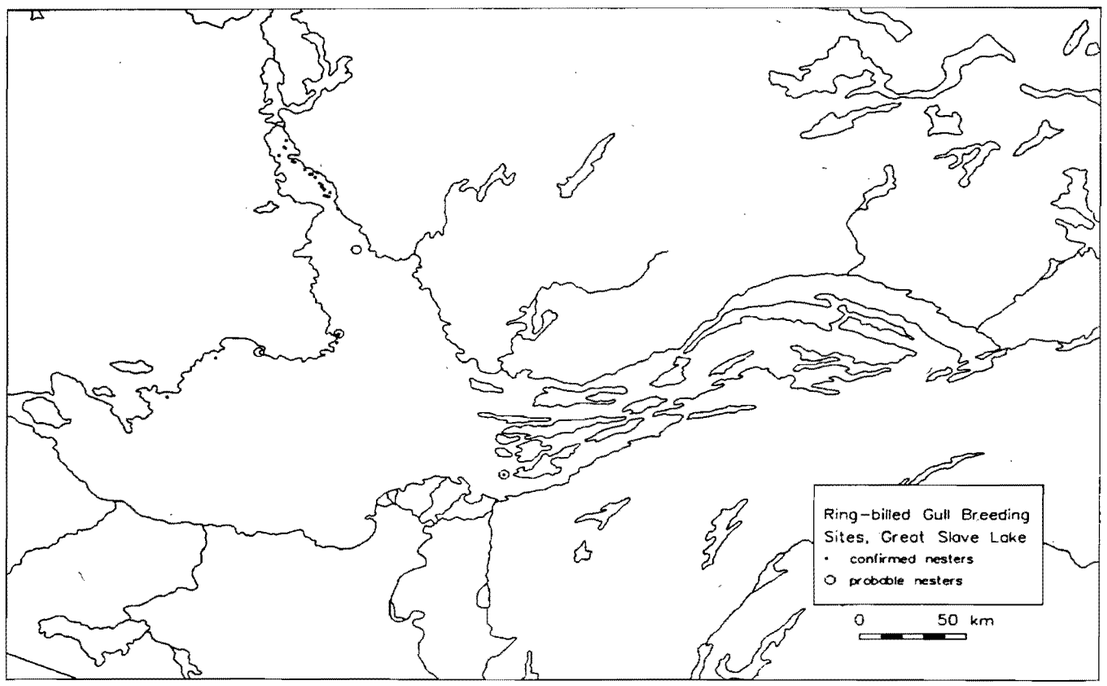


Figure 8
Distribution of Ring-billed Gulls



> July 13 . . . I visited a breeding colony on a small island . . . merely a rock about 50 yards in diameter and only 3 or 4 feet out of water, and was bare except for small patches of grass growing in the crevices. Upon it were nesting about 100 pairs of herring and California gulls, the latter out numbering the herring gulls two to one. Most of the nests of the two species were indistinguishable after the eggs were hatched. (Preble 1908)

> . . . common along the south shore from Fort Resolution to Buffalo River. At the mouth of the latter, a flock of about 300 was present on July 8, attracted by offal from fishing operations for the abundant inconnu or coney. (Soper 1942)

This large Holarctic gull was the second most abundant breeder but formed relatively small colonies (Table 1). In fact, it often nested in single pairs, alone or with other species (Appendix 3). It nested regularly on exposed offshore islands, where it was easily detected, but single, less visible pairs also nested on nearshore rocks and islets surrounded by treed islands.

The Herring Gull was confirmed to nest at the largest number of sites (Table 1) and occurred throughout the lake (Fig. 10). However, 48% of the nests occurred along the east shore of the North Arm, where the largest colony (site 171, East Mirage Islands, 25 and 5 km south of Yellowknife and the Wool Bay fish plant, respectively: 89 nests) was also located. In the North Arm, numerous single pairs and colonies have been using the same islands since 1986. This gull is also common on nearby lakes, where hundreds of pairs may breed.

We observed Herring Gulls from mid-April until the end of October (Appendix 2.6). It was usually the earliest nesting species. Some eggs hatched as early as mid-June.

4.1.7 Caspian Tern *Sterna caspia*

> Slave Lake: rare. (Ross 1862)

> Mr. Kennicott secured three near Fort Resolution, in 1860; Mr. Clarke, Jr., several near Fort Rae, in 1863; Mr. J. Lockhart, others at Fort Resolution, in 1864; Mr. J. Reid, several on Big Island, May 20, 1864. (Baird et al. 1884)

> In 1901, we met it but once, on July 9, when a single bird was seen flying over the shallow lagoons between the mouth of the Slave River and Stone Island, Great Slave Lake . . . I frequently noted the species at Fort Resolution, June 20 to July 17, but seldom saw more than one or two at a time. I saw several among the islands of the Northern Arm, between Yellowknife River and Fort Rae, July 25 and 26. (Preble 1908)

> . . . two on Nagel Channel [Slave Delta], near Fort Resolution, on July 6 [1932]. (Soper 1942)

This large cosmopolitan tern was fairly common (Table 1). It nested on exposed offshore islands. Once flushed from their nests, adults made loud, distinctive calls and aggressively chased gulls flying near their nests. Nesting birds were therefore easily detected. There was only one pair at 80% of the nesting sites, but the terns usually nested surrounded by numerous other terns and gulls (Appendix 3). Nests were usually located at or near the highest point of an island. When a colony comprised numerous pairs of Caspian Terns and other larids, Caspian Terns formed the core of the colony, and the other species nested in the periphery.

This tern had a rather wide distribution (Fig. 11). The largest colony (site 11, 1989: 110 nests, or 47% of all nests) occurred on one islet near Northwest Point, along the west shore of GSL. Nests were also abundant (39% of all nests) along the east shore of the North Arm, where the second largest colony (site 250, 1988: 56 nests) occurred, near Trout Rock. We never observed nesting pairs on lakes near GSL.

Intercolony movements and colonization of new sites are well-known for this species (Väisänen 1973; Gill and Mewaldt 1983; Cuthbert 1988). The largest shifts of nesting birds that we documented occurred near Trout Rock. For example, there were 56 nests at site 250 in 1988 but only 19 nests there, and 25 and 21 nests at nearby sites 242 and 253, respectively, in 1992 (Appendices 3 and 4). On the other hand, single pairs have been nesting on the same islands in the North Arm since 1986.

This breeding population is the northernmost known on the continent (Martin 1978; AOU 1983). Caspian Terns arrived in the North Arm after 15 May and generally left before 15 September (Appendix 2.7).

4.1.8 Common Tern *Sterna hirundo*

> Occasional pairs . . . were observed in the Fur Region . . . An example was taken . . . at Fort Rae, by Mr. L. Clarke; . . . and three on Big Island, in Great Slave Lake, by Mr. J. Reid . . . The eggs in the Smithsonian Collection are from Great Slave Lake, in the extreme north. (Baird et al. 1884)

> On the open expanse of the lake between Hay River and the outlet . . . were met in moderate numbers . . . Herring, Ring-billed and Short-billed [Mew] Gulls and Common Terns. (Soper 1950)

This Holarctic species was the most abundant tern and formed relatively large colonies (Table 1). It often nested with other larids on exposed islands, where it was easy to detect. However, it also nested on nearshore islands, where it was less visible.

This tern had a rather limited distribution (Fig. 12). Seventy-four percent of the nests occurred along the east shore of the North Arm, particularly between Yellowknife

Figure 9
Distribution of California Gulls

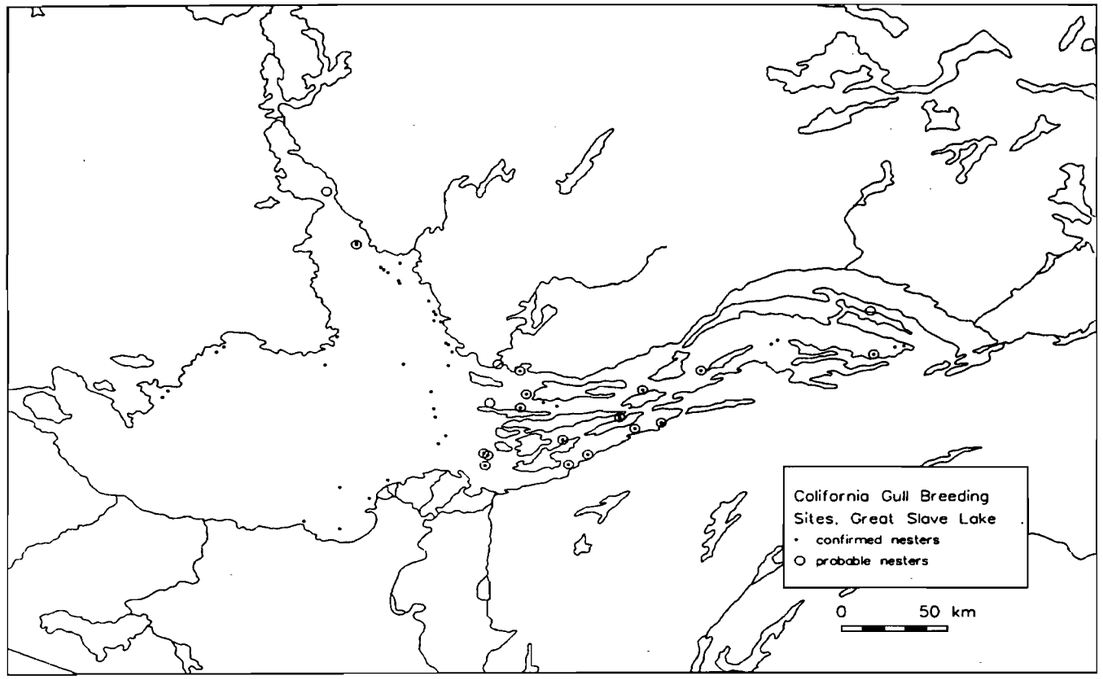


Figure 10
Distribution of Herring Gulls

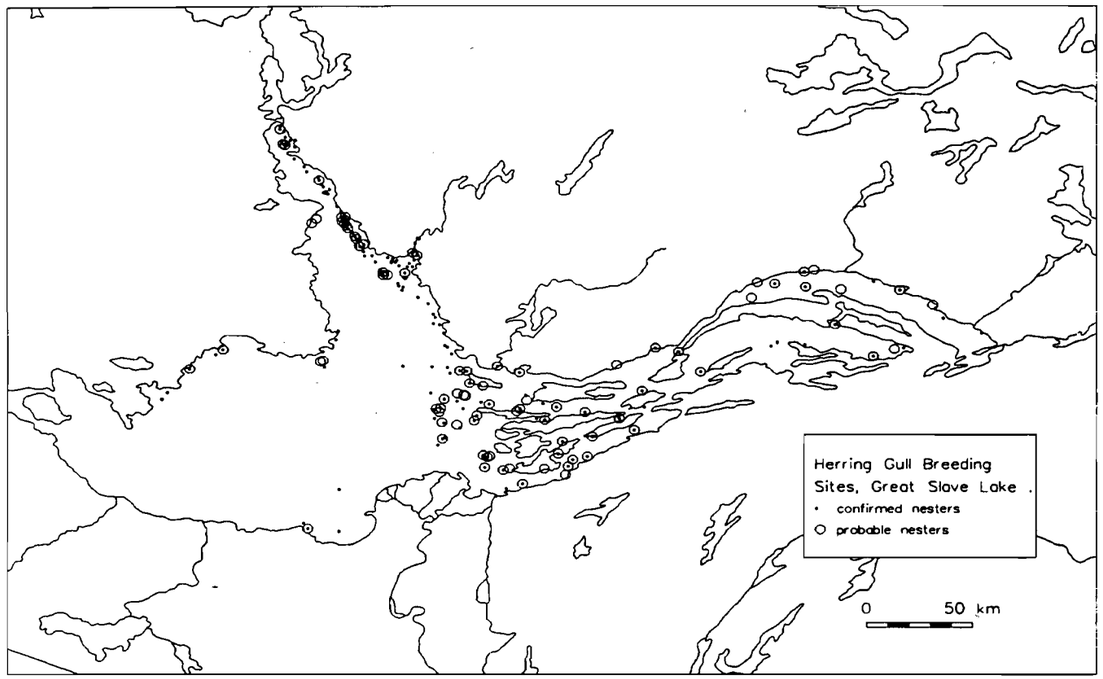


Figure 11
Distribution of Caspian Terns

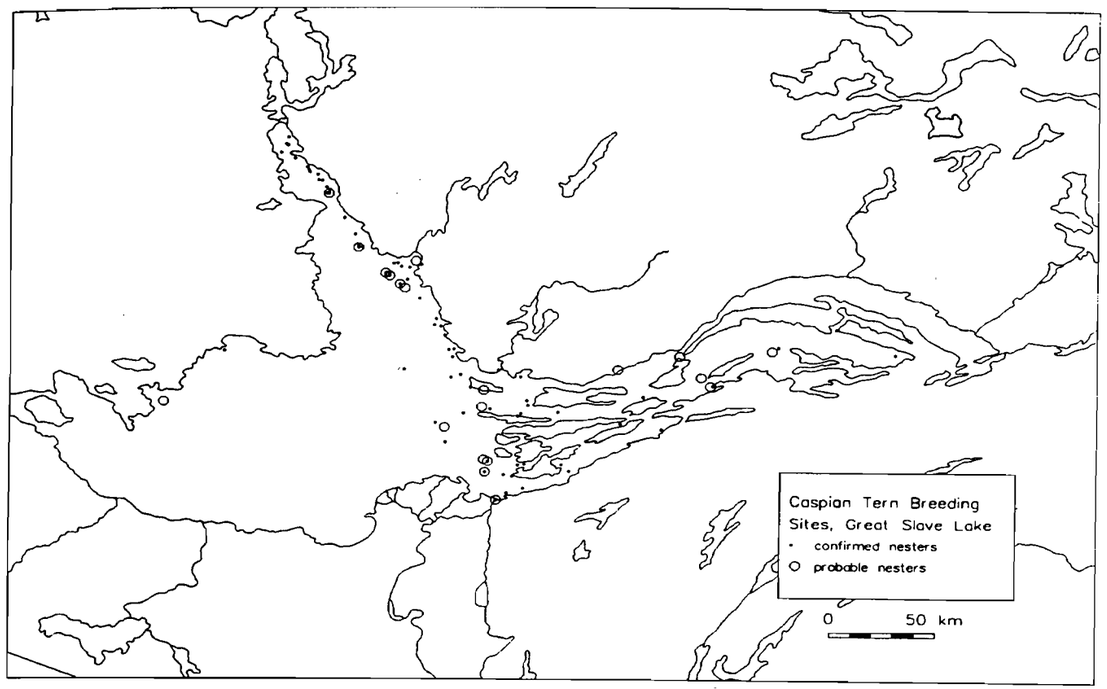
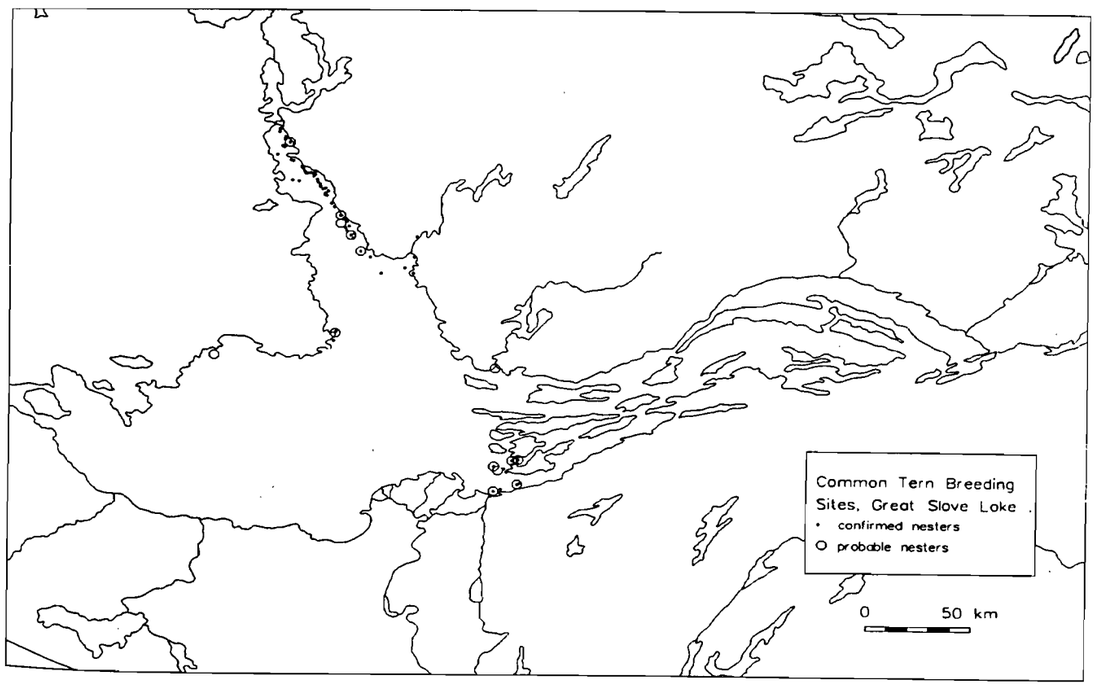


