

An Assessment of Breeding Populations of Common Terns and Black Terns in the St. Marys River Area of Concern (Ontario)



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Purpose

The purpose of this summary is to report on the results of recent assessments of breeding populations of Common Terns (*Sterna hirundo*) and Black Terns (*Chlidonias niger*) within the St. Marys River Area of Concern (AOC) (Ontario) following the recommended action put forward in the Stage 2 Remedial Action Plan report (Environment Canada *et al.* 2002). These assessments are based on nest count surveys conducted in the AOC and are supplemented with historical breeding data for these species where available. Population trends for other colonial waterbirds based on decadal surveys are also reported to provide a broader historical context of trends in diversity and abundance of breeding colonial waterbirds in the St. Marys River AOC.

Methods

Since the 1970s, Canadian Wildlife Service (CWS) biologists have conducted four decadal surveys of colonial waterbirds nesting on the Canadian side of the Great Lakes. In the St. Marys River (Ontario), these surveys were completed in 1978/80 (1st survey), 1989 (2nd survey), 1999/2000 (3rd survey) and with the most recent decadal survey (i.e., 4th survey) in 2007/2008 (Blokpoel and Tessier 1996, 1997, 1998; Morris *et al.* 2003, 2010, 2011, 2012; Rush *et al.* in review; CWS unpublished). During these surveys, all nests of colonial waterbirds were counted individually using the total count methods of Blokpoel and Tessier (1996). The results of decadal surveys of colonial waterbirds in the North Channel of Lake Huron are also reported to provide a comparison of trends downstream and beyond the influence of the AOC. For the purpose of reporting on colonial waterbird trends, the North Channel is defined as the area bounded by the contiguous shoreline from McNab Reef in St. Joseph Lake, which is northeast of Campement d'Ours Island, to Frazer Bay, located southeast of McGregor Point on the mainland. The southern boundary of the North Channel includes Manitoulin Island, Cockburn Island and the international boundary.

In addition to the decadal surveys conducted within the AOC, additional surveys were conducted from 2010-2013 as part of two separate Environment Canada (EC) studies of Common Terns in the region. Nest counts from these studies are included to examine more recent trends in abundance in the AOC. One of these studies was conducted in 2011 and 2012 to assess the reproductive status of Common Terns and Herring Gulls breeding within the St. Marys River AOC (Hughes *et al.* 2014). Noteworthy is that in 2011 the only breeding Common Tern colony in the AOC was at an island NNW of Hay Point near the southwestern shoreline of St. Joseph Island. This colony was abandoned early in the breeding season and subsequently a colony located at North Sister Rock, just beyond the AOC boundary in St. Joseph Lake, was selected as the alternate AOC colony. For consistency purposes in this report, this nesting site as well as four other small tern nesting sites (i.e., McNab Reef, Hurt Rock, islet 200m SW of mouth of Sucker Creek, and South Sister Rock) are considered to be part of the AOC. This cluster of nesting sites, consisting of small rocks, are in close proximity to one another and are situated approximately 6 kilometres beyond the eastern AOC boundary at Quebec Bay. Surveys of these Common Tern nesting sites as well as other sites downstream were conducted from 2010-2013 as part of another EC study of breeding site tenacity and productivity of Common Terns on the North Channel (D.J. Moore, CWS

unpublished). Similar to that reported above, temporal trends of Common Tern populations in the St. Marys River AOC will be compared to trends reported for tern populations in the North Channel.

As part of the CWS decadal survey of Great Lakes coastal marshes conducted in 2010, marsh habitat within a 5 kilometre band along the St. Marys River shoreline was surveyed for Black Terns, as well as other marsh-nesting waterbirds. Nest counts were determined by either counting individual nests or by halving the maximum number of adult terns counted during a series of sweeps with binoculars and/or a spotting scope. Historical breeding data for Black Terns in the AOC are provided where available. These include CWS decadal surveys of coastal marshes (Graham *et al.* 2002) as well as evidence of breeding status based on data collected for the first and second Ontario Breeding Bird Atlases in the St. Marys River (Cadman *et al.* 1987, 2007).

