



The Black Tern Enigma in British Columbia: Issues of Assumptions, Monitoring, Nest Searches and Conservation

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Abstract

Black Tern (*Chlidonias niger*) is an enigma among the avifauna of British Columbia. It has a precarious life, spending its summers nesting in productive wetlands in central North America and wintering in coastal and offshore marine waters of Central America and northern South America. Many aspects of the tern's life history are unpredictable, making it a difficult species to study, survey, and monitor. Even though it has been a species of concern in many states and provinces since the 1950s due to declining numbers from loss of wetlands, it has not received support for listing as threatened or endangered by federal governments, mainly due to lack of supporting documentation.

Much of the information on the location of Black Tern nesting colonies in British Columbia is anecdotal based on conjecture and assumption, because most observers are not fully aware of the unpredictable biology of the species. Black Tern is a highly mobile, semi-colonial species; some of its life history traits are confusing that can complicate confirmation of a nest location. These traits include differentiating foraging sites and nesting wetlands, knowing that the species has low nest site fidelity, abandonment of traditional colony sites for no apparent reason, and dynamic wetland conditions causing long-term annual shifts of breeding sites. Less than one percent of occurrence records in the Biodiversity Centre for Wildlife Studies database ($n = 29,128$) have been confirmed with in-marsh nest searches, although it

has been assumed most sites with flying birds support nesting populations.

The methodology used in most standard surveys, such as the North American Breeding Bird Survey, point counts at selected wetlands for target species, and aerial pond counts do not adequately provide reliable information to estimate population trends or confirm nesting. This article provides a brief history of the conservation concern for declining numbers of Black Terns in North America, discusses current survey methodology, and points out some of the misleading documentation of possible nesting sites in British Columbia. The results of two unique examples from in-marsh nest searches in British Columbia where initial observations of breeding behaviour suggested Black Terns may be nesting are discussed in detail.

Introduction

Although Black Tern (*Chlidonias niger*) still occupies most of its former breeding range in North America (Figure 1), it has been a species of concern since the 1950s because of the dramatic loss of wetlands where it breeds, which has resulted in general population declines continent-wide (Shuford 1999). It is an unpredictable fresh-water wetland-dependent species during migration and the breeding season in North America with a checkered past for inclusion on state and provincial lists as a species of concern by various governments and conservation

organizations. The earliest formal attempt to feature species with declining numbers, either locally or in their North America range, was in 1971 when the National Audubon Society started publishing its “Blue List”, an early warning system of potential threats for birds (Christman 1972). Over the following 18 years the list grew from six to 52 species of which 22 species were officially blue-listed. Black Tern was in the latter group (Tate 1981, 1986; Tate and Tate 1982).

This action prompted a proposal to have Black Tern listed under the federal Endangered Species Act but there were not enough supporting data to make that determination (United States Fish and Wildlife Service 1991). Five years later, however, the species was included in the 1995 list of Migratory Nongame Birds of Management Concern in the United States (United States Fish and Wildlife Service 1995).

In Canada, soon after the initial proposal in the United States, the Committee on the Status

of Endangered Wildlife in Canada (COSEWIC) commissioned two reports on the status of Black Tern across the country. Gerson (1988) recommended a listing of “threatened” and Alvo and Dunn (1996) recommended a “vulnerable” status. COSEWIC later decided that the species warranted a “no designation required” listing. In British Columbia the ranking for the breeding status is “apparently secure” (see Shuford 1999).

Black Tern breeds in many scattered locations across much of the interior of British Columbia and has a low population density but its natural history and ecology provincially is not well known despite thorough short-term research in the Creston valley (Chapman-Mosher 1986) and updated surveys (see Cooper and Campbell 1997) since *The Birds of British Columbia* (Campbell et al. 1990, p. 292). Most wetland monitoring programs are multi-species oriented and require refinement to consider



Figure 1. For over 60 years Black Tern has been a species of concern to ornithologists and conservationists in North America, mainly due to loss of nesting wetlands to agriculture and purported declining numbers. Part of the reason for not being able to have the species formally listed by governments is its unpredictable breeding ecology and problematic monitoring and surveying methods that make decisive statements on long-term population trends difficult. *Photo by R. Wayne Campbell, near Dawson Creek, BC, 26 June 2007.*

individual species' natural history for more effective evaluation.