Figure 12
Distribution of Common Terns



Bay and Frank Channel. There, the terns nested in or near shallow areas that were ice-free relatively early in the spring and that were also favoured by Ring-billed Gulls. We found several nests on nearby lakes, where thousands of pairs may breed.

Common Terns did not usually arrive in the North Arm until 20 May. Most terns left soon after 15 August, but some stayed until September (Appendix 2.8).

According to Godfrey (1986), GSL is the northernmost breeding location of Common Terns in North America. However, Common Terns breed in Lac La Martre (J. Sirois, unpubl. data), 80 km to the northwest, and probably farther north. MacFarlane (1891) reported that they nested with Arctic Terns on the shores of the "Arctic Sea" and in many inland lakes near Fort Anderson in the 1860s, which was confirmed by Baird et al. (1884) and Preble (1908).

4.1.9 Arctic Tern *Sterna paradisaea*

> It has been seen occurring in abundance by Mr. Kennicott at Fort Resolution . . . by others at Fort Rae, . . . Big Island. (Baird et al. 1884)

> While crossing Great Slave Lake we found it common among the islands. On Loon Island, 50 miles north of Fort Resolution, where we were detained by wind, July 11 to 14, about 50 pairs were nesting. At this time most of the eggs were hatched but the colony raised very few young. Many were killed by the cold storm which kept us from leaving the island, and the jaegers and gulls were frequently seen to swoop down and snatch a young one . . . common especially among the islands of the Northern Arm. (Preble 1908)

This Holarctic tern was common but formed rather small colonies (Table 1). It usually nested on exposed offshore islands in single pairs or with a few other larids. There was only one nest at 40% of all nesting sites. Thus, the terns were not very visible, and we may have missed some. We also recorded large numbers of probable nesters (Table 1), suggesting that many more pairs may nest on the lake. We suspect that these probable nesters were late breeders that did not lay eggs until early July.

Arctic Terns occurred widely (Fig. 13) but were most common along the east shore of the North Arm (45% of the nests) and in and near the Simpson Islands (41%). The largest colony (site 29, 1989: 39 nests) occurred on one island at Îles du Goulet, a small archipelago within the Îles du Large archipelago (Fig. 1). In 1995, approximately 300 adults were seen at this island during a very brief visit. In and near the North Arm, numerous single pairs and colonies have been using the same islands since 1986. We regularly observed this tern nesting on nearby lakes, where thousands of pairs may breed.

Arctic Terns usually arrived in the North Arm after 20 May (Appendix 2.9). Adults and fledglings congregated with Common Terns in late July and early August, before leaving later in August.

4.1.10 Black Tern *Chlidonias niger*

> Slave Lake: rare. (Ross 1862)

> It is found . . . north to the Fur Regions . . . Examples of this bird were taken near Fort Resolution. (Baird et al. 1884)

> . . . occurs commonly in suitable places north to Great Slave Lake. The marshes at the delta of Slave River appear to mark its northern limit of abundance in this region . . . We next noted the species about 50 miles below Fort Smith July 30 [1901], and during the next three days found it numerous along the lower part of Slave River, where the many outlying marshes afford a congenial habitat. (Preble 1908)

> On August 19 [1914] I found the head and feathers of a bird in immature or winter plumage on an islet near the mouth of the Taltson River; it appeared to have been eaten by some bird or animal of prey. The species was last noted on August 21, when several were seen off Fort Resolution. (Harper 1914)

> Common at the mouth of the Slave River, June 9th [1921]. (Williams 1922)

This Holarctic species is fairly common on GSL. However, we found nests only in nearby marshes in the Slave Delta, on the southwest shore of Big Island, at Caën Lake and three nearby lakes, and on one marsh near the east shore of the North Arm near Yellowknife (Figs. 1 and 14). At these sites, we observed 10–300 adults and several nests, which were usually difficult to find in dense vegetation. The sheer abundance of apparently optimal habitat at and near these sites and the number of birds that we observed on the lake after the nesting season (e.g., 400 young-of-the-year and more than 30 adults foraging over nearshore waters at Trout Rock, North Arm, on 2 August 1995) suggest that thousands of Black Terns nest near GSL.

Locations of other records (Harper 1914; Soper 1942; Thompson et al. 1979) are also depicted on Figure 14, to provide a broad picture of the species' regional distribution. We never saw this species in and near the East Arm, nor did we find records from that area. In 1995, dry conditions and very low water levels prevented terns from nesting at Big Island and in a marsh near Caën Lake. On the other hand, one colony has occurred in the same marsh near Yellowknife each year since at least 1988.

This breeding population is the northernmost known on the continent (AOU 1983; Sirois and Fournier

Figure 13
Distribution of Arctic Terns

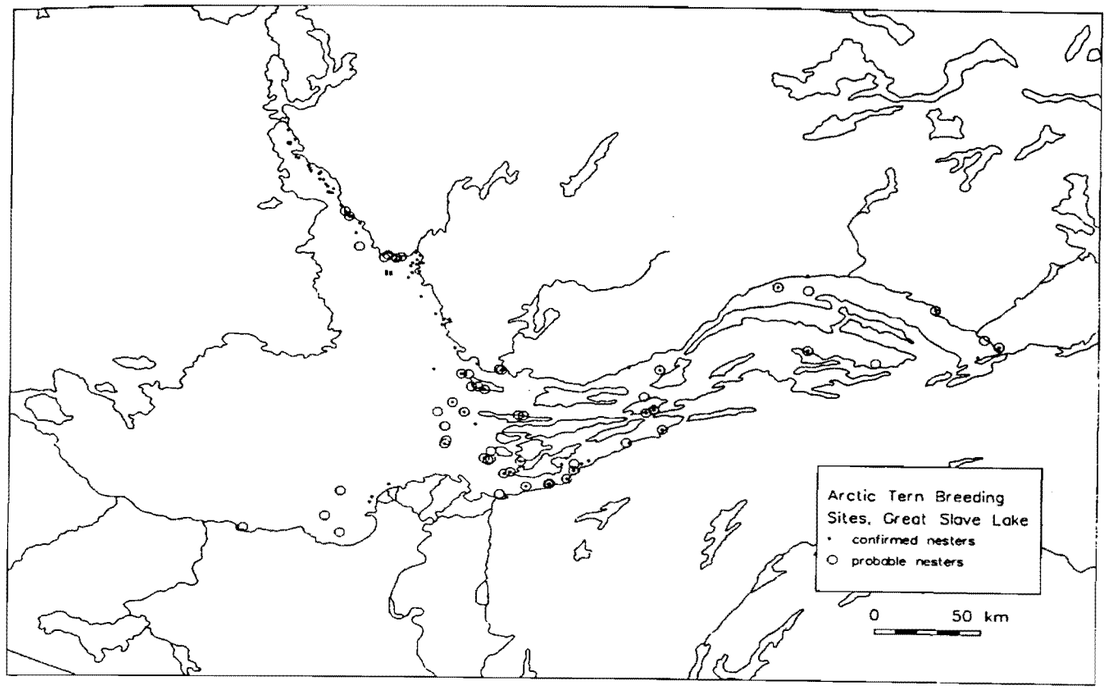
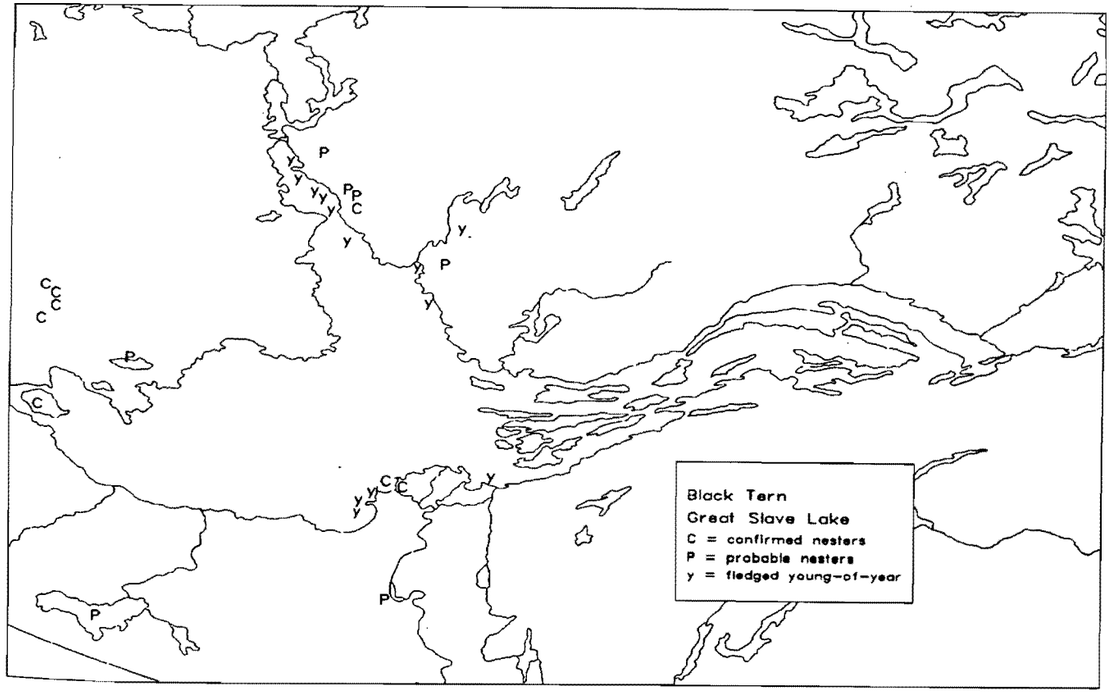


Figure 14
Distribution of Black Terns



1993). However, D.G. Kay and G. Barrett (pers. obs.) observed 30 probable nesting adults in a remote marsh (65°06'N, 125°20'N) north of Great Bear River in July 1994 and 1995. Nesting was also confirmed once in Alaska, near Fort Yukon (66°35'N, 145°20'W), in 1866 (Dall and Bannister 1869; Gabrielson and Lincoln 1959; B. Kessel and D.D. Gibson, pers. commun.).

In the spring, we did not see Black Terns in the North Arm until the end of May (Appendix 2.10). Upon arrival, they foraged for several days over ice-free inshore wetlands and shallows. Later in June, adults began foraging and nesting in nearby inland marshes, but some adults continued to forage in the North Arm's wetlands throughout June and July. In late July and early August, adults and fledglings foraged over nearshore shallows and inshore marshes of the North Arm. Adults and young also congregated on islands with Arctic and Common terns before the majority left in mid-August.

4.2 Additional Species

4.2.1 American White Pelican *Pelecanus erythrorhynchos*

Ross (1862) considered this species common as far north as Big Island. MacFarlane (1908) reported that it occurred on the south shore, at Big Island and at Fort Providence. Preble (1908) reported that several pairs were said to breed annually on a small rocky islet in the Desmarais Islands (Fig. 1), near Big Island. However, Soper (1942) saw only a few pelicans there in July 1932.

Currently, pelicans are rare summer transients on the north side of the lake (Bromley and Trauger, n.d.) but fairly common summer residents on the south shore. Up to 75 pelicans spent one month at Mackenzie Rocks (Fig. 1), near Hay River, in August 1993 (B. Buckley, pers. obs.). There were as many as 200 pelicans at the mouth of the Taltson River on 28 June 1994, at Hay River on 14 July 1994, and in the Desmarais Islands – Big Island area between June and August 1994 (Anon. 1994; E.L. Covert, E. Pollard, and J. Sirois, pers. obs.).

Moreover, up to 1200 pelicans occurred in 1989–1994 near the south shore in the Oracha Falls area (Fig. 1), Taltson River (T. Best and J. McPherson, pers. obs.), where T. Teed also photographed two nests in 1983. Breeding was also reported there by Fort Resolution hunters in the past (J. McPherson, pers. commun.) and by Harper (1914). The closest known regular nesting colony occurs 120 km to the south, 4 km south of the N.W.T.–Alberta border, in the Slave River, where there were 400 nests in 1994 (J. Van Pelt, pers. obs.).

4.2.2 Double-crested Cormorant *Phalacrocorax auritus*

Ross (1862) mentioned that this was a rare species on GSL. Preble (1908) reported that a few birds were collected in and near GSL. There are only two recent but unconfirmed sightings for GSL: one individual flying over Yellowknife in late December[1] 1994 (L. Singer, pers. obs.) and another one loafing near Big Island on 6 June 1995 (J. Sirois, pers. obs.).

Recently, this species was confirmed to breed at several locations in southern and central Alberta and was considered a probable and possible breeder at a few sites in northern Alberta, as far north as Wadlin Lake (approx. 57°30'N, 115°30'W) (Semenchuk 1992).

