Forster's Terns Breeding in Ontario

Historical Trends and Recent Surveys of Eastern Lake St. Clair and Long Point, Lake Erie

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Forster's Tern nest, Cook's Bay, Lake Simcoe, late 1990s. *Photos: Glenn Barrett, Environment Canada.*

Introduction

The Forster's Tern (*Sterna forsteri)* has one of the most unusual histories of any bird species in Ontario. Its nesting at "St. Clair Flats", the north end (Canada and the U.S.) of Lake St. Clair, was well-known and documented in the late 1800s (Collins 1880, Morden and Saunders 1882, Langille 1884, McIlwraith 1894), a time of intense egg collecting. However, at that time, no estimate was made of the number of birds nesting or the extent of its nesting area on Lake St. Clair. Bent (1921) included Port Maitland (presumably the Dunnville Marshes, in Haldimand Co.) in a list of breeding areas, but no details were given and the record cannot be traced (McCracken 1987).

This period of activity in the late 19th century seems to have been followed by a hiatus of more than 90 years with no reported nesting of the species whatsoever (Baillie 1958). Presumably it still nested in the Ontario waters of Lake St. Clair but we have no confirmation. It did nest commonly on the U.S. side of Lake St. Clair during this period (Baillie 1958).

At Long Point, Lake Erie, breeding was first suggested as a possibility as early as 1950, when 9 birds were reported on 15 July (Baillie 1950). In 1975, A. Wormington observed 8 adults, 4 immatures, and 12 flying young-of-the-year (Goodwin 1975). It was not until 1976, however, that breeding was documented definitively, with the discovery of about 50 nesting pairs (Speirs 1985). By the mid 1980s, this number increased to an estimated 200+ pairs, but the colony collapsed thereafter due to high water levels (McCracken 1987, Weseloh 2007).

Forster's Tern was found nesting at Lake St. Clair and a few other locations during both the 1st and 2nd Ontario Breeding Bird Atlases (McNicholl 1987, Weseloh 2007). It was also found nesting annually in Cook's Bay, Lake Simcoe, during 1996-1999; the maximum number of nests there was 13 (DVCW, unpubl. data). Outside of a possible nest record on Lake of the Woods near Rainy River, all breeding of this species occurred in southern Ontario (Weseloh 2007).

The purpose of this article is to pull together as many of these records (post-1976) as possible with any quantitative data that may have been collected by the original observers. We also report on two recent surveys of Forster's Tern colonies by the authors on Lake St. Clair and at Long Point, Lake Erie.

Methods

We used several comprehensive, Ontario-wide surveys to provide information on the distribution and population size of Forster's Terns and how these have changed over time. First, were the three decadal colonial waterbird surveys, conducted by boat and at approximately 10-year intervals from 1977 to present by the Canadian Wildlife Service (CWS) and its partners. Included in this program were two surveys specifically designed to census Black Terns (*Chlidonias niger*) and Forster's Terns nesting in coastal Great Lakes wetlands, conducted by CWS in 1991 (Austen *et al.* 1996) and Bird Studies Canada (BSC) in 2001 (Graham *et al.* 2002). Second, were the first (Cadman *et al.* 1987) and second (Cadman *et al.* 2007) Ontario Breeding Bird Atlases (OBBA), providing complete coverage of the Forster's Terns' breeding range across the province. Nest records for years outside of the comprehensive survey periods were obtained from the Ontario Nest Records Scheme (ONRS) and from published sources.

We also report on two recent surveys of Forster's Tern colonies at Tic Tac Point, Lake St. Clair (2007) and Long Point, Lake Erie (2009). The Tic Tac