Assumptions without confirmation can be misleading for assessing the breeding status of Black Terns in wetlands in British Columbia. Such assumptions could also affect scientific models that are being developed to improve marsh bird surveys and predict the presence of nests in marshes from nest-site characteristics (see Tozer et al. 2016).

This article documents a situation in British Columbia where pre-survey behavioural observations suggested Black Terns were nesting but two follow-up nest searches by canoe and/or wading proved otherwise. It also records the province's first post-breeding staging location.

Surveying and Monitoring Black Terns – The North American Approach

The biology of Black Tern makes it difficult to study, monitor, and search for nests. It is a semi-colonial wetland species that nests in scattered clusters as well as solitary pairs (Figure 2). It has low site fidelity and responds to annual site quality such as vegetation density, water level, and available nesting substrate (Bailey 1977, Dunn 1979). It may frequent (and nest) at traditional sites for years but then suddenly abandon a wetland without obvious changes in site characteristics (Carroll 1988, Gerson 1988, Burke 2012). Black Tern may also return to a site to nest after an absence of many years (Mazzocchi et al. 1997). For example, at a wetland in the Thompson-Nicola region in south-central British Columbia that RWC monitored annually, a gap of 22 years occurred between confirmed nestings, although small numbers of foraging birds were occasionally present in the intervening years (RWC pers. obs.).

No single census method used in North America to date provides reliable figures to assess breeding populations and trends of Black Terns. The breeding bird survey (BBS), run annually since 1966 and developed primarily for passerines (Robbins and Van Velzen 1967), is the only survey to provide trend estimates for Black Tern on the continent (Peterjohn and Sauer 1997). The methodology, however, is unsuitable for colonial-nesting species and may not be representative of all habitats used by Black



Figure 2. Black Terns, a semi-colonial species, may nest singly (centre right in photo), or in small clusters, that may be hundreds of metres apart depending on suitable nesting substrate. Therefore, locating nests can be challenging and time consuming. *Photo by R. Wayne Campbell, Halfmoon Lake, BC. 20 June 2002.*

Terns (Robbins et al. 1986; Figure 3). Shuford (1999) suggested that better precision for estimating trends could be attained by expanding survey routes in the known breeding range of Black Tern. In addition, some effort has been made to assess the reliability of BBS data (e.g., Igil and Johnson 1997, Stewart and Kantrud 1972) without success. More data, however, are required to evaluate any wetland monitoring program, especially for a species like Black Tern with unpredictable annual nesting fluctuations in use of wetlands each year for nesting.



Figure 3. The North American Breeding Bird Survey (BBS) was developed 51 years ago to assess population trends in passerines. The roadside surveys are not suitable for colonial nesting marsh birds because available habitats are under sampled and populations for species like Black Tern fluctuate greatly between years. In this photograph Mark Nyhof is recording birds on a typical BBS route near Kennedy Lake BC. *Photo by Rose Nyhof.*

Brief History of Categorizing Black Tern Colonies in British Columbia

Recently a breeding record of 18 Black Terns nesting on a lake near Kamloops was submitted to the British Columbia Nest Record Scheme (see Campbell et al. 2013). It was assumed they were breeding because the terns were seen flying in a loose flock low over a marshy habitat in which they have been known to breed in the past (Figure 4). RWC visited the location several times between mid-June and early July, the peak breeding time for the species in British Columbia. No evidence of nesting was found and it appears that the terns reported were a feeding aggregation that had gathered temporarily over the *Scirpus* marsh to take advantage of a recent hatch of flying insects. It is a common habit of Black Terns to seek areas where food is concentrated (Shepard 1953, Dunn and Argo 1995). The following account is provided as a caution to encourage observers to seek out additional evidence of nesting (e.g., nests with eggs/chicks or recently fledged young incapable of sustained flight) to support their observations. The original record, however, is still useful to have on file

as it identifies a feeding location for Black Terns that may be breeding nearby. Also, depending on the date, it may represent a post-breeding aggregation site that is used prior to migration (see Dunn and Argo 1995, RWC pers. obs.).