4.2.3 Great Blue Heron *Ardea herodias*

According to E.L. Covert (pers. commun.), this species is rare at Hay River, where, in August 1990, G. Low (pers. commun.) found one weak heron that later died. Salter et al. (1974) reported one heron along the Mackenzie River, near Big Island, on 7 May 1973. Another heron was reported farther down the river, at Jean Marie River, by local residents on 16 August 1994 (D. Davidge and R.G. Bromley, pers. commun.). This species has bred in the Peace–Athabasca Delta in northern Alberta in the past (Godfrey 1986; Semenchuk 1992).

4.2.4 Great Egret *Casmerodius albus*

One adult occurred at Hay River on 15–17 June 1987 (Sirois et al. 1991b). We also observed one adult at Yellowknife on 5–17 May 1993. This tropical to temperate species wanders north irregularly (AOU 1983). It is a vagrant in Alberta (Macdonald et al. 1993) and has bred previously in Saskatchewan (Godfrey 1986; Kreba 1990).

4.2.5 Common Eider *Somateria mollissima*

Ross (1862) reported that one male and one female were killed at Fort Resolution in 1858 and 1861, respectively. Preble (1908) mentioned that one was killed at Fort Providence in the Mackenzie River west of Big Island and that another one was seen near there. This Arctic colonial seaduck is also accidental in the Yellowknife area (Bromley and Trauger, n.d.).

4.2.6 Pomarine Jaeger *Stercorarius pomarinus*

This jaeger was recorded at Fort Resolution, Fort Rae, and Big Island in the last century (Baird et al. 1884; Preble 1908). Trauger and Bromley (1976) reported that it was often recorded by the late W.L. McDonald, a Yellowknife naturalist, in Yellowknife Bay in late June. According to McDonald, one pair once remained on the West Mirage Islands all summer but did not breed. J. Sirois observed one adult in the Mackenzie River, 30 km west of Big Island, on 18 June 1994. Midcontinent records of this circumpolar Arctic breeder are generally scarce (Taylor 1993).

4.2.7 Long-tailed Jaeger *Stercorarius longicaudus*

At least one bird was collected at Fort Rae in the last century (Russell 1898; Preble 1908). On 24 May 1990, J. Sirois observed one pair on the ice of Yellowknife Bay with dozens of loafing gulls. J.E. Hines observed another individual at Big Hill Lake, near Yellowknife Bay, on 30 May 1993. This jaeger occurs and breeds widely in the circumpolar north (AOU 1983) and on the arctic and alpine tundra east, north and west of GSL (Kelsall et al. 1971; Godfrey 1986; S.J. Miller, F.M. Brigham, N.M. Simmons, and L. Carbyn, unpubl. data).

4.2.8 Laughing Gull *Larus atricilla*

J. Sirois observed one adult loafing with four Bonaparte's Gulls and two Caspian Terns on an island in the North Arm on 25 June 1988. However, light conditions were poor, and this sighting remains unconfirmed. This gull has been reported quite often elsewhere in Canada (e.g., Savile and Savile 1976; Godfrey 1986; Brazier 1989; Gebauer et al. 1993). Its breeding population in the northeastern United States is currently expanding (Belant and Dolbeer 1993).

4.2.9 Franklin's Gull *Larus pipixcan*

This species is an uncommon but regular spring visitant at Hay River (E.L. Covert, pers. obs.). It was also reported at Falaise Lake (Fig. 1), near the southwest shore, in June 1989 (N. Caulkett, pers. commun.) and farther west along the Mackenzie River, at Fort Simpson, in May 1973 (Salter et al. 1974). J. Sirois observed 20 adults and 10 immatures foraging with 15 Bonaparte's Gulls and 4 Black Terns on the south shore of Big Island on 6 June 1995. In light of the abundance of apparently optimal nesting habitat at and near Falaise Lake and Big Island (Fig. 1), this species may breed in this region.

In North America, this species breeds as far north as the Lake Athabasca region in northern Alberta and may breed at Lake Bistcho, a few kilometres south of the N.W.T.–Alberta border (Godfrey 1986; Semenchuk 1992). It was reported as a probable breeder near the western Arctic coast in the 1860s (MacFarlane 1891).

4.2.10 Thayer's Gull *Larus thayeri*

Bromley and Trauger (n.d.) previously recognized this Arctic breeder as a rare summer transient in the Yellowknife area. It is also an occasional fall migrant. J. Fernandez Layna observed one adult in September 1991 at the Yellowknife landfill, where J. Sirois also observed one adult on 28 September 1993, one juvenile on 9 October 1993, and two juveniles on 21 October 1993.

4.2.11 Slaty-backed Gull *Larus schistisagus*

Williams (1922) reported several individuals of this species on GSL on 7 and 8 June 1921. However, he also mentioned that he may have confused Ring-billed Gulls with Short-billed (Mew) Gulls elsewhere — hence the hypothetical nature of his observations.

4.2.12 Glaucous-winged Gull *Larus glaucescens*

Ross (1862) reported that this species was abundant on GSL. However, Preble (1908) suggested that those were probably Glaucous Gulls, which are not on Ross's list. Moreover, in 1862, R. Kennicott suggested to S.F. Baird that "Ross was often guilty of making queer identifications based on imagination rather than on fact" (Lindsay 1993) — hence this species' hypothetical status. This very common coastal species (Gabrielson and Lincoln 1959; Campbell et al. 1990) is easily overlooked and probably occurs inland more frequently than reported.

4.2.13 Glaucous Gull *Larus hyperboreus*

J. Sirois observed numerous adults, subadults, and juveniles of this Arctic breeder during spring and fall migrations in and near the North Arm during 1986–1995. During that period, the earliest spring record was 23 April. Fall migrants occurred at Yellowknife from late August to late October. R.G. Bromley (pers. commun.) once observed one adult at Yellowknife in mid-December. This species also occurs during the summer. J. Sirois observed one subadult at Fort Resolution on 25 June 1995 and two subadults at Yellowknife between 15 July and 2 August 1993.

4.2.14 Sabine's Gull *Xema sabini*

This Arctic breeder is a rare spring migrant. J. Sirois observed two adults feeding on dead, floating insects in broken ice on Yellowknife Bay on 14 June 1990 and near Trout Rock on 14 June 1992.

4.2.15 Black Guillemot *Cepphus grylle*

This Arctic colonial seabird is a rare vagrant. Sirois (1991) reported one guillemot at the Cameron River, near the North Arm, in November 1988, and he saw at least one other on GSL near Hardisty Island, where there was some ice-free water left, in December 1988.

4.3 Summary

4.3.1 Diversity

Twenty-five species of colonial waterbirds, including 10 regular breeders, have been reported in the GSL region since the 1820s. Although we know of no other lake in the Northwest Territories that has been surveyed comprehensively, preliminary surveys in Lac La Martre and Great Bear Lake (J. Sirois, unpubl. data) and a thorough literature review suggest that this assemblage of freshwater colonial waterbirds may be the Northwest Territories' most diverse. Moreover, as far as we know, the 10 regular nesters do not breed sympatrically elsewhere in North America, although all of them, except the Parasitic Jaeger, also breed on and near Lake Athabasca (Nero 1963; Höhn 1971).

4.3.2 Abundance

Compared with large Nearctic lakes farther south, the numbers of colonial waterbirds that occur on GSL are small (Tables 1 and 2) (Behle 1958; Conover 1983; Koonz and Rakowski 1985; Blokpoel and Harfenist 1986; Blokpoel and Tessier 1986, 1991, 1993; Blokpoel and Scharf 1991; McMahon and Koonz 1991; Ewins et al.

[1] Ice-free water may occur on GSL until early January (Kelsall et al. 1971).

Table 2
The 20 largest nesting sites.

No.[a]	Site[b]	Name	Year	No. of nests	Dominant species
1	19	Egg I.	1989	733	California Gull
2	12	Found I.	1989	370	California Gull
3	15	Gooseberry I.	1989	356	California Gull
4	275	Islets off Smith I.	1991	180	Ring-billed Gull
5	111	François Bay Is.	1990	163	California Gull
6	11	Northwest Pt. Islets	1989	157	Caspian Tern
7	171	East Mirage Is. No. 1	1989	154	Herring Gull
8	263	Unnamed I. No. 1	1986	135	Ring-billed Gull
9	252	Trout Rock I. No. 1	1992	116	Ring-billed Gull
10	271	Unnamed I. No. 2	1991	109	Ring-billed Gull
11	155	Matonabbee I.	1987	101	California Gull
12	250	Trout Rock I. No. 2	1988	95	Caspian Tern
13	206	West Mirage Is.	1992	95	Herring Gull
14	170	East Mirage Is. No. 2	1987	95	California Gull
15	5	Gypsum I.	1989	93	California Gull
16	249	Trout Rock I. No. 3	1991	90	Common Tern
17	256	Unnamed I. No. 3	1988	86	Common Tern
18	260	Unnamed I. No. 4	1988	85	Ring-billed Gull
19	51	Outer Whaleback Rks.	1989	83	California Gull
20	241	Unnamed I. No. 5	1991	79	Arctic/Common terns

[a] See Figure 16.
[b] See Appendices 3 and 4.

1994; Jehl 1994). Countless vacant islands suggest that availability of nesting habitat is not a limiting factor. As suggested for other northern oligotrophic lakes (e.g., Stelfox and Brewster 1979), GSL's relatively low biological productivity (cf. Fee et al. 1985; Allan et al. 1994) may largely explain this situation. Moreover, only relatively small quantities of refuse generated by people, fishing, and agriculture are available to scavenging species. However, this community of freshwater colonial waterbirds is the largest known in the Northwest Territories.

Late springs (e.g., 1988, 1990, and 1992) likely influence the annual abundance of nesting and nonnesting birds. By reducing the already short period that the birds have to complete their breeding cycle, late springs apparently discourage many adults from nesting. An example of this was the large numbers of Mew Gulls recorded as probable breeders in and near the Simpson Islands in 1990 (sites 68–106, Appendix 3).

We do not know why the numbers of nesting birds fluctuated widely at numerous nesting sites or why some old nesting sites were deserted and new sites colonized during the study period (Appendix 3). Nor do we know about the population trends for any of the 10 regular breeding species. However, colonial waterbirds are less abundant at Egg Island and at the West Mirage Islands now than before (Tables 3 and 4). What may have caused these declines and whether these reflect lake-wide trends are also unknown. One possibility is the growing numbers of Herring Gulls owing to the development of a commercial fishery and the growth of the regional human population on and near the lake in the last five decades. This phenomenon has been abundantly documented elsewhere (e.g., Brown and Nettleship 1984; Parnell et al. 1988; Blokpoel and Tessier 1993). Other possibilities include increased human disturbance and the possible decline in biological productivity in the lake following the construction of dams on rivers (e.g., Peace, Tazin, and Taltson rivers) upstream in the Mackenzie watershed (Anon. 1975; Townsend 1975). Additional surveys in various parts of the lake are needed to assess population trends of colonial waterbirds on this large lake (see Section 4.3.5).

The status of four species of colonial waterbirds that occur on GSL — Caspian Tern, Common Tern, Black Tern, and American White Pelican — was or is currently being assessed by the Committee on the Status of Endangered Wildlife in Canada (Martin 1978; Koonz 1987; Gerson 1988; COSEWIC 1994; R. Harris, pers. commun.). We do not know if population trends recorded for these species elsewhere are similar to those on GSL, but their occurrence here, where pristine habitat is abundant, may be important for their long-term conservation.

4.3.3 Distribution

Nesting colonial waterbirds were particularly abundant along the east shore of the North Arm and in the islands at the mouth of the East Arm (Table 5; Fig. 15). This was likely caused by three main factors: (1) the presence of countless small, poorly vegetated or unvegetated islands; (2) the occurrence of vast wetlands and shallows, inshore and between islands, teeming with invertebrates and small fish; and (3) turbid and shallow waters that were ice-free relatively early in the spring in parts of these areas, which appeared to be particularly attractive to Common Terns and Ring-billed Gulls.

Relatively few birds nested along the west and south shores (Fig. 15), despite the presence of abundant wetlands and shallows. There are considerably fewer islands there, and they are often treed or low-lying and flooded in the spring, thus forcing nesting birds on to the few high, treeless islands. However, the three largest colonies (Egg, Found, and Gooseberry islands) and the largest Caspian Tern colony (Northwest Point Islets) occurred along the southwest shore (Fig. 16).

Colonial waterbirds were least abundant in the eastern half of the East Arm (Fig. 15), where the water is very deep (Fig. 1), inshore wetlands and shallows are nearly absent, and the ice melts late. Primary productivity is also low there, compared with the North Arm (Fee et al. 1985).

Other factors undoubtedly influenced the distribution of gulls and terns on GSL. For example, Mew Gulls preferred sheltered nearshore islands, where foraging for insects was evidently more successful. Particularly sheltered nesting and foraging conditions on lakes and marshes near GSL likely explained to a large extent why Bonaparte's Gulls and Black Terns preferred these water bodies to GSL. Whatever these factors were, they were sufficiently stable and consistent year after year to ensure that all species breeding along the east shore of the North Arm, for example, had a nearly identical distribution at the beginning (1986–1987) and at the end (1994–1995) of the study period.

In terms of continental distribution, seven species of colonial waterbirds (California, Ring-billed, and Franklin's gulls; Caspian, Common, and Black terns; and American White Pelicans) are at or near the known northern limits of their Nearctic breeding ranges on GSL.

Table 3
Number of adults and nests at Egg Island

	California Gull		Herring Gull	Arctic Tern
Date	Nests	Adults	Nests	Adults
25 July 1951		6000[a]	0	100
25 June 1989	689		44	4
24 June 1995	571		23	8[b]

[a] Reported as adults and subadults; "large numbers" of nestlings also present (Soper 1952).
[b] One nest was found.

Table 4
Number of nests at the West Mirage Islands

Year	CATE[a]	ARTE	HEGU	CAGU	MEGU	PAJA	Total
1969–73[b]	3	75–100	40–60	150–200[c]	3–5	2–3	~270–370
1986	4	22	82	17	1	0	126
1989	4[d]	21	117	71	1[e]	1[f]	215

[a] Species codes in Appendix 3.
[b] Trauger and Bromley (1976); reported as number of pairs nesting annually.
[c] W. McDonald reported 250 nests only on the westernmost islets of the archipelago in June 1956 (Trauger and Bromley 1976).
[d] + 4 nonnesting adults also present.
[e] + 18 nonnesting adults also present.
[f] + 3 nonnesting adults also present.

Table 5
Distribution of nests recorded during primary surveys (see Methods and Appendix 1)

	No. of nests					
Species	West Shore	South Shore	The Islands	Inner East Arm	North Arm's East Shore	Total
Parasitic Jaeger	–	–	10	–	5	15
Bonaparte's Gull	–	–	–	–	6	6
Mew Gull	1	–	290	37	118	446
Ring-billed Gull	38	–	20	–	311	369
California Gull	739	716	512	86	443	2496
Herring Gull	177	155	385	71	735	1523
Caspian Tern	111	–	31	3	91	236
Common Tern	22	–	155	–	508	685
Arctic Tern	1	29	168	26	186	410
Arctic/Common terns	–	–	11	10	82	103
Total[a]	1089	900	1582	233	2485	6289
%	17	14	25	4	40	100

[a] All island-nesting birds, excluding Black Terns, which nested only in nearby marshes.