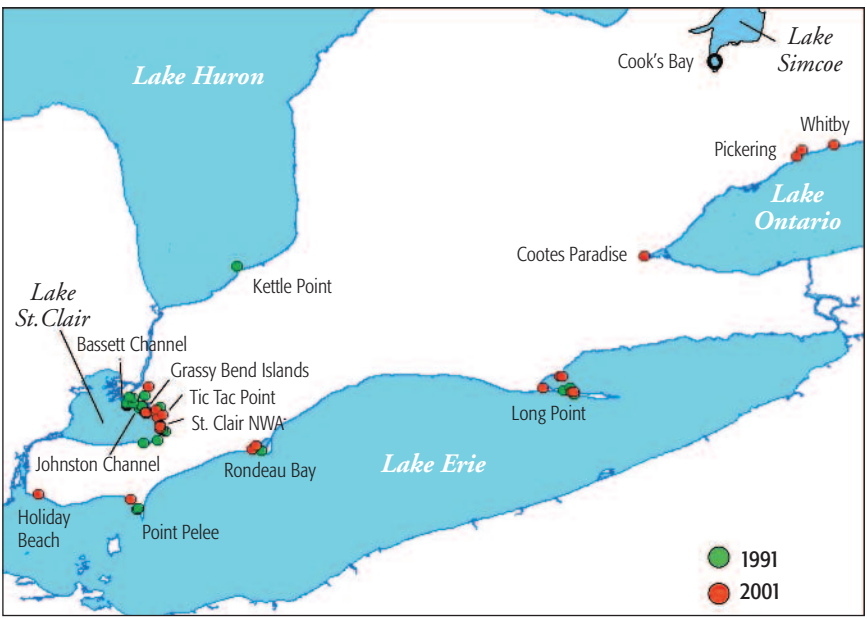

Figure 1. Nesting locations of Forster's Terns in Ontario during the 1991 (green circles) and 2001 (red circles) 'decadal' surveys. Nest records from Cook's Bay, Lake Simcoe (open circle) occurred between survey periods.

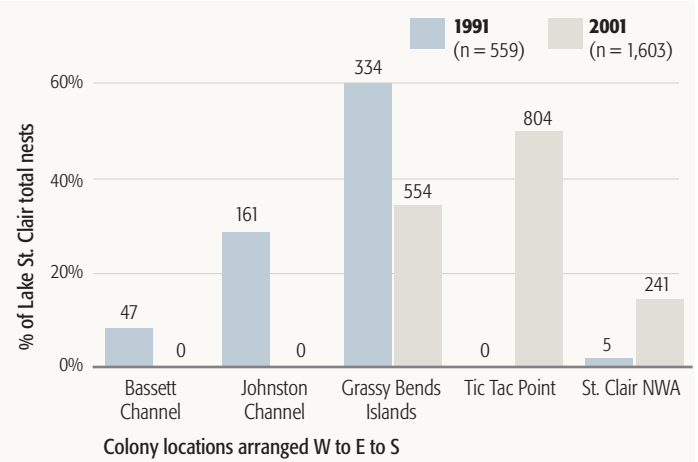

Figure 2. The proportion of nests at each of five colony locations in Lake St. Clair during the 1991 (blue bars) and 2001 (gray bars) 'decadal' surveys. Nest counts are shown above the bars.

Point islands were accessed by flat bottom boat using a "mud buddy" motor, launched from an access canal approximately 1 km to the SSE. We landed on any island from which Forster's Terns flushed. Usually two observers walked the perimeter and central portion of each such island; nests were marked with a small spot of spray paint to prevent double counting and the contents of all nests were recorded. The number of adults flying overhead was also noted. At several sites, an estimate of the number of nests was made from the boat due to the presence of large numbers of mobile chicks. The Long Point sites were surveyed by two people wading through the emergent vegetation to conduct nest counts; the number of adults present was assessed by counts from photographs.

Results

Population Trends and Distribution

Breeding has been restricted to a number of locations (Figure 1), some of which have been occupied consistently since the late 1970s; nesting at other sites has been much more intermittent. Within these general breeding locations, nest counts and colony sites have varied markedly among survey periods (Table 1). In both the 1991 and 2001 decadal surveys, 95% of all Ontario nests were found in Lake St. Clair (559 of 588 nests in 1991; 1603 of 1677 nests in 2001; Table 1). Major breeding sites in Lake St. Clair included: (i-iii) three main areas of the Bkejwonong Territory (Walpole Island First Nation) — Bassett Channel in the west and Johnston Channel and the Grassy Bend Islands in the east, (iv) Tic Tac Point and (v) St. Clair National Wildlife Area (St. Clair NWA).