The apparent decline of some marsh-dependent species and significant loss of wetland habitats have recently focused efforts to develop survey techniques that provide reliable population and trend estimates and generally increase the quality and accuracy of the data. Wetland-monitoring programs are being established (and standardized; see Conway 2011) but historically these have underestimated marsh birds that are secretive and difficult to detect (Kohl 2011). Burnham (1981:325) cautioned “Using just the count of birds detected (per unit effort) as an index of abundance is neither scientifically sound nor reliable...It is necessary to adjust study counts by the detection probability.” While researchers are refining methodology towards more reliable bird surveys (e.g., Naugle et al. 1999, Thompson 2002) we want to emphasize that uninformed assumptions on visits to wetlands during the breeding season can lead to incorrect conclusions about species diversity,



Figure 4. It cannot be assumed that observations of Black Terns flying low over suitable nesting habitat during the breeding season are actually nesting. Even recording courtship and nest-building activities can be misleading. Locating a nest with eggs or chicks or flightless young is still the most reliable method to confirm nesting. *Permission to reproduce the drawing was obtained from Peter Burke. It was published in the Black Tern account by Dunn and Agro (1995) that is available at Birds of North America Online <http://bna.birds.cornell.edu/bna>, maintained by the Cornell Lab of Ornithology.*

numbers, breeding status, and trends over time.

In British Columbia, the locations of most suspected Black Tern breeding sites are derived from observations of birds recorded flying in suitable nesting habitat; frequently the total number is divided by two to equal an estimate of pairs (see Figure 4). These records should not be considered as confirmation of breeding. For example, of 11 colony locations listed by Campbell et al. (1990), nine (82%) were suspected of breeding but not confirmed by nest searches. In the northern Okanagan valley complete early nest surveys were not done. Munro (1917) estimated 20 breeding pairs at Swan Lake on 18 May 1916 and on 8 June he collected three sets of fresh eggs. The former estimate, however, may have included migrating terns as he later reported finding only 10 nests (Munro 1922). On 22 June 1918, Munro (1922) noted the colony was larger and 12 nests were examined. Subsequently, estimates/counts of flying terns were made on 12 June 1937 (five groups totaling 57 pairs), 4 June 1938 (24 pairs), and 28 May 1940 (78 pairs) (Cannings et al. 1987). It is not known whether these totals represent

feeding aggregations or birds that were staging during migration. Similar observations were reported for the North Arm of Okanagan Lake and Rawlings Lake.

Reports of other nesting colonies in British Columbia were similarly documented. Munro (1946) estimated that a “possible 100 pairs” nested in marshes at the west end of Tachick Lake and, on 24 July 1944, 150 adults and 40 flying young were estimated flying in marshes at the west end of Nulki Lake. He was the first to notice that birds, both adults and young, often fed at sites other than where they were known to be nesting. There are, however, numerous reports of single confirmed nests, mostly from photographers, in the files of the BC Nest Record Scheme (see Campbell 1970, Campbell et al. 1990, pp. 292 and 293).

In the mid-1990s, the Colonial Waterbird Society dedicated an entire issue of their publication *Colonial Waterbirds* to the plight of the Black Tern. Populations, especially in the east, were declining, nesting wetlands were rapidly being lost to agriculture, and Black Terns had disappeared as a breeding species in several states. The publication was to be a collection of papers by

a number of researchers that would be issued as *Status, biology and management of the Black Tern in North America*.