Figure 15
Distribution of nests recorded during primary surveys

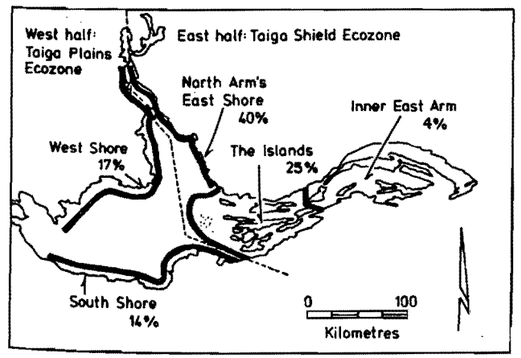
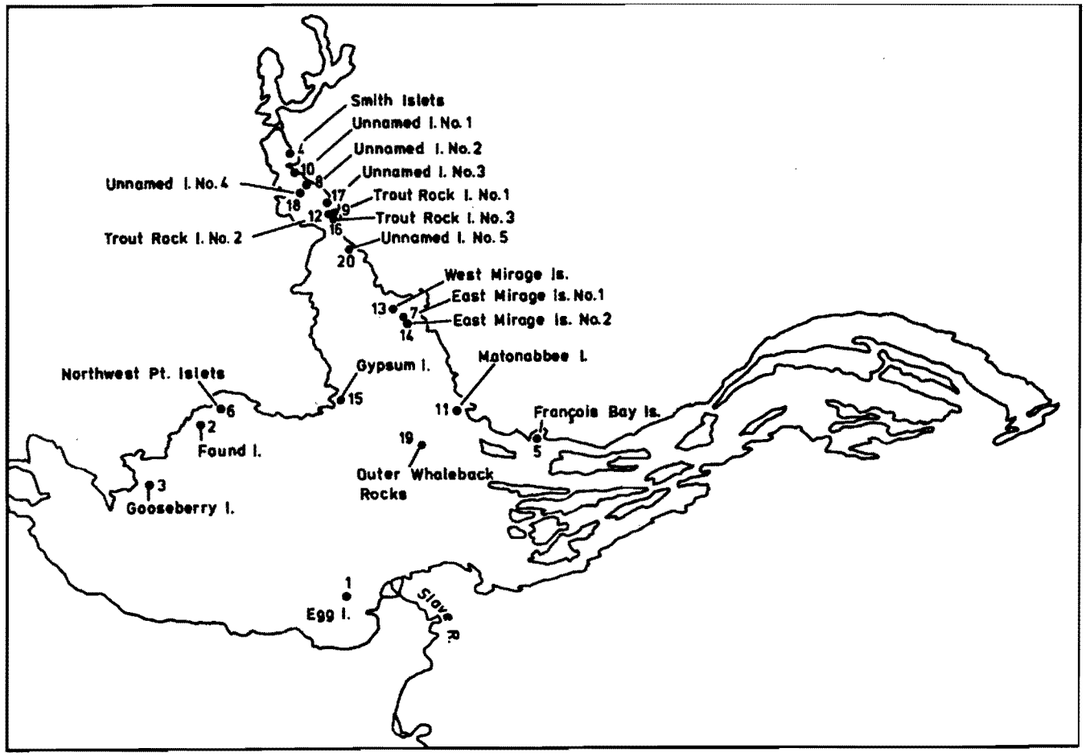


Figure 16
Locations of the 20 largest nesting sites (numbers correspond to Table 2)



As climate warming trends in the western Northwest Territories have shown the greatest overall increase (1.7°C) in Canada in the last century (Gullett and Skinner 1992), they may favour long-term changes in the distribution of these species in this region, as documented for some of these and other species elsewhere in western North America (Jehl and Johnson 1994).

Drought displacement from the Prairies may also favour short-term cyclical changes in the distribution of freshwater colonial waterbirds in the western Northwest Territories, as it does for other waterbirds (Murdy 1966; Derksen and Elridge 1980; Hansen and McKnight 1982; Kuyt and Johns 1992). For example, the breeding California Gulls and Common Terns reported north of Great Bear Lake in the 1860s (MacFarlane 1891) were probably displaced by the severe drought that occurred on the Prairies during that decade (Spry 1968; Koshida 1992).

4.3.4 Chronology

Several factors beyond the scope of this study undoubtedly influence the chronology of arrival, nesting, and departure of colonial waterbirds at GSL. However, our observations suggest that four main events, which remain to be specifically documented, influenced this chronology on GSL.

(1) The snowmelt and icemelt coincided with the birds' arrival in the spring. Gulls did not arrive until the snow began to melt in mid-April, and terns did not arrive until substantial foraging areas were ice-free along the shores, in late May.
(2) The massive emergence of insects in early summer appeared to be correlated with the timing of the hatch. Nestlings began to demand food en masse in late June and early July, when arthropod fallout (dead and torpid insects blown onto the cold water surface from inshore and nearby wetlands) was superabundant on the lake.
(3) Early frosts in late summer appeared to stimulate the departure of the small, largely insectivorous species around 15 August. These first frosts apparently had a significant negative impact on insect abundance.
(4) Freeze-up in late October and early November likely influenced the departure of the last large gulls.

Nesting was somewhat asynchronous between and within species and between different parts of the lake (Appendix 2). This asynchrony likely resulted from the fact that climate and ice conditions were variable across this very large lake and the fact that birds nested in numerous small colonies rather than in a few large ones.

4.3.5 Population monitoring

We hope that the abundance and distribution of GSL's colonial waterbirds will be monitored in the coming decades. We suggest that nests be counted in at least three areas or sites: (1) the east shore of the North Arm, between Frank Channel and Gros Cap (Fig. 1), where 40% of GSL's colonial waterbirds nested during this study (Fig. 15); (2) the southwest shore, between Gypsum Point and Slave Point, where four large colonies occurred (Found Island, Gooseberry Island, Northwest Point Islets, and Gypsum Island) (Fig. 1, Table 2); and (3) Egg Island, GSL's largest colony (Fig. 1, Table 2). We also suggest that these sites be surveyed within one breeding season, because gulls, terns, and jaegers may move between areas of the lake from year to year. Surveys should take place between 15 and 30 June, after spring breakup but before the hatch is too advanced.

In our view, the most practical and inexpensive plan to survey these areas within 15 days should be as follows:

(1) Charter a small floatplane at Yellowknife on 15 June, land at Egg Island, carry out a ground nest count, and return to Yellowknife on the same day.
(2) Survey the east shore of the North Arm with a small motorboat from Yellowknife between approximately 16 and 23 June. Refuelling can be done at Yellowknife.
(3) Survey all islands between Gypsum and Slave points with a motorboat from Yellowknife between 25 and 30 June. Refuelling can be done at Hay River before returning to Yellowknife.

In all cases, only two qualified observers are needed.

Motorboat surveys in "The Islands," where 25% of GSL's colonial waterbirds breed (Fig. 15), are difficult and time consuming, because nesting islands supporting small colonies are scattered over a large area. Moreover, surveys cannot be executed without at least two fuel caches. The small numbers of birds nesting in the Inner East Arm (Fig. 15) do not justify the inclusion of this area in a monitoring program. Aerial surveys in all areas are not encouraged because they yield only a fraction of the information collected during boat surveys.

Monitoring the population of Black Terns breeding in marshes near GSL, most of which are accessible only with an aircraft, may not be practical. However, aerial surveys with a small fixed-wing aircraft (e.g., PA-18 Piper Supercub, at 125 km/h, 30 m above ground level), during which the adult probable breeders are counted, are conceivable. We know of only two regular breeding marshes near the road that can be quickly surveyed with a kayak. They are Caën Lake (Fig. 1), on the west side of the North Arm, and Marsh #128A (Yellowknife Study Area, Boreal Ducks Project, maps available from the Canadian Wildlife Service in Yellowknife), on the east side, near Trout Rock. A total of 350 adults occurred at these two sites in 1995. Surveys may take place shortly before 15 June or after 30 June.

There appears to be no practical way of monitoring the population of Bonaparte's Gulls breeding on and near GSL. Nesting pairs are thinly scattered among countless islands and lakes, often at different locations from year to year. Moreover, their tree nests are often difficult to locate, and their nesting chronology is particularly asynchronous.

We also suggest that the Oracha Falls area, along the Taltson River, and the area between Pointe Desmarais, Big Island, and Falaise Lake (Fig. 1) be visited again to determine if American White Pelicans and Franklin's Gulls breed there.

4.3.6 Colonial waterbirds as bioindicators

GSL is certainly less contaminated than the Great Lakes (Mudroch et al. 1992; Braune 1993; Weseloh et al. 1994), for example, but it is presumably one of the least pristine lakes in the Northwest Territories. Not only does more than 10% of Canada's land mass drain into this lake (Rawson 1947), but up to 90% of its water comes from Saskatchewan, Alberta, and British Columbia — where pulp mills, heavy oil and tar sand deposits, and industrial farming occur — via the Athabasca, Peace, and Slave rivers (Mackenzie River Basin Committee 1981; Alberta–Pacific Environmental Impact Assessment Review Board 1990). Moreover, one-third of the population in the Northwest Territories lives around GSL, where commercial and industrial activities are concentrated. Long-lived colonial waterbirds, which occupy high trophic levels and bioaccumulate contaminants, are potentially important bioindicators of contamination (Fox and Weseloh 1987; Furness and Greenwood 1993; Kushlan 1993).

In light of the fact that seven species of colonial waterbirds that occur on GSL are at or near the northern limits of their Nearctic breeding ranges, these birds also provide an excellent opportunity to monitor the impacts of climate warming trends on migratory birds in northwestern Canada, a region where these trends have shown the greatest overall increase in this country in the last century (Gullett and Skinner 1992). Thus, we hope that this atlas will help in the design and the execution of environmental monitoring programs at GSL.

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Appendices

Appendix 1
Primary surveys[a] of breeding colonial waterbirds, Great Slave Lake

Date	Location[b]
23–26 June 1986	Islands along the east shore of the North Arm, between Trout Rock and West Mirage Islands; Slave Delta.
19–22 June 1987	Islands along the east shore of the North Arm, between Wool Bay and Gros Cap; islands in Goulet and Campbell bays; eastern Îles Basses.
24–26 June 1988	Islands along the east shore of the North Arm, between Frank Channel and Trout Rock, and along the west shore of the North Arm, between Frank Channel and Whitebeach Point, including Waite Island.
17–25 June 1989	Greater Yellowknife Bay as far west as West Mirage Islands and as far east as East Mirage Islands; islands along the west shore from Whitebeach Point to Slave Point; islands in Resolution Bay; Îles du Large; Outer and Inner Whaleback Rocks and western Îles Basses.
27 June – 3 July 1990	Caribou and Westhead islands and nearby islands; Simpson Islands, including Wilson, Preble, and Petitot islands, Îles Terribles and nearby islands; Union, Keith, and Seton islands and nearby islands; islands along the south and west sides of Blanchet Island; islands in François and Campbell bays.
29 June – 5 July 1991	North side of Blanchet Islands; islands along the north shore of Hearne Channel from McKinley to Sachowia points; Etthen Island and nearby islands; islands along the south shore of and in Christie Bay; south shore of Douglas Peninsula, including Fortress Island and nearby islands; The Gap area and the extreme western portion of Wildbread Bay; islands along the north shore of McLeod Bay; northern half of Charlton Bay; islands along the north shore of and in western McLeod Bay; islands in Hearne Channel, from Taltheilei Narrows to Utsingi Point.
21 June 1994	Big Island area.
28–30 June 1994	Taltson Delta area and eastward along the south shore to La Loche River area.

[a] See Methods.
[b] See Figure 1 or 4 and Appendix 4. Toponyms not on Figure 1 or 4 are on topographic maps in Appendix 4.

Appendix 2
Approximate dates of arrival, nesting, and departure of the 10 regular breeders, 1986–1995

Appendix 2.1 Parasitic Jaeger

Earliest spring records in the North Arm between 30 May and 5 June.

18 June 1995, Yellowknife Bay: 1 nest with 3 eggs.
20 June 1987, North Arm: 2 nests with 2 eggs.
25 June 1989, Îles du Large: 7 nests with 1 or 2 eggs.
17 July 1992, North Arm: 1 nest with 1 hatchling.
18 July 1970, West Mirage Is.: 1 downy young (Trauger and Bromley 1976).
23 August 1992, West Mirage Is.: 2 adults and 1 fledgling flying above nesting island.
27 August 1989, Yellowknife Bay: 1 adult and 1 young foraging at large.
3 September 1989, West Mirage Is.: 2 adults foraging at large.

Appendix 2.2 Bonaparte's Gull

Earliest spring records in the North Arm between 2 and 15 May.

14 May 1989, Yellowknife Bay: 1 pair at nest site that was active the previous year.
16 May 1989, 3 small lakes near Yellowknife Bay: 400 adults foraging where there is ice-free water.
18 May 1993, Yellowknife Bay: 30 adults and 1 subadult loafing on the ice.
24 May 1990, pond near North Arm: 2 pairs defend their territory.
28 May 1995, lake near North Arm: 1 nest with 2 eggs.
17 June 1989, Yellowknife Bay: 2 nests with 1 and 2 eggs.
17 June 1995, North Arm: 1 nest with 2 nestling that are 2–3 days old.
11 July 1989, pond near North Arm: 6 pairs with 1–3 feathered chicks that can barely fly.
12 July 1989, pond near the North Arm: 2 fledglings flying alone.
15 July 1989, Yellowknife Bay: 2 pairs with 1 and 2 chicks that are about 15 days old and downy.
6 August 1989, North Arm: 10 adults and 30 young foraging.
8 August 1990, pond near the North Arm: 2 adults with 3 fully grown but apparently flightless chicks.
11 August 1989, North Arm: 16 young foraging and loafing with 1 adult.
15 August 1993, lake near Yellowknife Bay: 2 young foraging alone.

Appendix 2.3 Mew Gull

Earliest spring records in the North Arm between 21 April and 5 May

6 May 1988, Yellowknife Bay: 60 adults foraging where there is ice-free water and loafing on the ice.
14 May 1988, Yellowknife Bay: 40 adults present at nesting site, but nest construction has not started.
28 May 1995, lake near Yellowknife Bay: 1 nest with 3 eggs.
2 June 1988, lake near Yellowknife Bay: 2 new nests without egg, and 1 nest under construction.
5 June 1988, lake near Yellowknife Bay: 1 nest with 3 eggs.
10 June 1989, lake near Yellowknife Bay: 5 nests with 1–4 eggs.
18 June 1989, Yellowknife Bay: 19 nests with 1–3 eggs.
29 June 1990, Simpson Is.: 15 nests containing eggs (some pipped), hatchlings, and nestlings (some are about 5 days old).
15 July 1992, East Arm: 60 adults with only 4 small (about 1 week old) chicks.
21 July 1995, lake near Yellowknife Bay: 5 fledglings on the wing.
29 July 1989, Yellowknife Bay: 20 fledglings flying near nesting site.
2 August 1993, North Arm: 7 adults foraging at large with 7 young.
13 August 1989, Yellowknife Bay: 1 adult with 3 fledglings still at nesting site, but few individuals remaining.
23 September 1994, Yellowknife Bay: 5 young foraging, most birds left 1 month ago.
18 October 1989, Yellowknife Bay: 2 subadults loafing.