There was a major shift in distribution between decadal survey periods, with the concentration of nests moving from the western part of Lake St. Clair to the eastern shoreline (Figure 2). Declines were observed at both Bassett Channel (47 nests in 1991 to 0 nests in 2001) and Johnston Channel (161 nests to 0 nests), with corresponding increases at Tic Tac

Table 1. Ontario nest records of Forster's Terns, 1976-2009. Columns in blue indicate nest counts from comprehensive, province-wide surveys: Decadal Waterbird Surveys in 1991 and 1992; OBBAs in 1981-85 and 2001-05. (see text for citations of various sources)

Water Body	Colony	1976-77	1979	1981	1982	1983	1984	1985
Lake of the Woods	Rainy River							
Lake Huron (main body)	Corsdu Reef							
	Kettle Point							
Lake St. Clair	Tremblay Beach							
	Jeanette's Creek							
	St. Clair NWA	14						
	Tic Tac Point	8						
	Mitchell's Bay - north							
	Walpole Island - Grassy Bend Islands							
	Walpole Island - Johnston Channel							
	Walpole Island - Snooks Lake							
	Walpole Island - Bassett Channel	8	2			3		
	Walpole Island - Squirrel Island	12						
	Walpole Island - unspecified	12						
	Walpole Island - Total	**32**	**2**			**3**		
Lake Erie	Holiday Beach							
	Point Pelee							
	Rondeau Bay	0		18	58	2	6	30
	Long Point	50		154	91			
Lake Ontario	Cootes Paradise							
	Rouge River Mouth							
	Frenchman's Bay							
	Whitby Harbour							
Lake Simcoe	Cook's Bay							
	TOTAL	**104**	**2**	**172**	**149**	**5**	**6**	**30**

N = nesting, prob =probable nesting, poss = possible nesting (see Cadman *et al.* 2007 for definitions).

1981-1985	1986	1990	1991-92	1996	1997	1998	1999	2001	2001-2005	2007	2009
poss									poss		
0			0					0	0		1-3 poss
N			3					0			
poss			4					0			
prob			0					0			
N			5					241	N		
N			0					804	N	640	
N			0					2	N		
N			334					554	N		
N			161					0	N		
N			8					0	N		
N	382		47					0	N		
N			0					0	N		
N			0				26	2	N		
N	**382**		**550**				**26**	**556**	**N**		
			0					2	N		5-7
poss			10					30	N		
N		200	3					12	N		
N	162		13					20	N		150
0			0					2	N		
0			0					1	N		
0			0					4	N		
0			0					3	N		
poss				13	10	2	6		N		
	544	**200**	**588**	**13**	**10**	**2**	**32**	**1677**		**640**	**156+**

Not included: possible nesting during 1981–85 (McNicholl 1987) at (a) two squares on St. Clair River, (b) one square on the Detroit River and (c) two blocks north of Lake of the Woods in southwest Ontario.

Point (possibly nesting in 1991 to 804 nests in 2001) and St. Clair NWA (5 nests to 241 nests); three colonies at Grassy Bend Islands accounted for substantial numbers of nests in both surveys (334 in 1991, 554 in 2001; Figure 2). All of these sites were occupied during the second OBBA (Weseloh 2007). More ephemeral nesting within Lake St. Clair occurred at other sites on the Bkejwonong Territory, Trembley Beach lagoons and Jeanette's Creek (Table 1).

Away from Lake St. Clair, most Forster's Tern nests occurred on Lake Erie, representing approximately 4% of nests found in both the 1991 and 2001 decadal surveys (26 of 588 nests and 64 of 1,677 nests, respectively; Table 1). The main breeding sites were: (1) Point Pelee National Park, near Leamington, Ontario (2) Rondeau Bay, near Erieau, Ontario and 3) Long Point, near Port Rowan, Ontario (Figure 1).

Forster's Terns have been reported breeding at Long Point since at least 1976 when there were an estimated 50 nests (McCracken *et al.* 1981), based on the observation of 100 adults (ONRS; 1976 record by A. Wormington) and the confirmation of at least 28 nests during late May-early June (by E. Dunn, M. Field and D. Hussell; Goodwin 1976). Since then, the number of nests at Long Point has fluctuated markedly. Forster's Terns did not nest there in 1977 (Blokpoel and McKeating 1978). JM found 154 nests at 8 separate colonies (range: 1-85 nests per colony) during an extensive survey made between 19 May and 12 June 1981 (McCracken 1981). The following year, he surveyed the same areas and found 91 nests at 9 locations (range: 1-44 nests per colony), and estimated that only 10-20% of these nests were successful (McCracken 1982). G. McKeating also reported "many nests washed out" in 1982 (ONRS). Long Point supported 162 nests in 1986 (M. McNicholl, pers. comm.). During the 1991 decadal survey, only 13 nests were found (10 confirmed, 3 probable), while the 2001 decadal survey yielded 20 nests. Up until 2009, all documented nestings at Long Point occurred in the large, broken expanses of cattail marsh several kilometres east of the Provincial Park (i.e. in the Thoroughfare Point Unit of the Long Point National Wildlife Area and in the Long Point Company marshes).