Since British Columbia is within the species' breeding range, biologist John Cooper (Figure 5) decided in 1996 to initiate British Columbia's first survey of select colonies in a single breeding season. Thirty-two "active" colonies were surveyed that included 975 flying birds and 133 nests with an estimated 501 breeding pairs (Cooper and Campbell 1997). Some previously occupied sites had been abandoned. Most colonies deemed "active" were based on observations of flying birds in appropriate habitat where nesting was suspected but not confirmed. None of the 32 sites visited was surveyed completely although at a few some nests were tallied.



Figure 5. From late May through early July 1996, John Cooper co-ordinated the first provincial survey of select Black Tern nest sites. The endeavour included confirming activity, mainly flying adults, at known sites as well as investigating newly created wetlands. In this photo an adult Black Tern is hovering over John's head as he nears a tern nest. *Photo by Neil K. Dawe, 101 Mile Lake, BC.*

Most sites surveyed in 1996 (94%) had previously been identified and were within the range reported by Campbell et al. (1990). Highest numbers of terns and potential colony sites were found in the Central Interior, Boreal Plains, and Sub-boreal Interior ecoregions (Figure 6). While populations had declined in the Okanagan valley and vicinity of Creston, the species' breeding range had expanded northward and westward (Cooper and Campbell 1997).

A multispecies survey of 32 wetlands was carried out in the Cariboo parklands in 2001 to compare changes in breeding populations with those of the late James A. Munro in 1936 and 1958 (Dawe et al. 2003). It is noteworthy that Black Terns were observed at 21 wetlands (66%) but found nesting at only eight (38%) of those sites (J.M. Cooper pers. comm.). Although 436 adult Black Terns were tallied at the 21 wetlands only 44 nests and nine young were confirmed as breeding.

Recently, another approach to documenting Black Tern colonies in the province was carried out between 2008 and 2012 when a systematic survey of much of British Columbia, grid by grid, was completed as part of the British Columbia Breeding Bird Atlas project (BCBBA). The emphasis was on recording birds in different habitats, not on actual nest searches or surveys. Nineteen categories were developed to document observations, including "possible", "probable", and "confirmed" breeding. For 62 years, the British Columbia Nest Record Scheme (BCNRS) has had long-established simple and irrefutable standards for accepting confirmation of breeding – nests with eggs and/or nestlings and recently fledged young incapable of sustained flight. During the period of the BCBBA, the BCNRS received 59,733 confirmed breeding records (Campbell et al. 2013; Figure 7) as well as hundreds of additional nest cards of likely breeding from atlas participants. Most of these were for "Species/pair observed during its breeding season in suitable habitat", "Singing male present...", "Courtship or display between a male and a female...", and "Used nest or eggshell found..." None of these were accepted as irrefutable breeding records and all were added to an electronic database for occurrence records in a unique data field for behaviour.