Appendix 2.4 Ring-billed Gull

Earliest spring records in the North Arm between 26 April and 27 May.

16 May 1988, Yellowknife Bay: 3 adults loafing on the ice.
5 June 1993, North Arm: 15 adults without nest present at nesting site.
21 June 1989, west shore: 15 nests with 1–3 eggs.
30 June 1990, Simpson Is.: 14 nests with 1–3 pipped eggs, hatchlings, and nestlings.
5 August 1988, North Arm: 120 adults with 10 downy chicks and 25 fledglings.
31 August 1993, Yellowknife landfill: 1 adult and 10 young foraging.
22 September 1993, Yellowknife Bay: 10 adults, 1 subadult, and 15 young loafing.
19 October 1993, Yellowknife landfill: 5 adults, 1 subadult, and 10 young foraging.
21 October 1989, Yellowknife Bay: 1 adult and 10 young loafing.
23 October 1994, Yellowknife River: 3 adults and 1 young loafing near cisco spawning area.

Appendix 2.5 California Gull

Earliest spring records in the North Arm between 21 April and 9 May.

5 May 1989, Yellowknife Bay: 50 adults feeding on invertebrates where there is water.
14 May 1989, Yellowknife Bay: 10 adults without nest at nesting site.
6 June 1995, Yellowknife Bay: 5 nests with 2 or 3 eggs.
18 June 1989, West Mirage Is.: 18 nests with 1–4 eggs.
21 June 1987, North Arm: 152 nests with 1–3 eggs, including 1 nest with 1 pipped egg.
24 June 1989, Egg Island: 689 nests with 1–4 eggs: no sign of hatching.
25 June 1989, Îles du Large: 30 nests with 1–3 eggs; including 1 nest with 2 nestlings (<3 days old).

Continued

Appendix 2 (cont'd)
Approximate dates of arrival, nesting, and departure of the 10 regular breeders, 1986–1995

1 July 1991, East Arm: 40 adults with 7 nests containing 0 or 1 egg.
3 August 1989, East Mirage Is.: 1 fledgling among 50 not fully grown chicks.
24 August 1992, West Mirage Is.: 20 fledglings with 20 flightless, not fully grown chicks, and 5 downy chicks.
21 October 1993, Yellowknife landfill: 50 adults, 1 subadult, and 200 young foraging and loafing.
24 October 1993, Yellowknife River: 20 adults and 30 young feeding on ciscoes.
30 October 1993, Yellowknife River: 13 adults flying.
3 November 1994, Yellowknife Bay: 4 adults loafing on the ice near the water.

Appendix 2.6 Herring Gull

Earliest spring records in the North Arm between 12 April and 26 April.

3 May 1988, Yellowknife Bay: 3 adults without nest present at nesting site. The island is largely covered with snow.
7 May 1989, Yellowknife Bay: 40 adults without nest present at nesting site.
12 May 1989, Yellowknife Bay: 300 adults foraging and loafing at the ice edge, near a patch of open water.
14 May 1989, Yellowknife Bay: 120 adults with 15 new nests at one nesting site.
27 May 1993, Yellowknife Bay: 2 adults copulating on the ice.
29 May 1993, Yellowknife Bay: 1 nest with 3 eggs.
17 June 1989, Yellowknife Bay: 1 nest with 1 egg, 1 hatchling, and 1 nestling.
21 June 1989, west shore: 1 chick at least 15 days old at one nesting site.
27 June 1990, Simpson Is.: 1 nest with 2 nestling (4–5 days old).
30 June 1991, East Arm: 5 nests with 2–3 eggs.
15 July 1990, Yellowknife Bay: 2 adults with 1 small, downy chick.
30 July 1989, Yellowknife Bay: 2 adults flying above nesting island with 2 fledglings.
2 August 1992, North Arm: 3 young foraging alone.
18 August 1993, Yellowknife Bay: 2 adults with 1 small, downy chick.
5 October 1993, Yellowknife landfill: 30 adults and 40 young foraging and loafing.
21 October 1993, Yellowknife landfill: 10 adults, 1 subadult, and 50 young foraging and loafing.
30 October 1989, Yellowknife landfill: 1 young loafing.

Appendix 2.7 Caspian Tern

Earliest spring records in the North Arm between 17 and 24 May.

23 May 1993, North Arm: 2 adults performing courtship feeding.
5 June 1993, North Arm: 50 adults without nest at a nesting site, 4 pairs copulating.
7 June 1995, Yellowknife Bay: 1 nest with 1 egg. No egg present on the previous day.
20 June 1987, Yellowknife Bay: 2 nests with 2 and 3 eggs.
22 June 1989, Northwest Point: 110 nests with 1–3 eggs; no sign of hatching.
29 June 1990, Simpson Is.: 1 nest with 2 nestlings (1–2 days old).
3 July 1990, Simpson Is.: 1 nest with 2 eggs (1 pipped) and 1 hatchling.
2 August 1993, North Arm: 2 adults and 2 fledglings flying about nesting site.
3 August 1989, Yellowknife Bay: 2 adults and 1 young foraging.
5 August 1988, North Arm: 100 adults and 20 fully grown but flightless chicks.
24 August 1993, West Mirage Is.: 2 adults and 2 fledglings flying about nesting
12 September 1989, Yellowknife Bay: 3 adults and 1 young foraging, few terns left.
28 September 1993, Yellowknife landfill: 1 young feeding on refuse.

Appendix 2.8 Common Tern

Earliest spring records in the North Arm between 17 and 26 May.

5 June 1993, North Arm: 30 adults with nests at nesting site; 1 nest contains 1 egg.
8 June 1995, lake near North Arm: 39 nests with 3 eggs, 8 nests with 2 eggs, and 4 nests with 1 egg.
9 June 1987, Yellowknife Bay: 5 nests each with 3 eggs.
21 June 1989, west shore: 10 nests with 1–3 eggs, no sign of hatching.
29 June 1990, Simpson Is.: 6 nests containing 1 or 2 eggs, 1 pipped egg, 1 hatchling, and 3 nestlings (<3 days old).
21 July 1990, lake near North Arm: 40 adults, 10 fledglings, and 10 fully grown but flightless chicks.
5 August 1988, North Arm: 1000 adults and young loafing on 5 adjacent islets; includes several Arctic Terns.
15 August 1993, Yellowknife Bay: 5 flocks (5–10 birds) of adults and young flying high and southward.
18 August 1993, Yellowknife Bay: 4 adults with 1 chick (about 5 days old).
27 August 1994, Yellowknife Bay: few terns remaining; 30 adults and young foraging above raft of 80 Common Loons.
2 September 1989, West Mirage Is.: 7 young foraging; may include Arctic Terns. First terns seen in 10 days.

Appendix 2.9 Arctic Tern

Earliest spring records in the North Arm between 13 and 29 May.

3 June 1995, lake near North Arm: 1 nest with 1 egg.
6 June 1995, Yellowknife Bay: 13 nests with 1–3 eggs.
18 June 1989, West Mirage Is.: 2 adults copulating on the ice.
24 June 1990, Îles du Goulet: 39 nests with 1 or 2 eggs.
29 June 1990, Simpson Is.: 2 nests each with 1 nestling (<5 days old).
2 July 1991, East Arm: 10 nests containing 0–2 eggs.
3 July 1990, Simpson Is.: 5 nests containing 1–3 eggs; no sign of hatching.
21 July 1995, lake near Yellowknife Bay: 1 fledgling flying short distances.
29 July 1989, Yellowknife Bay: 15 adults and 30 young foraging with Common Terns.
16 August 1989, Yellowknife Bay: 3 flocks (20–35 birds) of adults and young flying high and southward; may include Common Terns.

Continued

24 August 1992, West Mirage Is.: few terns remaining; 3 adults and 3 young foraging.
11 September 1989, near Big I.: 2 terns foraging, may be Common Terns.

Appendix 2.10 Black Tern

Earliest spring records in the North Arm between 23 May and 4 June.

2 June 1990, North Arm: 25 adults foraging in nearshore wetlands.
7 June 1995, marsh near North Arm: 50 adults foraging in nesting marsh.
22 June 1991, same marsh: 20 territorial adults and 2 subadults, at least 1 nest with 3 eggs.
10 July 1993, same marsh: at least 20 adults and 4 nestlings (7–10 days old) present.
12 July 1986, Slave Delta: 12 territorial adults present, at least 1 nest with 3 eggs.
26 July 1994, North Arm: 1 adult and 2 young foraging between islands; 12 adults and 13 young, the following day.
31 July 1991, marsh near North Arm: 2 adults and 1 chick attempting its first flight.
10 August 1991, North Arm: 2 adults and 90 young foraging over inshore wetlands, near Trout Rock.
17 August 1989, North Arm: wetland used by foraging adults and young during the last 2 weeks is vacant.
11 September 1989, near Big I.: 25 young foraging.

Appendix 3
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
1	85J	1989												2												2
2	85J	1989												12												12
3	85G	1989		1					3	10			1						12						16	11
4	85G	1989							4				21				1			5	1				27	5
5	85G	1989							15		46		22						10						93	
6	85G	1990					1	1																	1	1
7	85G	1989												14												14
8	85G	1989												6												6
9	85G	1989									4		5												9	
10	85G	1989				1		2		1			18												18	4
11	85G	1989						2			35		12	10			110								157	12
12	85G	1989						1	1		299		70							1					370	2
13	85G	1989											12	26											12	26
14	85G	1989							15		11		24												50	
15	85G	1989									344		12					1							356	1
16	85B	1978																				40				40
17	85G	1989									7		24												31	
18	85G	1989											14	20											14	20
19	85G	1989									689		44									4			733	4
		1995									571		23								1	6			595	6
20	85G	1978														10										10
21	85G	1978														12						4				16
22	85G	1978														25										25
23	85H	1978														70										70
24	85H	1978									3		73									2			76	2
25	85H	1978									12										11				23	
26	85H	1978																			13				13	
27	85H	1978									5										5				10	
28	85H	1989		1							24		24												48	1
29	85H	1989	1	2																	39	22			40	24
30	85H	1989						1					22	16											22	17
31	85H	1989									6		21				1					2			28	2
32	85H	1989												12												12
33	85H	1989											4					2				2			4	4
34	85H	1989												2												2
35	85H	1989						1					11												11	1
36	85H	1989		3									11				1				1	10			13	13
37	85H	1989	1																						1	
38	85H	1989									31		46				1								78	
39	85H	1989	1	2										2											1	4
40	85H	1989									23		18												41	

Continued

Appendix 3 *(cont'd)*
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
41	85H	1989	1											2								8			1	10
42	85H	1989											6	3											6	3
43	85H	1989	1	1									6					2							7	3
44	85H	1989	1	2										2											1	4
45	85H	1989												10												10
46	85H	1989	1											30											1	30
47	85H	1989	1										6												7	
48	85H	1989	1																		15	10			16	10
49	85H	1989											6	6											6	6
50	85H	1989									23		13												36	
51	85H	1989									71		11				1								83	
52	85H	1989											2								20				22	
53	85H	1989									10		13												23	
54	85H	1987		1									1				1								2	1
55	851	1987																			35				35	
56	85H	1990	1					1					5	4								1			6	6
57	85H	1990					1						3	2			1				6	19			11	21
58	85H	1990					1	1																	1	1
59	85H	1990											2	6			1					8			3	14
60	85H	1990					14	2														2			14	4
61	85H	1990											1												1	
62	85H	1990												2				2			9	17			9	21
63	85H	1990				2																				2
64	85H	1990										15	11	8			1								12	23
65	85H	1990					1																		1	
66	85H	1990											5	8											5	8
67	85H	1990											3	4							1				4	4
68	85H	1990					1	10														2			1	12
69	85H	1990				1	14	22													4	22			18	45
70	85H	1990					6	14									1		4	12					11	26
71	85H	1990				2	16	37									3		7	11					26	50
72	85H	1990					7	8											1	3					8	11
73	85H	1990									6	8	10	10			1	2							17	20
74	85H	1990					2	46						4								8			2	58
75	85H	1990						15			2	1	12	38			1	2				3			15	59
76	85H	1990		1							9	32	15	50				2			1	13			25	98
77	85H	1990					7	20	18	14			1	13			1			2	13	12			40	61
78	85H	1990					3	20						2					20		3	4			26	26
79	85H	1990					2										1		29						32	
80	85H	1990					8	4						2											8	6

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
81	85H	1990					12	16									1				1				14	16
82	85H	1990					1	1					1	1											2	2
83	85H	1990					1	3													1				2	3
84	85H	1990						4					5	1								6			5	11
85	85H	1990					10	30													7	21			17	51
86	85H	1990									10	5	4	2			1								15	7
87	85H	1990					15	30													1				16	30
88	85H	1990					2				54	42	2	18							1				59	60
89	75E	1990					11	6														2			11	8
90	75E	1990									8	18	5	2											13	20
91	75E	1990					9																		9	
92	75E	1990					20	30			19	22					1				6	28			46	80
93	85H	1990						6					2	2											2	8
94	85H	1990						2			14	32	5	30											19	64
95	75E	1990					4	2			3	24	7	16			1								15	42
96	75L	1990					9	27					2								1	14			12	41
97	75L	1990					28	19													7	1			35	20
98	75L	1990						6			15	20	7	51			1					2			23	79
99	85H	1990					1																		1	
100	85H	1990					1	13																	1	13
101	85H	1990											2	4											2	4
102	85H	1990											2	16											2	16
103	85H	1990						2					1												1	2
104	85H	1990									29		6	18			1								36	18
105	85H	1990					3						1								5	25			9	25
106	85H	1990					12	21						2			1					2			13	25
107	85H	1990						2			2	21	6	3			1								9	26
108	85H	1990									3		9												12	
109	85H	1990												2			1								1	2
110	85H	1990									5	5	10				1								16	5
111	85I	1990									145	30	17	6			1								163	36
112	85I	1990			1	17															1	4			18	6
113	85I	1990				15		40				2	2	15			1					2			18	59
114	85H	1990				1		2																	1	2
115	85I	1991				1																			1	
116	75L	1991				1		10																	1	10
117	75L	1991				6							1					2							7	2
118	75L	1991									34	62	2	16				2							36	80
119	75L	1991						1			7		14					1							21	2
120	75L	1991									12		2				1								15	