A pair of Forster's Terns was believed to have nested at Rondeau Bay in 1970 (Goodwin and Rosche 1971). However, it was not until the period of the first OBBA that nesting was actually documented at Rondeau (range = 2 – 58 nests and mean = 22.8±22.5 nests during 1981-85; Table 1; McNicholl 1987). Two hundred nests were recorded in 1990 (P.A. Woodliffe, ONRS); fewer during the 1991 (n=3 nests) and 2001 (n=12 nests) decadal surveys (Table 2). Overall nest abundance, and the degree to which it varied among years, was similar between Rondeau Bay (range = 2 to 200 nests) and Long Point (range = 13 to 162 nests; Table 1).

Forster's Terns have been reported breeding at Point Pelee less frequently. The first suggestion of nesting appears to be the report of an adult seen feeding a young bird on 12 July 1975 (Goodwin 1975). The only documented breeding records come from the two decadal survey

periods (10 possible nests in 1991, 30 nests in 2001). More recently, breeding has been reported at the wetlands associated with Holiday Beach Conservation Authority (where Big Creek empties into Lake Erie), near Malden, Ontario: 2 nests in 2001 (Graham *et al.* 2002) and 5-7 nests in 2009 (D. Ware, pers. comm.).

Since 1991, small concentrations of Forster's Tern nests have also been found farther afield from lakes St. Clair and Erie. From 2-13 nests were found each year during 1996-99 at Cook's Bay, in southern Lake Simcoe (DVCW, unpubl. data; Table 1, Figure 1), and breeding evidence was also reported in the second OBBA (Weseloh 2007). There are two breeding records from the main body of Lake Huron; (Table 1). During the 1991 decadal census, three probable nests were recorded in the coastal marshes east of Kettle Point, Ontario; no terns were found there in 2001. On 17 June 2009, at least 3 (3-5) Forster's Terns were present, and possibly breeding, at a small Common Tern (*Sterna hirundo*) colony (n= 27 nests) on a shoal SSW of Corsdu Reef, off the western coast of the Bruce Peninsula near Oliphant, Ontario (DJM, unpubl. data).

Forster's Terns were first recorded breeding along the Lake Ontario shoreline during the 2001 decadal survey: (i) two nests at Cootes Paradise, at the western end of Hamilton Harbour, (ii) a single nest at the mouth of the Rouge River, near Pickering, Ontario, (iii) three nests at Whitby Harbour and (iv) four nests at Frenchman's Bay marsh, also near Pickering, Ontario (Graham *et al.* 2002; Table 1). Finally, Forster's terns were also recorded as possible breeders on Lake of the Woods near Rainy River during both the first and second OBBA (McNicholl 1987, Weseloh 2007). Possible nesting was also reported in two blocks north of Lake of the Woods during the first OBBA (McNicholl 1987).

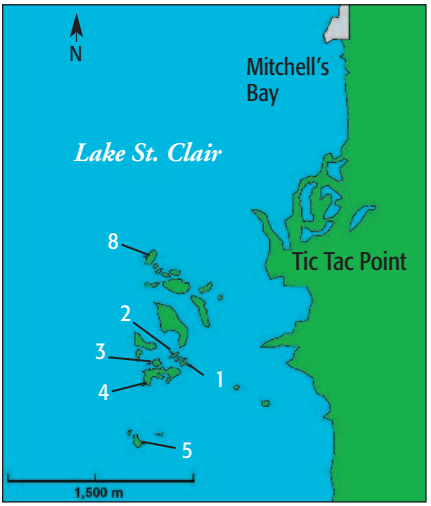

Figure 3. The locations of Forster's Tern colonies off of Tic Tac Point on Lake St. Clair in 2007. Colonies 6 and 7 are not shown, and were 3.5 km and 4.8 km south of the main cluster of colonies.

Recent Surveys

(1) Tic Tac Point

The Tic Tac Point islands (42.446, -82.430) are located south of Mitchell's Bay in eastern Lake St. Clair, approximately 0.5 km due west of Tic Tac Point (Figure 3). These 'islands' are essentially a series of sandbars, surrounded by shallow water (~60 cm deep), and covered to varying degrees with emergent vegetation (mainly *Typha* sp. cattails or *Phragmites* sp.). Open areas of these sandbars were usually covered with mats of dead vegetation, mainly cattail and *Phragmites* sp.