Results and Discussion

Historical Context – Colonial Waterbirds in the St. Marys River AOC (Ontario)

As part of the 4th decadal CWS Great Lakes colonial waterbird survey, four species including the Herring Gull (*Larus argentatus*), Common Tern, Ring-billed Gull (*Larus delawarensis*) and the Great Blue Heron (*Ardea herodias*) were found nesting on the St. Marys River (Ontario) (CWS unpublished; Table 1a). In total, 882 nests (=breeding pairs) were found at eight nesting sites situated on natural habitat that consisted of islands, reefs, shoals, and the mainland (Figure 1). Herring Gulls were the most abundant species nesting at six sites with colonies ranging in size from 42 nests at one of two islands south of Pumpkin Point to 159 nests at the island west of Chene Island in the northern portion of the AOC. Ring-billed Gulls were the next most abundant species and were found nesting at the shoal northeast of Whitestone Reef (262 nests) and the island west of Chene Island (83 nests). Common Terns were found nesting at two sites with colonies on the island NNW of Hay Point near the southwestern shoreline of St. Joseph Island (68 nests) and a nearby shoal west of Hay Point (10 nests). These two Common Tern nesting sites were not visited in 2008 as part of the survey for nesting terns in the St. Marys River; however, they were visited in 2010 and counts at these two sites are considered part of the 4th decadal survey. A single Great Blue Heron nest was found on Whitestone Reef in 2008.

Over the four CWS Great Lakes colonial waterbird decadal surveys on the St. Marys River, numbers of Herring Gull nests have remained high at over 450 nests (Blokpoel and Tessier 1996, 1997; Morris *et al.* 2003; CWS unpublished; Table 1a). Nest numbers decreased by -36.0% between the 3rd and 4th decadal surveys from 716 nests in 1999/2000 to 458 nests in 2007/2008. Ring-billed Gull nests which were relatively fewer in number during the first three decadal surveys (ranging from 0 nests to 14 nests) increased by two orders of magnitude from two nests found in the 3rd decadal survey to 345 nests in the 4th decadal survey (Blokpoel and Tessier 1996, 1997; Morris *et al.* 2011; CWS unpublished). Common Terns nested at two sites, Whitestone Reef and the island NNW of Hay Point, in the AOC in the 1st decadal survey (70 nests) and the 2nd decadal survey (159 nests; Blokpoel and Tessier 1996, 1997). While no nesting of Common Terns was reported in the AOC during the 3rd decadal survey in 1999, numbers of Common Tern nests increased in the 4th decadal survey (78 nests; CWS unpublished). The apparent abandonment of nesting sites by Common Terns in the AOC during the 3rd decadal survey is likely related to the low site fidelity shown by this species (see below), particularly evident in an area where

only three nesting sites have been historically reported. Great Blue Heron nests were found in low numbers at two different sites in two of the four decadal surveys: at an island south of Pumpkin Point in the 2nd decadal survey (3 nests) and at Whitestone Reef in the 4th survey in 2008 (1 nest; Blokpoel and Tessier 1998; CWS unpublished). Overall, the total number of colonial waterbird nests on the St. Marys River (Ontario) increased by +22.8% from 718 nests in 1999/2000 to 882 nests in 2007/2008, a finding largely driven by the dramatic increase in nesting Ring-billed Gulls in the AOC.

Table 1. Census data of colonial waterbird nests (=breeding pairs) on the Canadian side of the St. Marys River (a) during the 1st (1978/80), 2nd (1989), 3rd (1999/2000) and 4th (2007/08) decadal surveys as part of the Great Lakes colonial waterbird surveys conducted by the Canadian Wildlife Service (Blokpoel and Tessier 1996, 1997, 1998; Morris *et al.* 2003, 2010, 2011, 2012; CWS unpublished). Census data for colonial waterbirds on the North Channel of Lake Huron during the four decadal surveys are shown in (b). Percent change in nest numbers are based on comparisons between the 3rd and 4th surveys; NC denotes that rate cannot be calculated.