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
121	75L	1991						1					2								1	4			3	5
122	75L	1991					4	12			7	26	1	2								30			12	70
123	75K	1991					1																		1	
124	75K	1991						2			8			2			1								9	4
125	57K	1991					15				32		2												49	
126	75L	1991											7	11			1								8	11
127	75L	1991					1	2					2	6								8			3	16
128	75L	1991												10												10
129	75L	1991						2					16												16	2
130	75K	1991						4					5	2											5	6
131	75K	1991			2			8						1							6	56			6	67
132	75K	1991																			1				1	
133	75K	1991				1		6					5												6	6
134	75K	1991											3									12			3	12
135	75K	1991						2													11	8			11	10
136	75K	1991						6																		6
137	75K	1991						6													1				1	6
138	75L	1991												2												2
139	75L	1991						3					1	3							1				2	6
140	75L	1991											3	2							1	2			4	4
141	75L	1992												6												6
142	75L	1991						3						6												9
143	75L	1991											4	19				1							4	20
144	75L	1992						1					1	8											1	9
145	75L	1991			6	1		7													2	2			3	15
146	85I	1991					5														2				7	
147	85I	1992												20				2								22
148	85I	1992					2	60																	2	60
149	75L	1978																					10			10
150	75L	1978														10										10
151	75L	1978														10										10
152	75K	1978														10										10
153	85I	1987									39		6				1								46	
154	85I	1987					19										1				1				21	
155	85I	1987									98		2				1								101	
156	85I	1987									10		9												19	
157	85I	1987											4				1								5	
158	85I	1987					2				37		13				1				7				61	
159	85I	1987									33		19				1								53	
160	85I	1987																			2				2	

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
161	85I	1987																			5				5	
162	85I	1987									12		31				1								44	
163	85I	1987					1				2		14								1				18	
164	85I	1992	1																						1	
165	85I	1987									8		13												21	
166	85J	1987	1				2						13				1				11				28	
167	85J	1987	1																						1	
168	85J	1987											7												7	
		1989											13												13	
169	85J	1987											2												2	
		1989											3					2							3	2
170	85J	1987									60		34				1								95	
		1989									26		49				1								76	
171	85J	1987					4				35		52				1								92	
		1989						4			64		89				1	1							154	5
172	85J	1987					4						1				1				10				16	
		1989					2						2				1				10				15	
173	85J	1987											5												5	
		1989											6												6	
174	85J	1987																	2		10				12	
		1989																	2		10				12	
175	85J	1989											5												5	
176	85J	1987					1														24				25	
		1989																			12				12	
177	85J	1987											4												4	
		1989											9	7											9	7
178	85J	1987	1				1						2				1				33				38	
		1989	1										1				1		6		19				28	
179	85J	1989			1		6	18																	7	18
180	85J	1989											1												1	
181	85J	1989					2	1													1				3	1
182	85J	1989					2	1					1								1				4	1
183	85J	1987					3														5				8	
		1989		2		10	2																6		8	12
184	85J	1987					3														2				5	
		1989			2		12	15					2					2			5				21	17
185	85J	1987											1						5		4				10	
		1989				1	1	2					2	4					17		7				27	7
186	85J	1989											2												2	
187	85J	1987											11								1				12	
		1989											29	20											29	20
188	85J	1987					1						1								1				3	
		1989						4					1								5				6	4
189	85J	1989											1												1	
		1992																								

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
190	85J	1986											2												2	
		1988											2												2	
		1989											3												3	
		1992											2												2	
191	85J	1986											1												1	
		1989					1						1												2	
		1992																								
192	85J	1986																								
		1988																	33						33	
		1989																	24						24	
		1990																								
		1991																								
		1992																								
193	85J	1986																								
		1989																								
		1992											1												1	
194	85J	1986																								
		1989		2				2														2				6
195	85J	1986																								
		1989											3								5				8	
196	85J	1989		2			3	4					1									4			4	10
197	85J	1986											14												14	
		1989											20				1								21	
198	85J	1986				2	24														2				26	2
		1988					54																		54	
		1989					30						1								2				33	
199	85J	1986																								
		1989											11				1								12	
200	85J	1986									44		32				1								77	
		1988									29		37				1								67	
		1989									12		37				1								50	
201	85J	1986											10				1								11	
		1989									11		28				3	2			1				43	2
		1990											35	15											35	15
		1992	1										37				2	2	1						41	2
202	85J	1986															1								1	
		1989											1				1				6				8	
203	85J	1986					1				1		13				1								16	
		1989	1				1	18			21		19					2			1				43	20
		1990	1										15	22											16	22
204	85J	1986															1				22				23	
		1989		3									22								13				35	3
		1990	1										9								13				23	
		1992	1										5	14			1						31		38	14
205	85J	1986											18												18	
		1989																								

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
206	85J	1986									16		41												57	
		1989									39		47												86	
		1992									41		54												95	
207	85J	1989											1												1	
208	85J	1989					2															6			2	6
209	85J	1989					1																		1	
210	85J	1989			2		3	10														2			5	12
		1990			1	2																			1	2
211	85J	1989			1																				1	
		1990			1																				1	
212	85J	1986											23												23	
213	85J	1986					1						1						21						23	
214	85J	1990																					15			15
		1991																					15			15
		1992																					15			15
215	85J	1986											56												56	
		1900											46												46	
216	85J	1986											12												12	
		1990											25												25	
217	85J	1986																	11	5					11	5
		1992											9												9	
218	85J	1986											6												6	
219	85J	1986											8	10											8	10
		1990											18				1								20	
220	85J	1986					1						13	8											13	8
		1990											14												14	
		1991											18	20											18	20
		1992																								
221	85J	1986									9		12				1								22	
		1990								2	29		13				1					1			43	3
		1991													19										19	
		1992								30	3	10	14				1	2							18	42
222	85J	1986									22		13				2								37	
		1990									50		1												51	
		1992													48	75									48	75
223	85J	1990		4																						4
224	85J	1990	1	3																					1	3
225	85J	1986																								4
		1990						4																		
		1991											3												3	
226	85J	1986					1						9												10	
		1990											3												3	
		1991											5												5	
		1992												51												51

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
227	85J	1986					1						32												33	
		1990											40												40	
		1991					1						18						8						27	
		1992											15	12											15	12
228	85J	1986																	7						7	
		1990					3																41		44	
229	85J	1986					1						14				1				7				23	
		1990											6										15		21	
		1991											1						13						14	
		1992						4									2		5	3					6	9
230	85J	1986																								
		1990											15												15	
		1991											8												8	
		1992											6												6	
231	85J	1990					1																		1	
232	85J	1986																9							9	
233	85J	1986											20												20	
		1990											13												13	
		1991					1						19						1						21	
		1992											4	5											4	5
234	85J	1986																								
		1992					1												7						8	
235	85J	1986																								
		1990											5												5	
		1991					1						4						1						6	
		1992											3	16											3	16
236	85J	1990											1						1						2	
		1992					1																		1	
237	85J	1986																								
		1990											5												5	
		1992											10	15											10	15
238	85J	1986																								
		1990											9	3											9	3
		1991											16												16	
		1992											25							4					25	4
239	85J	1986																								
		1990					1												10						11	
		1992					2												40		4				46	
240	85J	1986																								
		1990					3														1	3			4	3
		1992					1						1	1					1		1				4	1
241	85J	1986		2									1										21		22	2
		1990	1				1	2					3										43		48	2
		1991	1				1																77		79	
		1992	1				1	5					4										32	13	38	18

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
242	85J	1986																								
		1990					2						1	1			43								46	1
		1992											4				25								29	
243	85J	1986					1																27		28	
		1990				4	1	6															25		26	10
		1992						3											3	14	1				4	17
244	85J	1986																								
		1990					1	1					3								1	2			5	3
245	85J	1986					1		2				1								3				7	
		1990					8						1								1				10	
246	85J	1986																								
		1991																	1						1	
247	85J	1986																								
		1990																					10		10	
		1991																	5						5	
248	85J	1986							3										57						60	
		1988					6						1						19		19				45	
		1990																	33						33	
		1992					4						1						46		4				55	
249	85J	1986					1		8				12										28		49	
		1988					1		30				12				2		41		1				87	
		1990						2	43			4	8					2						30	51	38
		1991					2		28										59		1				90	
		1992											1						17		2				20	
250	85J	1986							13				4				49				1				67	
		1988							29				10				56								95	
		1990											14				42								56	
		1991					2						7				14								23	
		1992							2				6				19								27	
251	85J	1986																								
		1988																								
		1991	1										2						11						14	
		1992											1				5		20						26	
252	85J	1986					1		6				1										35		43	
		1988					2		3										15		10				30	
		1990					1																12		13	
		1991					1																31		32	
		1992							116																116	
253	85J	1986					1												15						16	
		1988					1		46				1				1		25						74	
		1990															1						4		1	4
		1991					2										1		32		6				41	
		1992							24								21		6		1				52	
254	85J	1986																								
		1988																								
		1990																	17						17	

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
255	85J	1986							18				2										48		68	
		1988					1						4						7		1				13	
		1991					2												66						68	
		1992							7				1						52		1				61	
256	85J	1986					8		3										22						33	
		1988					3		30										53						86	
		1991																	13						13	
257	85J	1986					1										1		1		10				13	
		1988					1														19				20	
		1991							1								1		19						21	
		1992											2	3					9		1				12	3
258	85J	1986																								
258		1988															1				1				2	
259	85J	1986																								
		1988																								
		1991	1				2																		1	2
		1992											1						7						8	
260	85J	1986							5								1		23						29	
		1988							70										15						85	
		1991							62										15						77	
		1992							3										15		1				19	
261	85J	1986																								
		1988																								
		1991																	5		2				7	
		1992	1																15		4				20	
262	85J	1986																								
		1988																								
		1991	1																4						5	
263	85J	1986							132										3						135	
		1988																	13						13	
264	85J	1986																	29						29	
		1988							3										21						24	
		1992							23																23	
265	85J	1988																	8						8	
266	85J	1988																	14						14	
267	85J	1986																								
		1988																								
		1992							68										1						69	
268	85J	1986																								
		1988																								
		1992						1									3		8		1				12	1
269	85J	1986																								
		1988																								
		1991	1																1						2	
		1992															1		14		2				17	

Continued

Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
270	85J	1986															1		10						11	
		1988															1		30						31	
		1991					1		1								1		38		2				43	
		1922						2					1						21		6				28	2
271	85J	1986																								
		1988							16				1						29						46	
		1991							72										33		4				109	
		1992																	43		2				45	
272	85J	1986															1		8		1				10	
		1988																	46						46	
		1991							3										31						34	
		1992							3										12						15	
273	85J	1986							51										2						53	
		1988							10								1		27						38	
274	85J	1986																					25		25	
		1988											1										18		19	
275	85J	1986					1										1				29		22		53	
		1988							8								3		44						55	
		1991							172								1		6		1				180	
		1992					1						1	5			1		33		1				37	5
276	85J	1986											4				1		4						9	
		1988											5												5	
		1991							65				3	9							1				69	9
		1992											1	5											1	5
277	85J	1986																								
		1988																								
		1991					4						2						35		3				44	
		1992					2												30		7				39	
278	85J	1986					1						1								5				7	
		1988					1						1						23		1				26	
		1991			2		6												21		2				29	2
		1992					4	4											20	20	2				26	24
279	85J	1986											1												1	
280	85J	1986																								
		1988							64								2		1						67	
		1991																								
		1992											1												1	
281	85J	1986																	2						2	
		1988																								
282	85J	1986																								
		1988																								
		1992											1												1	
283	85J	1986																								
		1988																								
		1991											4	5					46						50	5

Continued

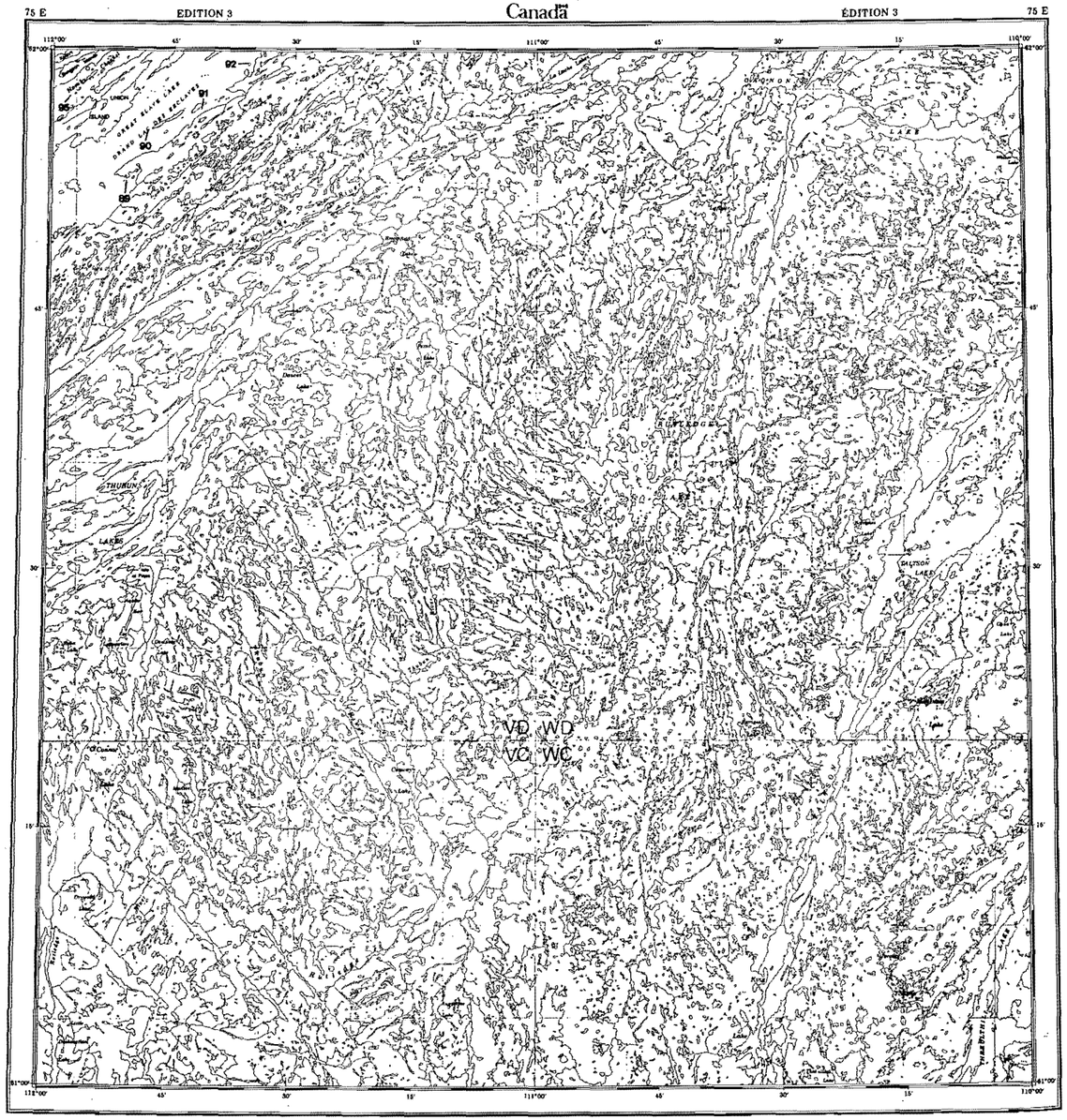
Appendix 3 (*cont'd*)
Confirmed and probable island-nesting sites, Great Slave Lake[a]

			PAJA		BOGU		MEGU		RBGU		CAGU		HEGU		GULL		CATE		COTE		ARTE		ACTE		Total	
Site	Map	Year	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A
284	85J	1986																								
		1988																	22						22	
		1991											1						24						25	
		1992											1						44						45	
285	85J	1986					1												39						40	
		1988																								
		1992					1	3													1				2	3
286	85J	1986																								
		1988					3																		3	
		1992					1	2											1						2	2
287	85H	1994					1		2		4		2				1	2	54						65	2
288	85H	1994					13												4	2		2			17	4
289	85H	1994											1				1		19						21	
290	85H	1994					1	6					5	6			2		16	24					23	26
291	85H	1994																	1		1	8			2	8
292	85H	1994					2	30													4	28			6	58
293	85H	1994					1														2	2			3	2
294	85H	1994					6	6						2							3	10			9	18

[a] PAJA = Parasitic Jaeger
BOGU = Bonaparte's Gull
MEGU = Mew Gull
RBGU = Ring-billed Gull
CAGU = California Gull
HEGU = Herring Gull
GULL = Unidentified Gull
CATE = Caspian Tern
COTE = Commen Tern
ARTE = Arctic Tern
ACTE = Arctic and Common terns

N = Nest (×2 = the number of adult confirmed breeders)
A = Adult probable breeder
Maps 75E, K, L, and 85B, G, H, I, J are in Appendix 4.