Table 2. Island characteristics, clutch size distribution and total number of nests and adults for Forster's Tern colonies surveyed near Tic Tac Point, Lake St. Clair in 2007.

	Latitude	Longitude	Size (ha)	Vegetation[1]
Tic Tac Point islands				
Island # 1	42.443517	- 82.429066	0.40	*Typha sp.*
Island # 2	42.443779	- 82.430414	0.16	*Typha sp.*
Island # 3	42.443416	- 82.431417	0.30	*Typha sp.*
Island # 4	42.442280	- 82.432687	0.08	*Phragmites sp.*
Island # 5	42.437846	- 82.433903	0.28	*Phragmites sp.*
				sub-total
				% of nests
Island # 6	42.411868	- 82.424935	0.37	not recorded
Island # 7	42.400398	- 82.421924	0.14	not recorded
Island # 8	42.451024	- 82.431852	0.48	*Typha sp.*
			0.28 ± 0.14[2]	

stalks, which had accumulated to a depth of up to 60 cm. It was on this 'rack' that the Forster's Terns constructed their nests.

During May 2007, CAF and Shawn Meyer (CWS) noted large concentrations of Forster's Terns while in the area conducting surveys of marsh-nesting birds. On 07 June 2007, DVCW, DJM, CAF and Gail Fraser visited the main cluster of the Tic Tac Islands to count nests and determine the breeding phenology of the colony.

In total, five sandbar islands were surveyed on the first day (Table 2, Figure 3). The small islands ranged in size from 0.08 ha to 0.40 ha (0.24±0.12 ha). The dominant emergent vegetation on three of the islands was cattail; the other two islands were covered with *Phragmites* sp. predominantly. A total of 470 nests was recorded: 20, 91, 94, 111 and 154 nests were found at the five colonies, respectively (Table 2). Most nests were constructed on more elevated areas of the island such as on sand ridges or mounded rack; even so, most nests were within 30 cm of the waterline. Forty-three percent of nests had three (or four) eggs, which is considered the average clutch size for this species (McNicholl *et al.* 2001); 31% had two eggs and 14% had a single egg or were empty. An additional 13% of nests had chicks (n=26, mean brood size = 1.3±0.5, range = 1-3 chicks) or were in the process of

[1] predominant vegetation cover; [2] mean± 1SD, * estimate based on 1:1 ratio of adults to nests (see text)

Nest Contents (e = eggs, c = chicks)								
0 e	1 e	2 e	3 e	4 e	e + c	c	Total Nests	Adults overhead
3	7	1	7	0	2	0	20	36
2	2	23	63	1	0	0	91	110
5	9	42	54	0	0	1	111	115
2	4	37	38	0	10	3	94	100
7	23	41	37	2	22	22	154	130
19	**45**	**144**	**199**	**3**	**34**	**26**	**470**	**491**
4.0%	**9.6%**	**30.6%**	**42.3%**	**0.6%**	**7.2%**	**5.5%**		
--	--	--	--	--	--	--	50*	50
--	--	--	--	--	--	--	80*	80
--	--	--	--	--	--	--	35*	40
							635*	661

hatching (n=34; mean = 1.4±0.5 eggs + 1.2±0.4 nestlings; Table 2). The oldest nestlings seen were 5-10 d old; most nestlings ranged from freshly hatched to 3 d old. There was some variation in nesting phenology among islands; interestingly, the two *Phragmites*-dominated islands were more advanced than the cattail islands (Table 2). There was roughly a 1:1 ratio between the number of adults present (n=491) and the number of nests (n=470).

In addition, to the Forster's Tern nests, we also found the nests of: Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus,* n=3), Green Herons (*Butorides virescens,* n=2), Mute Swans (*Cygnus olor,* n=3), Mallards (*Anas platyrhynchos*, n=3) and Herring Gulls (*Larus argentatus*, n=1). One of the islands in the cluster, distinct from the Forster's Tern colonies, supported a Ring-billed Gull (*L. delawarensis*) colony of an estimated 300-400 nests.

During the next few weeks, additional islands to the north and south of the main cluster of sandbars off Tic Tac Point were surveyed by CAF and Shawn Meyer for the presence of nesting Forster's Terns. Two more sites were discovered to the south of the main colonies: one island (island #6), ~ 3.5 km to the south, had 50 adults flush on 14 June 2007; 80 adults flushed from a second island (island #7), ~ 4.8 km to the south, on 20 June 2007.