a) St. Marys River (Ontario):

Species	Census Year				Percent Change
	1978/80	1989	1999/2000	2007/08*	
Herring Gull	539	612	716	458	-36.0%
Ring-billed Gull	0	14	2	345	+17150%
Common Tern	70	159	0	78	NC
Great Blue Heron	0	3	0	1	NC
Totals	609	788	718	882	+22.8%

* Includes census data for two Common Tern nesting sites that were surveyed in 2010.

b) North Channel:

Species	Census Year				Percent Change
	1980	1989/91	1997-2001	2008/09	
Herring Gull	5,551	3,706	4,291	3,377	-21.3%
Common Tern	2,680	1,360	1,954	1,924	-1.5%
Ring-billed Gull	53,645	48,405	35,117	23,898	-31.9%
Great Blue Heron	206	82	108	43	-60.2%
Caspian Terns	547	603	338	377	+11.5%
Double-crested Cormorant	159	2,177	6,716	7,380	+9.9%
Black-crowned Night Heron	0	0	9	48	+433%
Great Black-backed Gull	0	0	1	0	-100%
Totals	62,788	56,333	48,534	37,047	-23.7%

Population trends of colonial waterbirds breeding in the North Channel of Lake Huron during the four decadal surveys are provided in Table 1b as a comparison to trends downstream of the St. Marys River AOC (Blokpoel and Tessier 1996, 1997, 1998; Morris *et al.* 2003, 2010, 2011, 2012, Morris *et al.* in press; Rush *et al.* in review; CWS unpublished). Seven species were reported breeding in the North Channel during the 4th decadal survey in 2008/09. In addition to the four species breeding within the AOC, Caspian Tern (*Hydroprogne caspia*), Double-crested Cormorant (*Phalacrocorax auritus*), and Black-crowned Night-Heron (*Nycticorax nycticorax*) were also found nesting. This region has historically

Figure 1. Locations of nesting sites for colonial waterbirds (white circles) and Black Terns (red circle) within the St. Marys River Area of Concern (Ontario) during surveys conducted in 2007/08/10. Also shown is the general location of the five Common Tern nesting sites (McNab Reef, Hurt Rock, Islet SW of mouth of Sucker Creek, North Sister Rock and South Sister Rock) situated just beyond the AOC boundary and considered within the AOC for the assessment of Common Tern populations in this report.