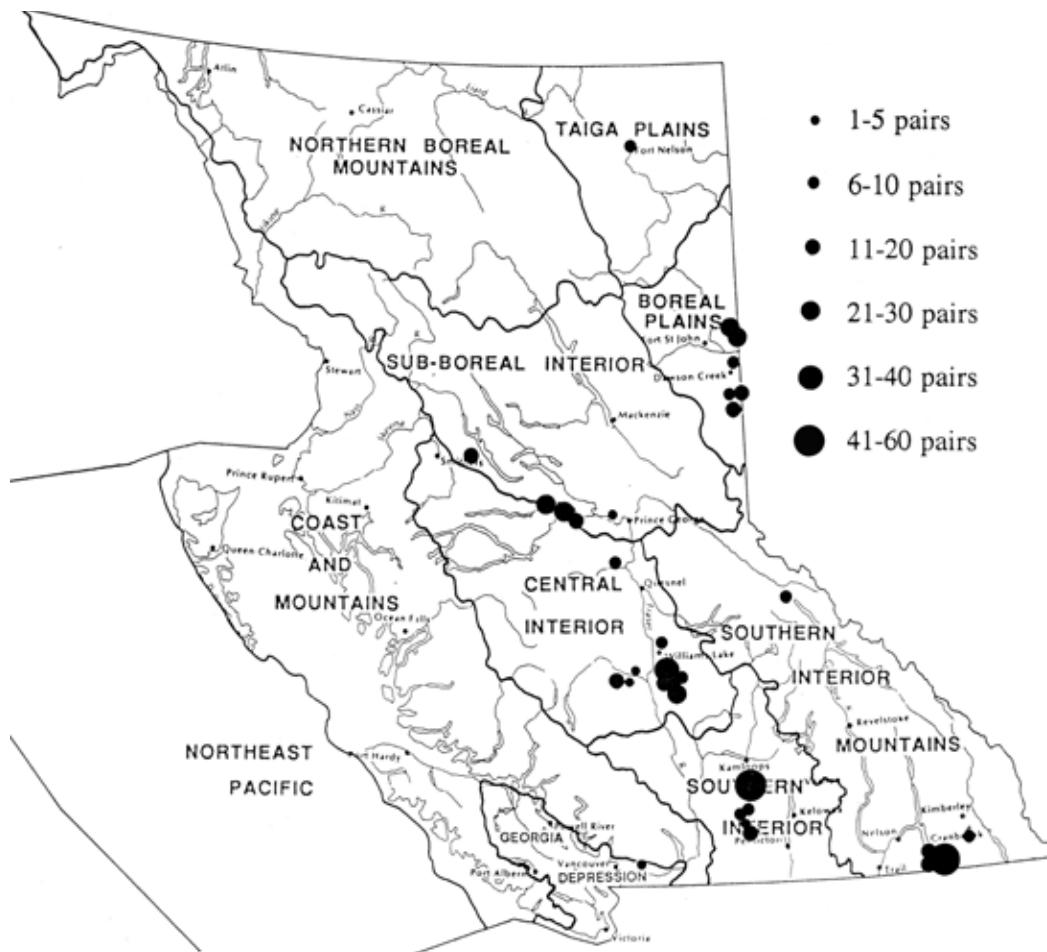


Figure 6. Estimated number of pairs of Black Terns tallied during wetland surveys in British Columbia in 1996. *Reproduced from Cooper and Campbell (1997).*



Figure 7. The British Columbia Nest Record Scheme, initiated in 1955 at the University of British Columbia and currently operated by the Biodiversity Centre for Wildlife Studies, a registered nonprofit society, contains close to 800,000 breeding records.

It cannot be determined from the distribution map for Black Tern published by BCBBA the precise criteria used to confirm breeding (Howie 2015). Of the nine confirmed breeding categories the BCNRS only consider three as definitive. Therefore, caution is required for acceptance of confirmed breeding for these records, especially when considering the following observations of sexual and foraging behaviour at 103 Mile Lake and One Island Lake that strongly suggested breeding.

Lessons from British Columbia – The 103 Mile Lake Experience

Of the 39 species of primary wetland-dependent native birds breeding in British Columbia, Black Tern is the most challenging to survey and monitor. Its unpredictability in use of wetlands for nesting from year to year, lack of consistent songs and calls, and isolation of nesting colonies are some of the contributing factors affecting traditional monitoring programs. One cannot postulate that nesting is occurring just because birds are present in suitable habitat during the breeding season. In-marsh nest searches are the most reliable technique to substantiate breeding, but before observers make the effort to

get into the wetland, they should gain knowledge of the breeding behaviour from literature and use personal experience. RWC developed a checklist of five general pre-survey criteria considered before a canoe was launched for a nest search of the wetland. These were used with noteworthy results for 130 Mile Lake in summer 1979. This long wetland (Figure 8), a Ducks Unlimited Canada conservation project, is located on the west side of Highway 97 about 21 km north of Lac la Hache (10U 586766E 5751311N). It lies at 780 m elevation. The entire wetland is about 1.4 km long and 0.36 km at the widest point. The productive portion of the marsh, composed of yellow water-lily (*Nuphar lutea*), sedge meadows, and patches of emergent cattails and bulrushes, however, extends about 0.8 km. The entire wetland encompasses an area of about 116 ha of which 51 ha is open water and 64 ha is emergent vegetation.