Some nests at these colonies had eggs, but a thorough census was not conducted due to the presence of large numbers of mobile chicks. Three pairs of Green Herons also flushed from island # 6. A final Forster's Tern colony was discovered on 20 June 2007, approximately 0.5 km to the north of the original main cluster of nesting sites (island #8). Thirty to forty adults flushed from this site; most nests seen at the water's edge contained 1-2 eggs but some nests had chicks. This colony was also not censused. Given the 1:1 ratio of adults to nests observed on 07 June 2007, we estimate 50, 80, and 35 nests, respectively, for islands #6, #7 and #8 (Table 2). Therefore the total number of Forster's Tern nests in the area of Tic Tac Point was estimated at 640 nests.

It is only recently that Forster's Terns have been recorded nesting at this location. Eight nests were recorded here during the first CWS decadal waterbird survey (1976-77; ONRS, 1977 record by George Peck) and were recorded as 'possibly nesting' during the second decadal survey (1991) although no nests were found (Austen *et al.* 1996). During the third decadal survey in 2001, however, 804 nests were counted, representing 48% of all nests found in Ontario (Graham *et al.* 2002). The number of nesting pairs for this location in 2007 was reduced slightly compared to the 804 nests counted in 2001, but it still represents an important, and perhaps the most significant, breeding area in Ontario.

(2) Long Point

Long Point is a 32-km long peninsula on the north shore of east central Lake Erie. Together with the adjoining wetlands at Turkey Point, it includes several thousand hectares of marshland. The most extensive amounts of suitable habitat for nesting Forster's Tern are closely associated with beds of cattail in the shallow waters of the Inner Bay. Farther to the west, the expansive marshes that are associated with the Big Creek delta are largely dominated by grasses and sedges and provide far less suitable nesting habitat for Forster's Terns.

During May through early June of 2009, there were regular sightings of large numbers of Forster's Terns to the east of the marina at the western terminus of Long Point, leading to the suspicion that the terns were nesting nearby (D. Hussell, S. Mackenzie and JM, pers. obs.). On 9 June 2009, Nick Bartok and his field crew were surveying the Long Point marshes for Least Bitterns (*Ixobrychus exilis*) and reported being mobbed by Forster's Terns when they conducted a point count at a small bed of cattails. The crew returned on 11 June 2009 and confirmed finding some nests with eggs, and estimated 75-100 adults flying around.

On 12 June 2009, JM and Stu Mackenzie (BSC) visited the site and discovered that there were actually two colonies in close proximity. Both colonies were in marshes owned by the Province of Ontario (part of what is called the "Crown Marsh" at Long Point). At the larger, more southerly colony (Colony A, Figure 4), at least 122 adults flushed (the number determined from counts taken from photographs). A partial count of the colony revealed 54 nests, many with 3-egg clutches; approximately 10 nests had

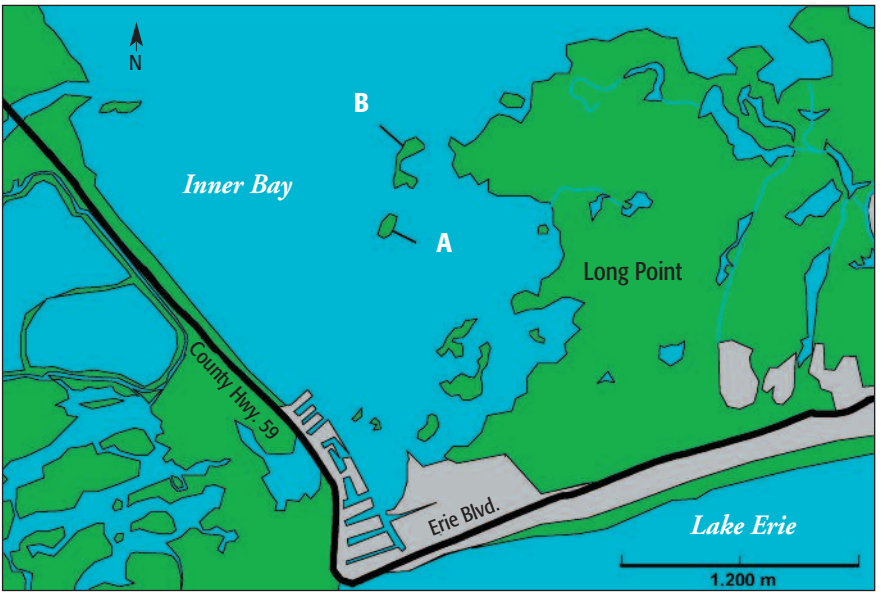

Figure 4. The locations of Forster's tern colonies (A and B, see text) at Long Point on Lake Erie in 2009.