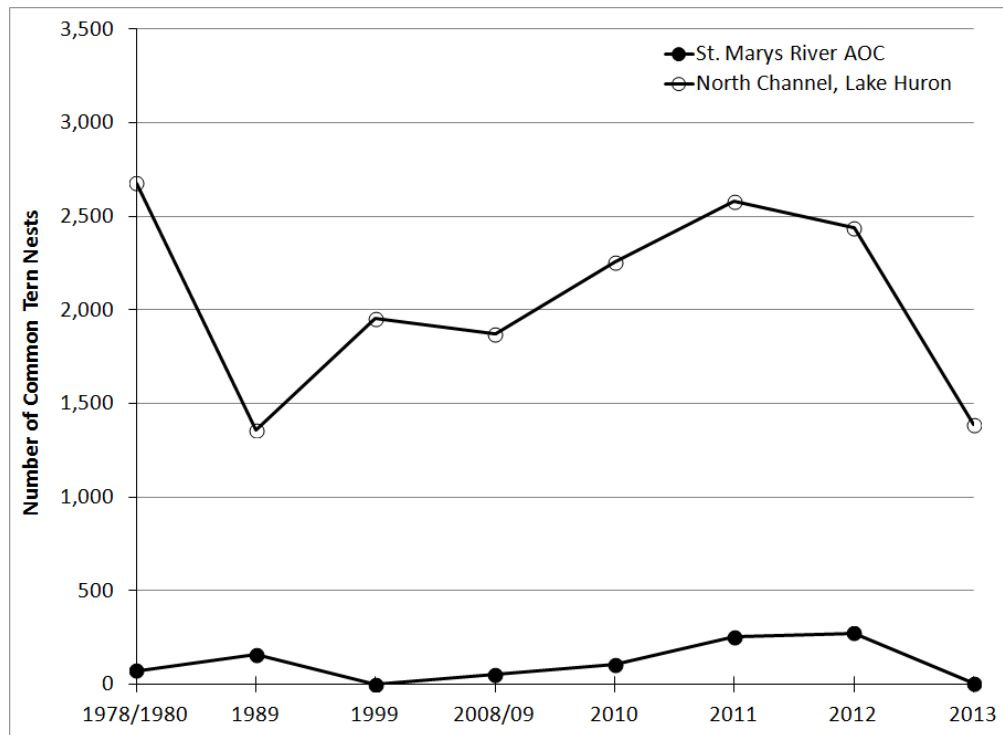
supported a rich diversity of colonially nesting waterbirds owing to its large expansive area consisting of numerous islands, reefs and rocks ideal as nesting habitat with the surroundings waters providing an abundant food supply. Over 37,000 nests were counted at 129 nesting sites during this survey period. Between the 3rd and 4th decadal surveys, increases in nest numbers were found for Caspian Terns (+11.5%), Double-crested Cormorants (+9.9%), and Black-crowned Night-Heron (+433%) in the North Channel. Similar to trends in the AOC, a decrease in nest numbers was found for Herring Gulls (-21.3%) while, in contrast to the AOC, decreases in nest numbers of Common Terns (-1.5%), Ring-billed Gulls (-31.9%), and Great Blue Heron (-60.2%) were found in the North Channel between the two last surveys. While a single Great Black-backed Gull (*Larus marinus*) nest was found in 1999, no nesting was reported by this species in this region in 2009. In the North Channel, a steady decrease in numbers of breeding colonial waterbirds has been found since the first decadal survey with an overall decrease in nest numbers of colonial waterbirds by -23.7% between the 3rd and 4th decadal surveys.

Trends in Breeding Populations of Common Terns

Based on the results of the four CWS Great Lakes decadal surveys and supplemented with data from recent surveys conducted by EC from 2010-2013, the total nesting population of Common Terns in the St. Marys River AOC generally ranged in size from a total of 53 nests in 2008 to 273 nests in 2012 (Figure

2). These counts include the additional five small nesting sites situated just beyond the AOC boundary as cited in the Methods (Figure 1). In two years, 1999 and 2013, nest numbers in the AOC were notably low with 1 and 3 nests, respectively, at single nesting sites. While a total of eight different nesting sites were occupied in the AOC during these eight surveys, numbers of nesting sites in each survey year ranged from one to five. The largest nesting colonies and corresponding years reported were: island NNW of Hay Point (1980, 1989, 2010: range=39-129 nests), McNab Reef (1999: 1 nest, 2008: 48 nests), South Sister Rock (2011: 109 nests), North Sister Rock (2012: 129 nests), and Hurt Rock (2013: 3 nests). Note that nest counts for two sites (i.e., island NNW of Hay Point and the nearby shoal west of Hay Point) in 2010 are grouped with census data for other colonies surveyed in that year. As a result, the total nest count may be underestimated in 2008/09 since these two colonies were not visited in that period. A complete listing of the eight nesting sites and corresponding nest numbers for the eight survey periods is provided in the Appendix.

Figure 2. Total nest counts of Common Terns in the St. Marys River AOC (Ontario) and the North Channel of Lake Huron for the four decadal surveys, 1978/80, 1989, 1999, and 2008/09 and annual surveys conducted from 2010-2013 as part of two complementary EC studies of Common Terns in the region. Note that the first four time-points on the x-axis are not evenly spaced time periods.