The wetland at 130 Mile Lake was surveyed by RWC for nests twice in 1979, on 9 June and 28 July. This was incidental to two trips to Rock Lake on Becher's Prairie, west of Williams Lake, sponsored by the provincial Ecological Reserves program to survey the large colony of Eared Grebes (see Campbell et al. 1979). Black Tern behaviour was observed at 130 Mile Lake from land for about half an hour on 9 June. Combinations of five general criteria, developed from literature and personal experience, were considered before a search for nests by canoe and/or wading was carried out. The topics considered, and follow-up results on 9 June, included:

1. History of nesting: *From the literature* –

Knowing site fidelity for Black Tern and local history of nesting (e.g., confirmed nest with eggs and/or chicks or flightless young) can determine the need for a follow-up survey. Nest site fidelity is low in Black Terns and although they may return to nesting areas for many years they also can suddenly abandon a site with no apparent changes in the site then return after an absence of years (Carroll 1988, Gerson 1988, Mazzocchi et al. 1997). The return rate for adults in Ontario is 27% (Dunn 1979) and in Wisconsin 40% (Bailey 1977). *Field observations on June 9, 1979* – This wetland has sporadically supported a small nesting colony of 12-35 pairs of Black Terns since at least 1934 and has been completely surveyed



Figure 8. The wetland at 130 Mile Lake, an enlargement of the San Jose River between Lac la Hache and Williams Lake, provides ideal habitat requirements for nesting Black Terns with a combination of open water and patches of floating and emergent vegetation. It has been used by Black Terns for foraging and nesting for over 80 years. *Photo by R. Wayne Campbell, 130 Mile Lake, BC. 29 June 2008.*

four times. On 9 June, a maximum of 26 adult Black Terns was counted at one time foraging low over the marshes, water-lilies, sedge meadows, and open water throughout the wetland. On several occasions an adult dropped into emergent vegetation and did not reappear, suggesting a potential nest site.

2. Habitat requirements: *From the literature*

– Active nesting sites in British Columbia are similar to those elsewhere in North America. The species prefers a proportion (about 50:50) of open water interspersed with scattered dense patches of emergent vegetation, such as bulrush (*Scirpus spp.*) and cattail (*Typha latifolia*), although some colonies are located in pure rush (*Juncus spp.*) and sedge (*Carex spp.*) meadows as well as on surfaces covered with water-lilies (*Nuphar spp.*) (Carroll 1988, Gerson 1988, Hickey and Malecki 1997, Linz and Blixt 1997, Maxson et al. 2007). The size of nesting wetlands ranged from as small as 1.6 ha to in excess of 20

ha (Heath et al. 2009, Brown and Dinsmore 1986). Black Tern is a semi-colonial species and often nests in clusters of vegetation scattered over a wetland. Prospective breeding sites include adults hovering over a location for a prolonged period, dropping down and not reappearing, or flying with food and leaving a site without prey. *Field observations on June 9, 1979*

– The habitat at 103 Mile Lake is diverse and is ideal for nesting terns allowing much of the wetland to be used. There are scattered small patches of bulrushes among water-lilies, substantial open water, and strips of open bulrushes and cattails bordering some shores (Figure 9). Vegetation at the north and south ends of the lake, at the junction of the San Jose River, was not used for foraging. During the initial observations from land, 10 potential breeding sites were identified: two on water-lilies near small clumps of bulrushes, three in small, open clumps of isolated bulrushes on the lake, and five in bands of bulrushes along the west side of the lake (Figure 8).