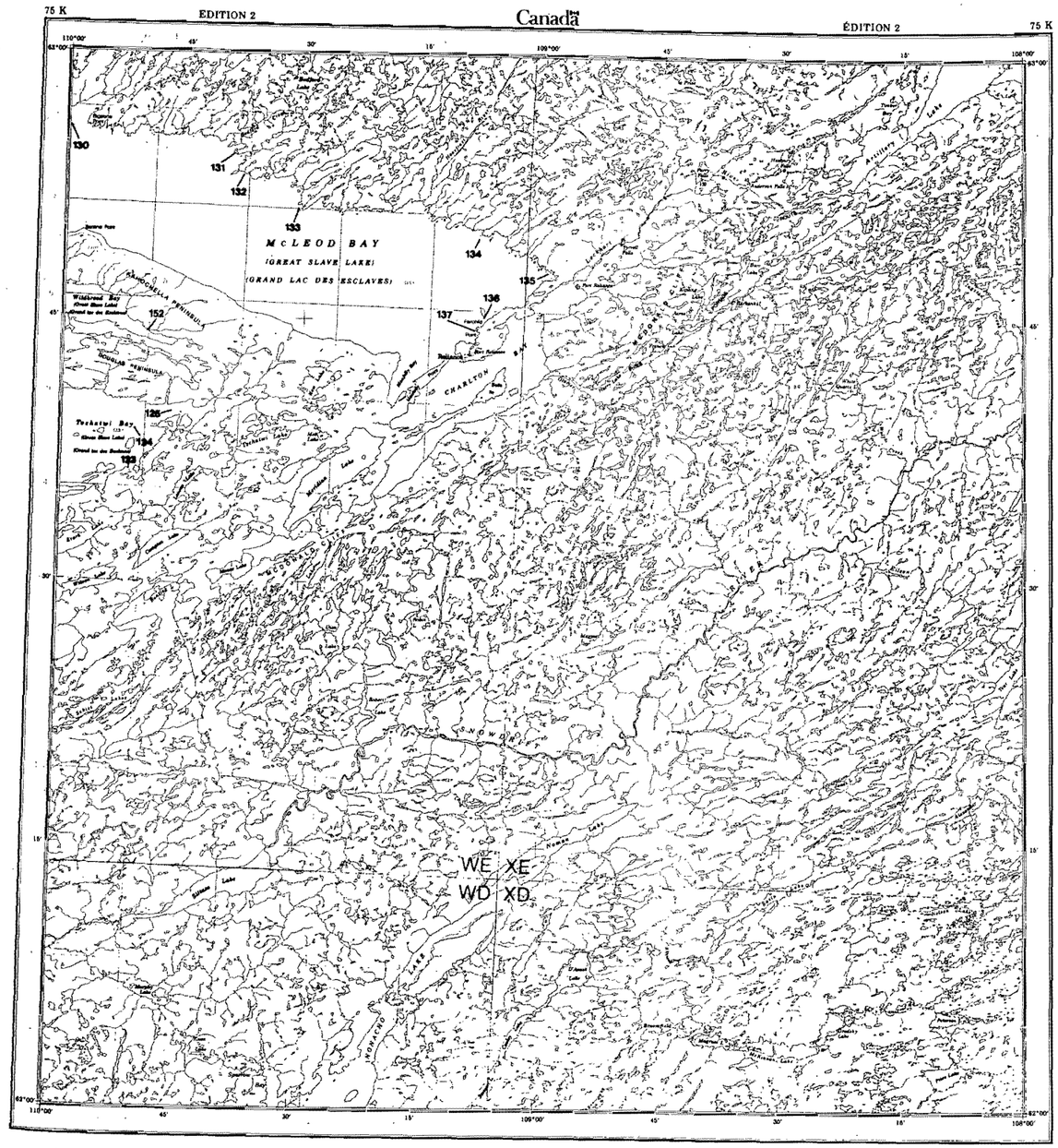
Appendix 4
Locations of island-nesting sites, Great Slave Lake (Map 75E)



TALTSON LAKE
DISTRICT OF MACKENZIE DISTRICT DE MACKENZIE
NORTHWEST TERRITORIES TERRITOIRES DU NORD-OUEST

Scale 1:250 000 Échelle

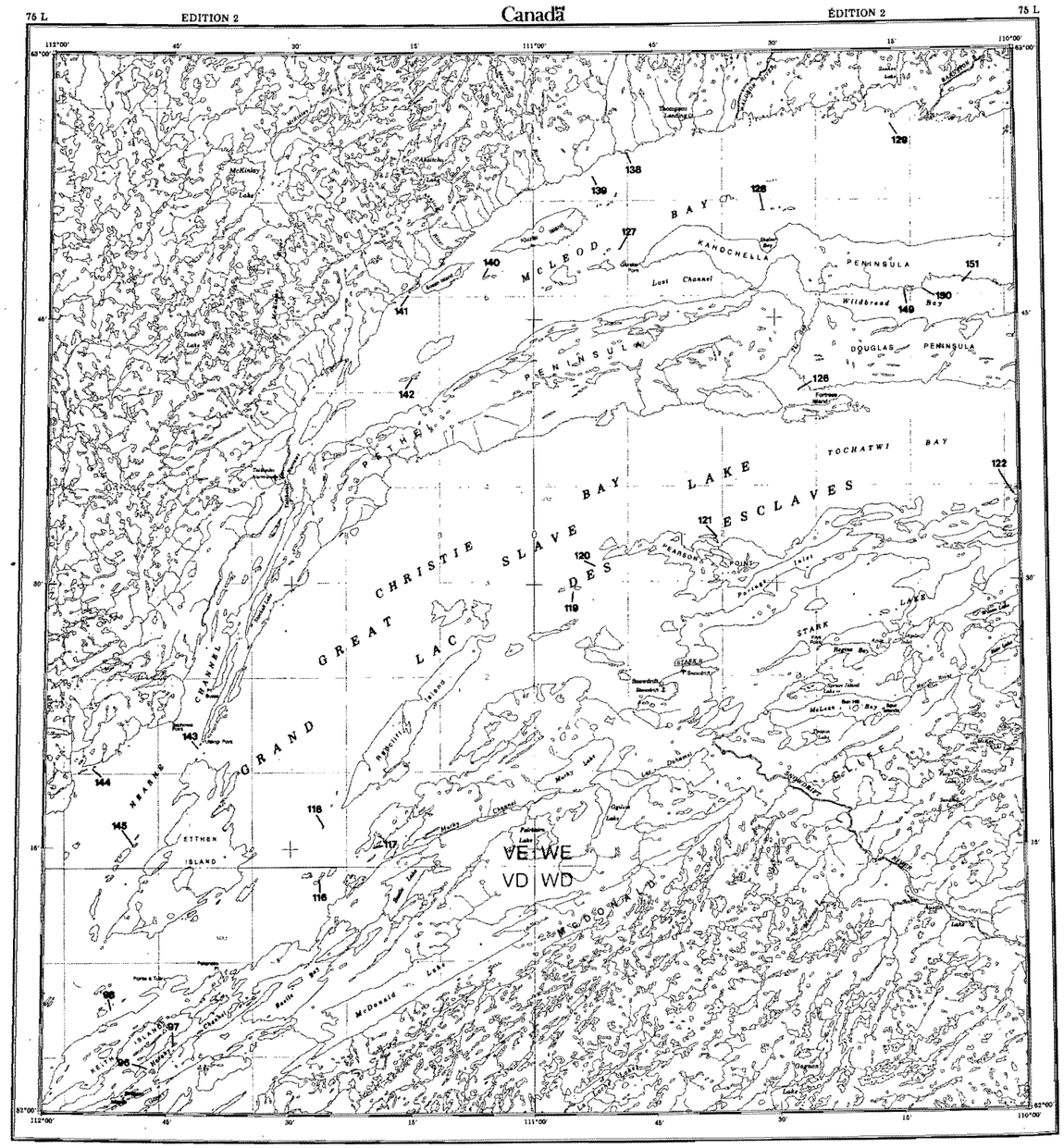
Appendix 4 (*cont'd*)
Locations of island-nesting sites, Great Slave Lake (Map 75K)



RELIANCE
DISTRICT OF MACKENZIE DISTRICT DE MACKENZIE
NORTHWEST TERRITORIES TERRITOIRES DU NORD-OUEST

Scale 1:250 000 Échelle

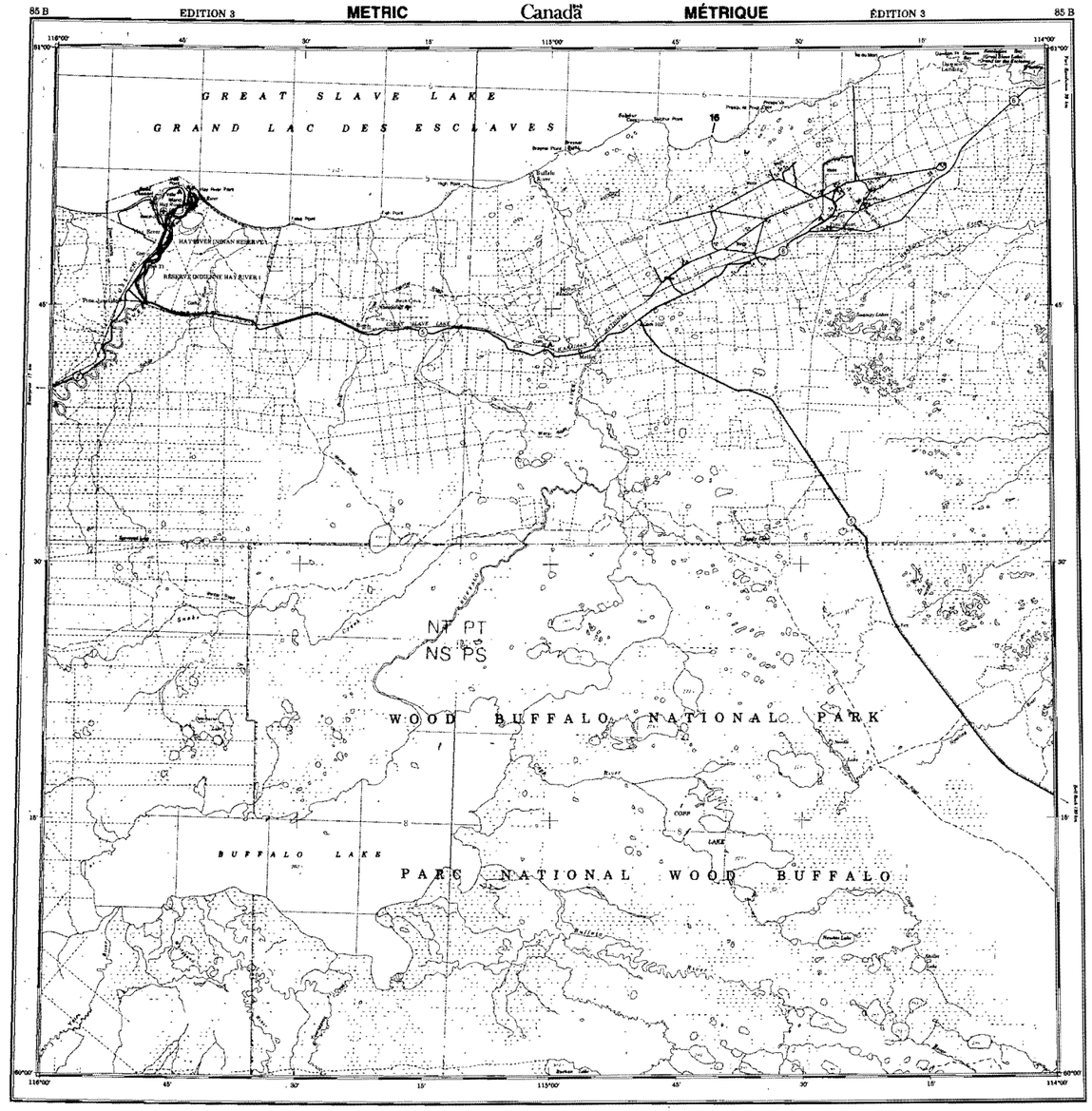
Appendix 4 (*cont'd*)
Locations of island-nesting sites, Great Slave Lake (Map 75L)



SNOWDRIFT
DISTRICT OF MACKENZIE DISTRICT DE MACKENZIE
NORTHWEST TERRITORIES TERRITOIRES DU NORD-OUEST

Scale 1:250 000 Échelle
Miles 5 0 5 10 15 20 Miles
Kilometres 5 0 5 10 15 20 25 30 Kilomètres