Breeding populations of Common Terns downstream in the North Channel were consistently higher than breeding populations in the St. Marys River AOC in every survey year (Figure 2). Colony sizes were larger and nesting sites were more numerous with total numbers of nesting sites ranging from 13 sites in 2010 to 28 sites in 1980. The largest nesting colonies and corresponding years reported were: island NE of Thessalon Dock (1980: 661 nests), island SW of Henry Island (1989, 2008, 2013: range=307-534 nests),

Batture Island (1999: 478 nests) and E island of the Cousins Islands (2010, 2011, 2012: range=525-1,142 nests). Nest numbers in this region were the highest in 1980 (2,677 nests), decreased in 1989 (1,360 nests), slowly increased reaching a peak in 2011 (2,582 nests) and then decreased in 2012 (2,440 nests) and 2013 (1,386 nests). While general declines in breeding populations of Common Terns have been reported throughout the Canadian Great Lakes over the four decadal surveys (Morris *et al.* 2012), declines in nest numbers were not as pronounced at colonies on Lake Huron (including the North Channel, as shown here) as those found on the lower Great Lakes.

Despite differences in the relative sizes of the breeding populations in the St. Marys River AOC and North Channel, there are some similarities in the patterns of abundance and site occupancy of Common Terns between the two regions which contributed to inter-year fluctuations in nest numbers observed. Specifically, nesting sites were not consistently occupied from year to year and there appeared to be considerable turnover in nesting sites between years. In the AOC, five of eight nesting sites (63%) were occupied in only one or two years of eight survey years and the remaining three sites were occupied in either three (South Sister Rock), four (North Sister Rock) or five (island NNW of Hay Point) survey years. This pattern of low site fidelity was effectively demonstrated in a broad EC 2010-2012 study of Common Terns in the North Channel where comparisons of nesting sites showed considerable turnover between consecutive study years: 14-59% of sites were abandoned, 9-55% of sites were newly colonized and 31-42% of sites remained active (D.J. Moore, CWS unpublished). These findings were further supported by the longer term decadal survey data for Common Terns in the North Channel (D.J. Moore, CWS unpublished). Morris *et al.* (2012) found similar evidence of shifts in site occupancy with high rates of abandonment and high rates of colonization of new sites at tern colonies on the Canadian Great Lakes (based on the decadal surveys), Newfoundland and New Brunswick.

These results highlight that low site fidelity in Common Terns is an important life history trait which must be considered in interpreting trends in abundance of Common Terns both at the local level (i.e., nesting colony) and the larger regional area. Inter-year fluctuations in nest numbers would be more pronounced in regions such as the AOC where Common Terns breed in relatively low numbers and at few nesting sites. In addition, the nearby proximity of the North Channel as well as the U.S. side of the St. Marys River with ample suitable habitat may facilitate selection of these regions as alternate nesting sites. This strategy may be beneficial for reproductive success under conditions of stress such as when predators are present. In 2011, significant predation of tern eggs early in the breeding season at the Hay Point colony in the EC Common Tern reproduction study was suspected to have resulted in abandonment of the colony which led to the subsequent selection of the next nearest colony for study at North Sister Rock. Predation was also severe at some North Channel nesting sites from 2010-2013 (CWS unpublished). Other general stressors known to influence productivity of Common Terns include adverse weather and water level fluctuations which were responsible for egg and chick losses at some North Channel nesting sites in 2010-2013 (CWS unpublished). Periods of high water levels in the northern Great Lakes have also been associated with loss of Common Tern nesting sites which would also impact population trends (Schugart and Scharf 1983). Contaminant levels in eggs of Common Terns collected from AOC colonies in 2011 and 2012 were not sufficiently high to impact reproductive success and development (Hughes *et al.* 2014). Based on the evidence from nest count surveys conducted from

1980 to 2013, trends in populations of nesting Common Terns in the AOC are likely related to factors consistent with the life history strategies of the species and that are not specific to influences in the AOC.

Trends in Breeding Populations of Black Terns

Based on the results of the CWS survey of marsh-nesting terns conducted in 2010, a large colony of Black Terns (88 nests) was found at Echo Bay, a large coastal wetland on Lake George (Figure 1). No other breeding colonies of Black Terns were found at coastal marshes along the St. Marys River (Ontario) shoreline. Additional evidence of Black Terns breeding at Echo Bay was also found in 2012 (point count surveys; Environment Canada 2013) and in 2013 when approximately 20 breeding pairs (nests) were counted (T. Hoar, pers. comm.).