recently hatched young and about a dozen nests were empty and the young were probably hiding nearby (no egg shells or signs of nest disturbance were observed). Based on the number of adults present and the density of nests in the area surveyed, the total size of Colony A was estimated at a minimum of 100 nests. Colony B (Figure 4) was estimated at 25-30 nests, based on the number of adults that flushed from this site. In total, both colonies were estimated to contain as many as 150 nests, representing the largest numbers of Forster's Terns nesting at Long Point since the mid-1980s.

Both colonies were located in small beds of emergent cattails. The cattail bed in Colony A was approximately 60 m x 100 m (~0.60 ha); the cattail stand at Colony B was about twice that size. Both areas were located in fairly deep water (120 cm+) and dominated either by *Typha angustifolia* or *T.a. x T.glauca*. There was a lot of muskrat activity at both colony sites and many of the nests were built on top of lodges (often three or more nests on a single lodge); others were constructed on floating mats of dead cattail. The bottom substrate at both sites was very loose silt/muck. The nesting substrate at Long Point was, therefore, considerably different from that observed at Tic Tac Point in 2007 (see above).

The Long Point colonies were located approximately 1 km from a local marina. A substantial amount of recreational boat traffic would have passed by both sites, which were each located about 0.25 km from the main boating channel from the marina to the Inner Bay. Hence, they

were potentially exposed to considerable disturbance from the watercraft themselves and the wake they would have produced. The colonies were not visited later in the season to assess the degree to which this factor may have affected breeding success. However, as most nests were elevated on muskrat lodges or on floating mats of cattail, the potential negative effects of boat traffic may have been dampened to some degree.

As noted earlier, up until 2009, all previous nestings of Forster's Terns at Long Point have occurred in various sections of two favoured areas that are located from 2 to 4 km east of Long Point Provincial Park. The 2009 nestings, however, were located farther to the west, and much closer to the base of Long Point. Intensive surveys of the traditional locations by Stu Mackenzie, Nick Bartok, and JM in the summers of 2008 and 2009 failed to locate any Forster's Terns breeding at these sites, though foraging birds were occasionally seen.

Discussion

Forster's Terns nesting in Ontario occur at the extreme eastern edge of this species' main breeding distribution in the Great Basin Desert and Prairie Pothole Region areas of North America, with scattered local populations elsewhere (isolated nesting also occurs on the Atlantic coast; McNicholl *et al.* 2001). After a perceived absence of at least 90 years, Forster's Terns were again recorded nesting in Ontario in 1976 at Long Point. Since then, the number of nests in Ontario has increased dramatically to greater than 1,600 during the last complete census in 2001 (Graham *et al.* 2002). Many nesting sites have been occupied on a consistent basis over the past three decades (Table 1). However, the number of nests recorded at individual sites has varied markedly among years; for example, at Rondeau Bay and at Long Point during the period from 1976-91 (Table 1). It also appears that considerable variation in colony site location can occur over relatively short time scales. McCracken (1982) reported a complete shift in colony locations at Long Point between successive years (1981 and 1982), despite similar numbers of colonies, ranges of colony size and total nest numbers among years. These unusual population patterns raise a number of questions. First, why did Forster's Tern become extirpated from Ontario during the late 19th or early 20th centuries and remain absent for so long? Second, what prompted their return and subsequent population increase during the latter part of the 20th and early 21st centuries? And finally, why do nest numbers at traditional Ontario breeding sites fluctuate so much from year to year?

One reason for the long absence, followed by a resurgence, may be that the Forster's Terns breeding in Ontario represent a small sub-population of birds, at the edge of their main distribution, and isolated from the main concentration of breeders in the interior of North America (McNicholl *et al.* 2001). The very nature of this isolation would make this sub-population more subject to random factors and prone to abrupt increases or decreases in size. However, the long gap

in Ontario nest records may not necessarily be in response to an overall decline or range contraction for this species. Although not well-suited to monitor waterbird species with clumped nesting distributions, the long-term Breeding Bird Survey data indicate that Forster's Tern numbers have been stable at a continental scale since the mid-1960s (a non-significant increase of 0.66 individuals/hr from point counts, 1966-2007; Sauer *et al.* 2008). Caution should be exercised, however, as no good historical trends exist; the ephemeral nature of nesting habitat makes it difficult to distinguish between changes in distribution and changes in population size (McNicholl *et al.* 2001).