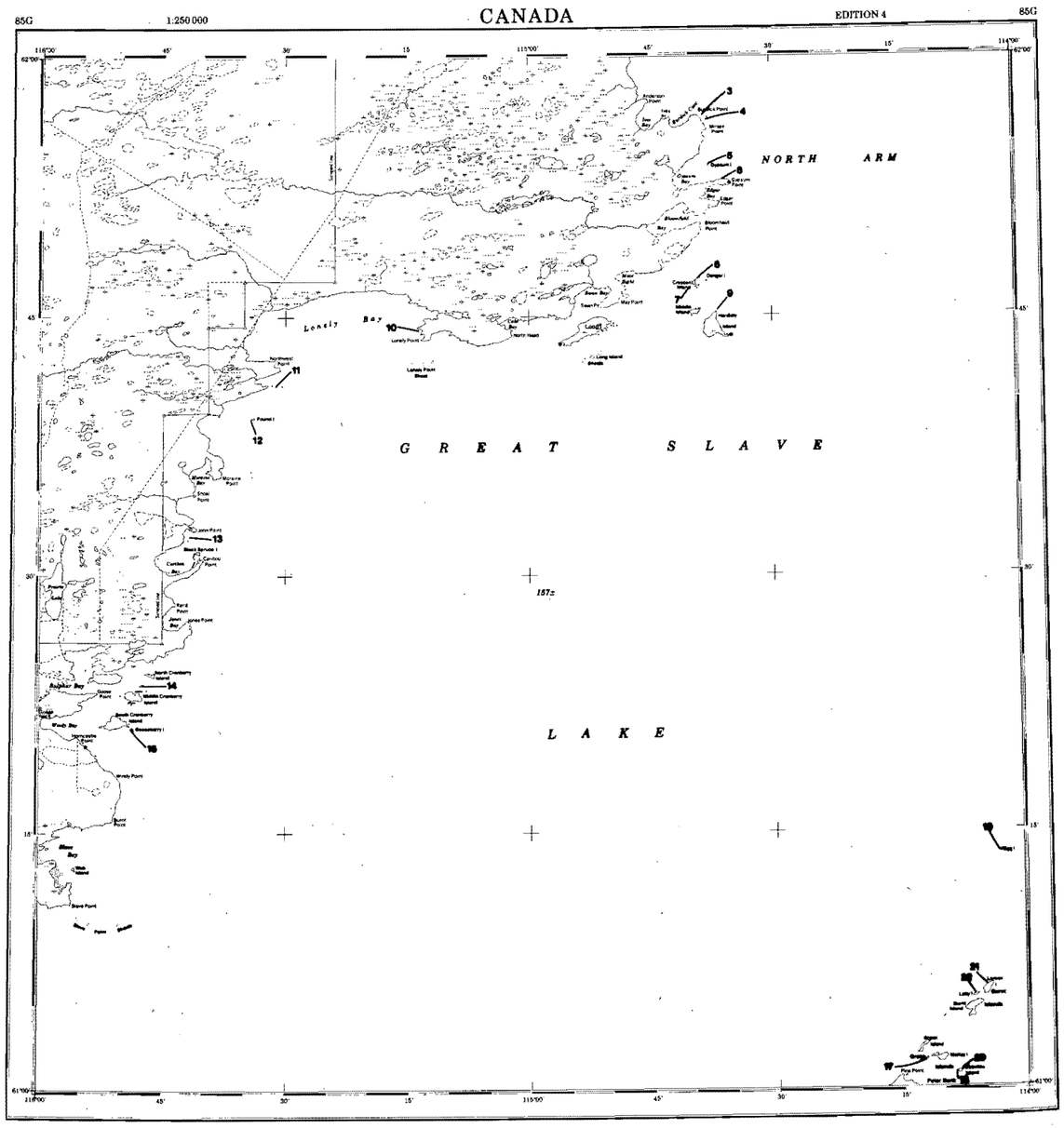
Appendix 4 (*cont'd*)
Locations of island-nesting sites, Great Slave Lake (Map 85B)



BUFFALO LAKE
DISTRICT OF MACKENZIE DISTRICT DE MACKENZIE
NORTHWEST TERRITORIES TERRITOIRES DU NORD-OUEST

Scale 1:250 000 Échelle
Miles 5 0 5 10 15 20 Miles
Kilometres 5 0 5 10 15 20 25 30 Kilomètres

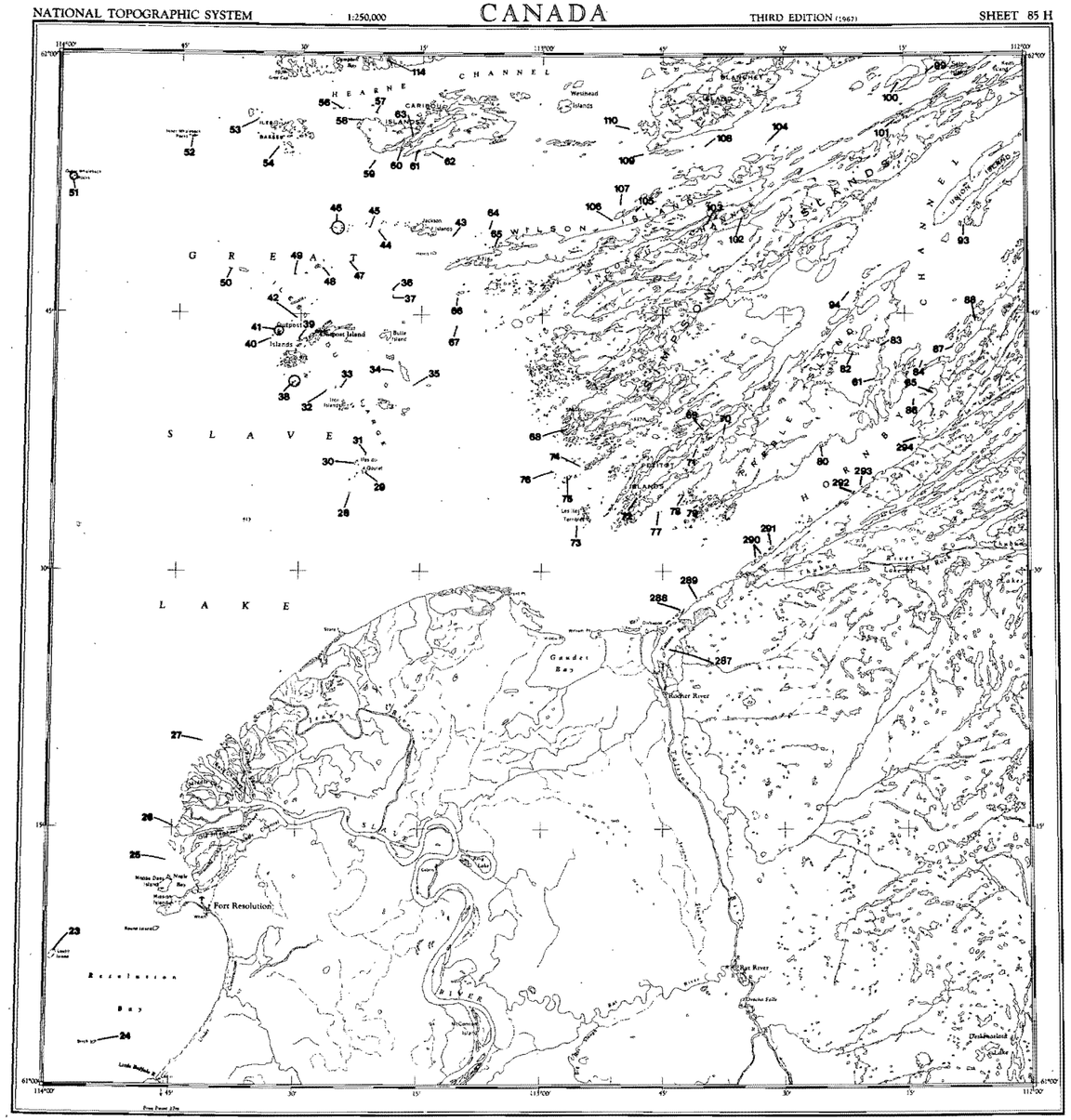
Appendix 4 (*cont'd*)
Locations of island-nesting sites, Great Slave Lake (Map 85G)



SULPHUR BAY
DISTRICT OF MACKENZIE
NORTHWEST TERRITORIES

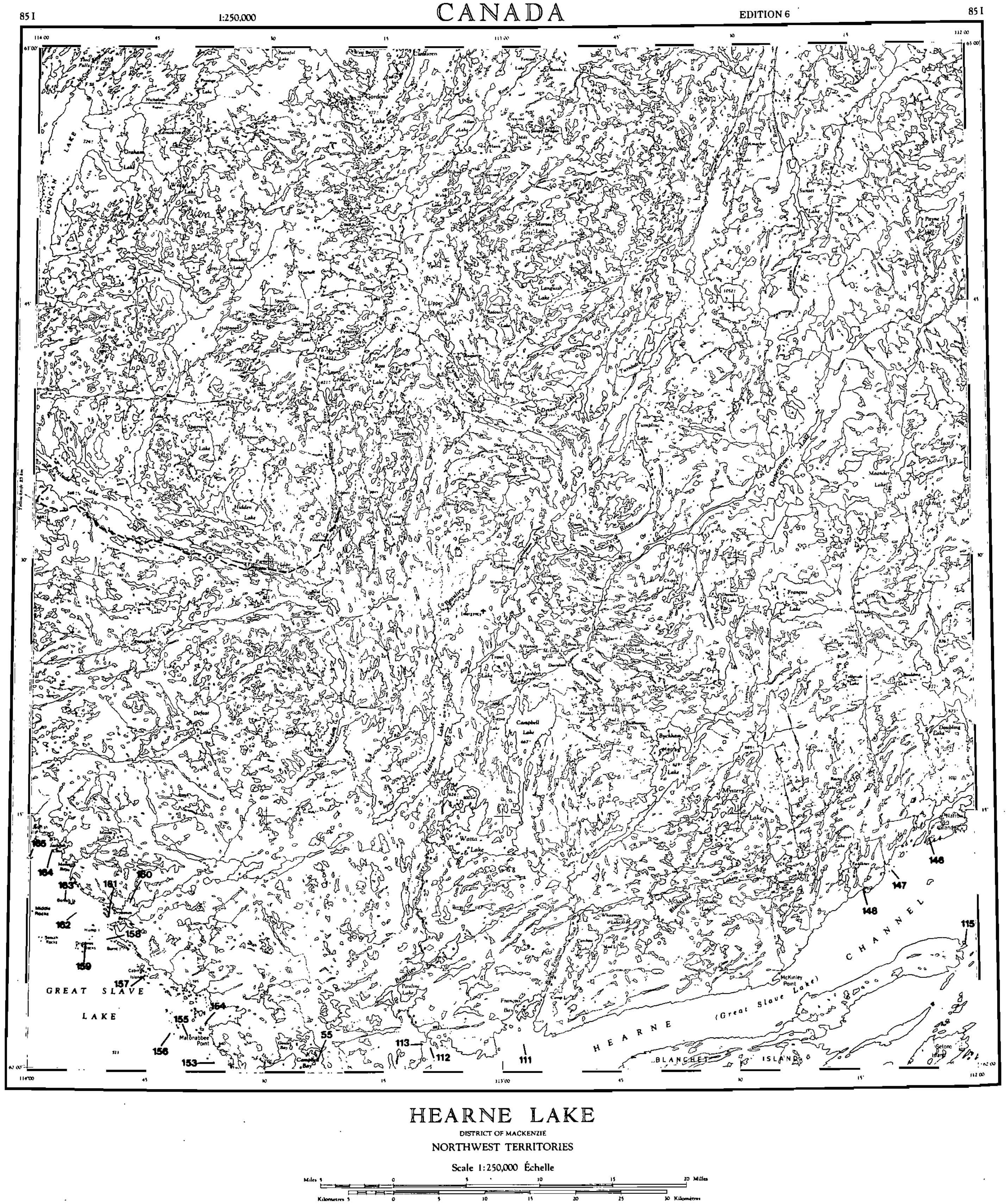
Scale 1:250 000 Echelle

Appendix 4 (*cont'd*)
Locations of island-nesting sites, Great Slave Lake (Map 85H)

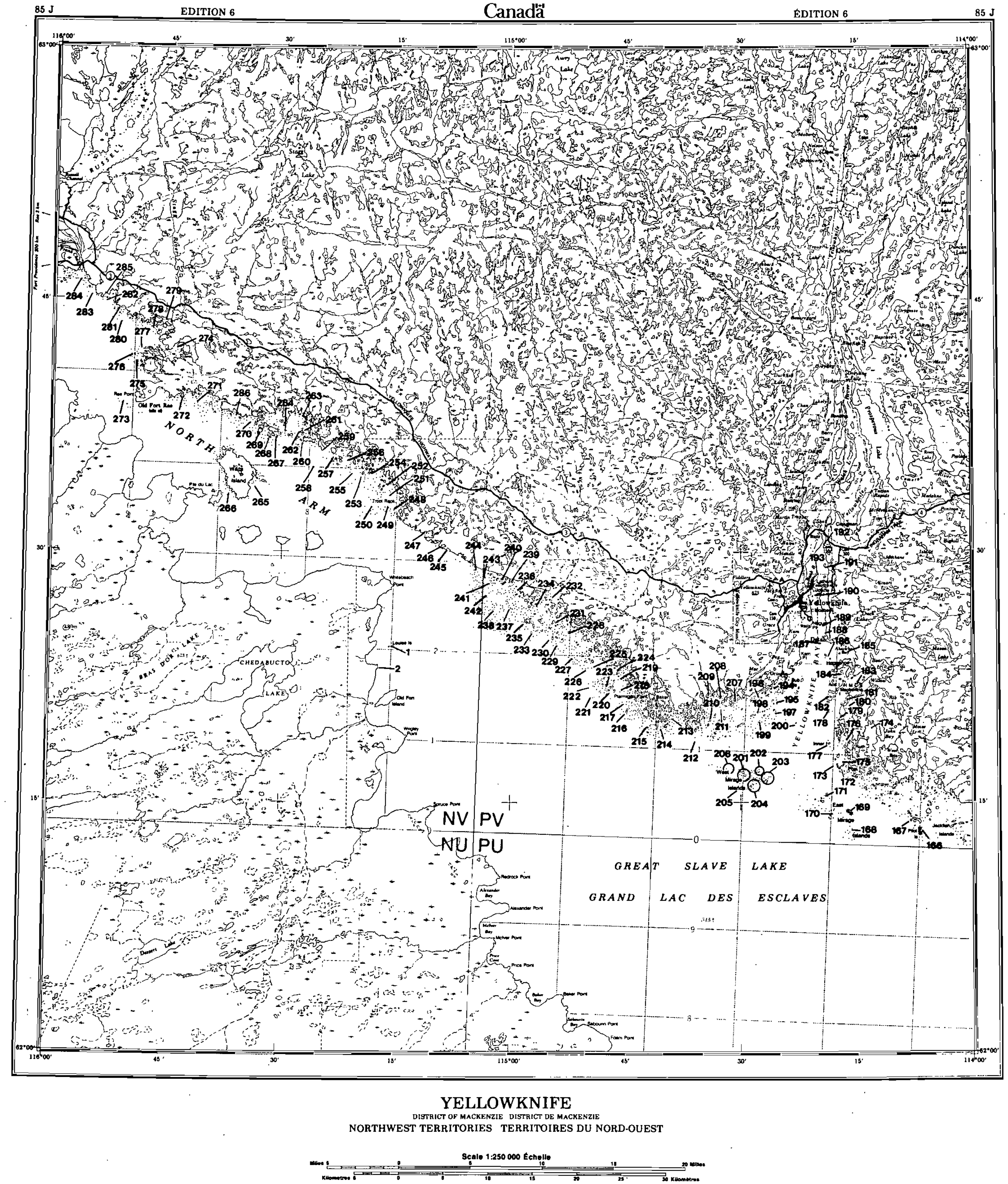


FORT RESOLUTION
NORTHWEST TERRITORIES
DISTRICT OF MACKENZIE
Scale 1:250,000

Appendix 4 *(cont'd)*
Locations of island-nesting sites, Great Slave Lake (Map 85I)



Appendix 4 *(cont'd)*
Locations of island-nesting sites, Great Slave Lake (Map 85J)



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