Table 2 provides a summary of available data reporting breeding status of Black Terns at sites within the AOC, just beyond the AOC border and on the North Channel shown for comparisons purposes. During the CWS decadal survey conducted in 2001, one Black Tern colony (16 nests) was found on St. Joseph Island (Graham *et al.* 2002). This survey did not include Echo Bay or Pumpkin Point. No nests were found in surveys of sites beyond the AOC border and the North Channel in 2001 and 2010 although only a portion of the North Channel was surveyed in 2010. Overall it is not possible to report on temporal trends in abundance of Black Terns in the AOC since only two CWS surveys were conducted and some sites were not surveyed in both years. While an earlier CWS decadal survey of Great Lakes marsh-nesting terns was conducted in 1991, surveys did not include areas north of McGregor Bay near Little Current, Lake Huron and thus did not include the St. Marys River (Austen *et al.* 1996). Using data collected for the two Breeding Bird Atlases, nesting was confirmed at sites within the AOC during the periods 1981-1985 and 2001-2005 (Cadman *et al.* 1987, 2007). Based on the very limited data reported here, there is no evidence to suggest that breeding status for Black Terns nesting within the AOC differs from those nesting at sites downstream in the North Channel.

The Black Tern is a species of Special Concern in Ontario. Long term trends of Black Terns based on data collected by the Marsh Monitoring Program from 1995 to 2007 indicate a significant Great Lakes basin decline for Black Terns at a rate of -11.4% per year (Archer and Jones 2009). These trends are supported by Breeding Bird Survey data from 1970-2012 that showed population declines for Black Terns in Ontario at a rate of -5.54% per year and regionally in the Boreal Hardwood Transition Zone (Bird Conservation Region 12), which includes regions along the St. Marys River and North Channel shorelines, at a rate of -6.43% per year (Environment Canada 2014). As reviewed by Burke (2012), Black Tern populations in Ontario have disappeared from many traditional nesting sites and have declined at existing sites, particularly in southern Ontario where they were historically most abundant. The destruction and/or degradation of wetlands are among the most important factors contributing to population declines of this species (Dunn and Agro 1995). Habitat quality is also important as Black Terns prefer to nest in a hemi-marsh, i.e., a wetland with 50:50 open water and emergent vegetation. The extensive areas of large coastal wetlands on the St. Marys River provide nesting habitat for Black Terns compared to the sites further downstream in the North Channel which may be less suitable although confirmed breeding was reported on Manitoulin Island (Table 2; Cadman *et al.* 2007). Other

Table 2. Summary of available data reporting breeding status of Black Terns at sites within the St. Marys River AOC, beyond the AOC boundary and in the North Channel from 1981 to 2010. Shown are results of nest counts for surveys conducted by CWS and breeding evidence from the Ontario Breeding Bird Atlas (OBBA) with survey years/periods as indicated. "NS" denotes that the site was not surveyed.

Regions	OBBA1 square	OBBA2 square	Site Name	CWS Survey# 2001	CWS Survey 2010	OBBA1^ 1981-85	OBBA2^ 2001-05
St. Marys R. AOC	16GG25	16GS25	Echo Bay	NS	88	Possible	Possible
St. Marys R. AOC	16GG24	16GS24	Pumpkin Point	NS	0	Confirmed	Confirmed
St. Marys R. AOC	16GG21	16GS21	St. Joseph I. (Everens Pt./Sunset Pt.)	16	0	Possible	Confirmed
St. Marys R. AOC	16GG22	16GS22	St. Joseph I. (Reed Pt./Court Pt.)	0	0	Confirmed	Not Breeding
St. Marys R. AOC	16GG31	16GS31	St. Joseph I. (Outlook/Hay Point)	0	0	Not Breeding	Not Breeding
Beyond AOC boundary	17KB70	17KM70	St. Joseph I. (South A-D)	0	0	Probable	Not Breeding
Beyond AOC boundary	17KB81	17KM81	St. Joseph I. (Milford Haven)	NS	0	Confirmed	Probable
North Channel, Lake Huron	17KB73	17KM73	Desbarats	0	0	Confirmed	Probable
North Channel, Lake Huron	17LB91	17LM91	Spanish Marsh	0	NS	Confirmed	Not Breeding
North Channel, Lake Huron	17MA38	17ML38	Manitoulin Island	0	NS	Possible	Confirmed