An alternative explanation for the erratic fluctuations in the number of Forster's Tern nests in Ontario might simply be a function of incomplete survey coverage. Forster's Tern colonies can be difficult to find and nests can be difficult to count even once the colony has been discovered. At least some of the major nesting sites occur on private property and may not be readily detected during casual surveys. Even when permission is granted, access into many wetlands can be limited. Searching for nests presents a further challenge, especially in situations where floating nests are hidden within stands of emergent cattails. Access to most nests requires wading from the small boat used to reach the colony site. To illustrate, during the second OBBA, only 54 nests Forster's Tern nests were confirmed (i.e. nests located; Cadman *et al.* 2007) at a time when hundreds of observers were actively searching for breeding evidence and the total population for the province was likely in the order of 1,000 nests.

A more likely explanation for the sporadic nesting patterns observed for Forster's Terns is related to their somewhat unique nesting strategy. In Ontario, this species nests colonially in freshwater marshes, usually within stands of emergent vegetation and adjacent to open water. Nests are normally constructed on heaps of washed-up or floating vegetation, or atop muskrat lodges (McNicholl *et al.* 2001). Therefore, the availability of nesting habitat, nest distribution and breeding success are all sensitive to fluctuations in water levels. According to McNicholl (1975), change in colony sites is a common feature of Forster's Tern breeding ecology, and that a lack of site tenacity and the ephemeral nature of colonies was probably reflective of an adaptation to a nesting environment that was itself prone to change.

McNicholl (1987) attributed the presence of Forster's Terns in south-western Ontario to periods of high water levels; continuous, above-average water levels were recorded during the late 1800s and again starting in the late 1970s, periods when Forster's Terns were known to be nesting in the province. Water levels remained relatively high from the mid 1970s to the late 1990s on Lakes St. Clair and Erie (The Canadian Hydrographic Service; http:// www.waterlevels. gc.ca/ C&A/ net graphs- _e.html), which may explain the consistent nesting and increase in nest numbers since the perceived re-colonization of Ontario in the 1970s. However, water levels were only

slightly lower on these water bodies during the mid 1940s to mid 1950s when no Forster's Tern breeding was detected, presumably because they were absent or present in very low numbers. Therefore, fluctuations in Great Lakes' water levels only provides a partial explanation for the long hiatus of breeding records by this species in Ontario.

Over shorter time scales, colony site selection does appear to be linked to the availability of suitable nesting substrate. McCracken (1982), observed an inter-year shift in colony locations at Long Point; terns nested at eight distinct sites in 1981, which were abandoned for nine new sites in 1982. The predominant nesting substrate in both years was rafts of dead cattail, floating within deep-water stands of emergent cattail. These rafts of vegetation were only present at the new colony sites and not at the sites occupied the previous year. It seems likely that both water level and wind action affect where these floating mats of cattails would accumulate or dissipate, thereby dictating where Forster's Tern colonies would develop (Graham *et al.* 2002).

While the fluctuations in water level and the associated affects on the availability of suitable breeding habitat are important factors influencing Forster's Tern population dynamics, local declines have also been attributed to competition for nesting space with other colonial-nesting species. Colonization of one island site by Ring-billed Gulls was suspected as the cause of a sharp decline in the number of Forster's Terns breeding in Rondeau Bay between 1990 and 1992 (Austen *et al.* 1996). Scharf and Shugart (1984) suggested that higher water levels favoured Forster's Terns, in part, because of the differentially adverse affect on Common Terns (*Sterna hirundo)*, thereby reducing competition for nesting space between these species. In addition, McCracken (1982) suggested that the proximities of suitable loafing and feeding areas were also important factors affecting colony site selection by Forster's Terns.

A comprehensive survey of marsh nesting terns by CWS is planned to begin during the 2010 breeding season. After it is completed, we will be in a better position to assess population trends and distributional changes for this species. As water levels have been stable but relatively low for the past decade (The Canadian Hydrographic Service; see link above), one might predict a decline in the number of Forster's Tern breeding pairs.

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