CWS decadal survey of Great Lakes coastal marshes (2001) conducted by Bird Studies Canada (Graham *et al.* 2002)

^ Breeding evidence for the two Ontario Breeding Bird Atlases (Cadman *et al.* 1987, 2007) is categorized as confirmed, probable, possible, or not breeding.

potential stressors include decreased fluctuations in water levels (which can impact the extent of emergent vegetation that is likely more an issue in the lower Great Lakes), increasing numbers of invasive species (that can affect wetland structure) and climate change (Burke 2012). Differences in survey methodology and regions surveyed and few data collection years combined with large-scale population declines make an assessment of trends within the AOC difficult. However, based on the most recent CWS survey of coastal wetlands along the St. Marys River (Ontario) in 2010, the low population size of nesting Black Terns within the AOC is likely reflective of low densities reported throughout region, Great Lakes and Ontario.

Summary

Recent surveys of Common Terns and Black Terns by CWS on the St. Marys River (Ontario) indicate that these two colonial waterbird species are breeding within the AOC. Common Terns have nested consistently at sites situated both within and just beyond the official AOC boundary in eight survey years. While large inter-year fluctuations in nest numbers were evident at these nesting sites, these patterns are likely related to factors consistent with the life history strategies of this species that are not specific to influences within the AOC. A colony of Black Terns has consistently been reported at Echo Bay, a large coastal wetland, over the last few years. Based on the limited data available, there is no evidence to suggest that breeding status for Black Terns nesting within the AOC differs from that outside of AOC. In addition, the low population size of Black Terns is reflective of low density throughout Ontario rather than conditions specific to the AOC. In general, population declines have been reported for both of these species in the Great Lakes basin. During the most recent CWS decadal survey, four colonial waterbird species were found on the St. Marys River including a new species, the Great Blue Heron, which was not found nesting on this side of the River in the previous survey. Overall, the total number of colonial waterbird nests on the St. Marys River (Ontario) increased by +22.8% from 718 nests in 1999/2000 to 882 nests in 2007/08, a finding largely driven by the dramatic increase in nesting Ring-billed Gulls in the AOC.

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Appendix. Nest counts of Common Terns at three sites within the boundary of the St. Marys River AOC (Ontario) as designated by the 41K site ids and the five nesting sites just beyond the AOC border as designated by the 41J site ids. Counts provided are from the four decadal surveys conducted in 1980, 1989, 1999 and 2008 and annual surveys conducted from 2010-2013 as part of two separate EC studies of Common Terns in the region. “-” indicates a site not previously identified and “NS” denotes that the site was not surveyed.

SiteID	Site Name	1978/80	1989	1999	2008	2010*	2011	2012	2013
	Census	1	2	3	4				
41K027	Whitestone Reef	31	30	0	0	NS	0	0	NS
41K028	Island NNW of Hay Point	39	129	0	NS	68	18	34	0
41K028A	Nearby shoal west of Hay Point	-	-	-	NS	10	0	0	0
41J001	McNab Reef	0	0	1	48	0	0	0	0
41J002	Hurt Rock	0	0	0	0	0	57	0	3
41J002A	Islet 200m SW of mouth of Sucker Creek	-	-	-	0	0	3	0	0
41J004	North Sister Rock	3	0	0	5	0	68	129	0
41J004A	South Sister Rock	-	-	-	0	27	109	110	0
	Total Number of Nests	73	159	1	53	105	255	273	3
	Total Number of Colonies	3	2	1	2	3	5	3	1

* Nest counts for all sites surveyed in 2010 are grouped together and include counts for the two nest sites 41K028 and 41K028A that are considered part of the official 4th decadal CWS survey completed in 2007/08.