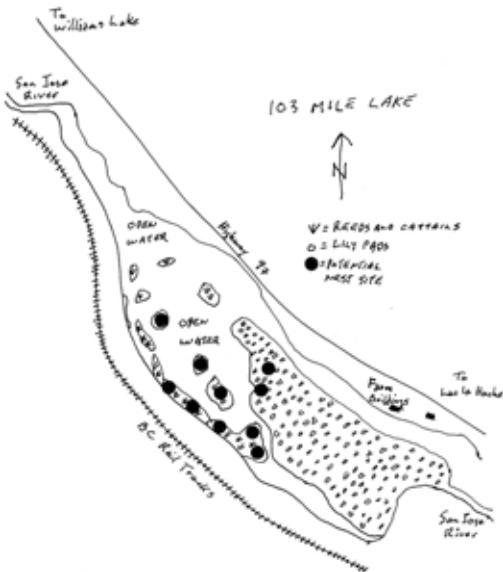


Figure 9. A field sketch, not to scale, of general habitat features of 130 Mile Lake, British Columbia, a site used frequently for nesting Black Terns. Ten potential nest sites, marked with a solid circle, were identified from initial observations from land. *From the field notes of R.W. Campbell.*

3. Nesting phenology: *From the literature* –

In Ontario, egg dates ($n = 145$ records) range from 17 May to 24 July with half reported between 31 May and 21 June (Peck and James 1983). In southern interior British Columbia, early migrant Black Terns may return from mid-to-late April and early May but most birds return in mid-May with egg-laying commencing near the end of the month. Peak egg-laying and incubation occurs during the first three weeks of June (Campbell et al. 1990, British Columbia Nest Record Scheme files). *Field observations on June 9, 1979* – Although nest-building and egg-laying may have already commenced, the date allowed a range of sexual behaviour to be observed such as pair bonding, territoriality, courtship displays and feeding, and copulation.

4. Sexual Behaviour: *From the literature* –

Courtship activities and territorial behavior for the

species' monogamous mating system occur on the wetland prior to and during nesting. While bonding may start to develop prior to arriving at a nesting location (Chapman-Mosher 1986) pairs observed together in the colony are ready to breed. *Field observations on June 9, 1979* – Three assumed pairs were noted: one on a Muskrat (*Ondatra zibethicus*) pushup in an extensive patch of water-lilies, one interacting while flying together, and another standing on a covered Red-necked Grebe (*Podiceps grisegena*) nest near the edge of a growth of dense water-lilies. Two observations at the latter site suggested that the pair had selected the grebe nest as a nest site. One of the adults, presumably the male, suddenly left the nest and chased and captured a dragonfly (Odonata) and returned and fed it to its mate, characteristic of courtship feeding (Doane 1972). While the tern was standing on the nest, the adult Red-necked Grebe returned to its nest from feeding and when about one and a half metres away the male Black Tern gave alarm calls and swooped on the grebe, typical of territorial behavior (Cuthbert 1954). Despite being harassed, the grebe resettled on its nest and the terns flew off and did not return.

The pair on the Muskrat pushup was courting, in the erect posture stance, as described by Dunn and Agro (1995) (Figure 10).

No instances of copulation, additional courtship displays, or interspecific/ intraspecific competition were observed.

5. Plumage characteristics: *From the literature* –

– Black Terns do not breed before their second summer when most, but not all, attain their black plumage (Dunn and Agro 1995). From 97-99 % of nonbreeders remain south of their breeding range (van Rossem 1923) but some terns may delay breeding beyond age two and/or skip breeding occasionally (Dunn and Agro 1995); therefore, up to three percent may frequent colonies in British Columbia each year and not breed. These birds have various amounts of white in their plumage. *Field observations on June 9, 1979* – All Black Terns identified to plumage on 103 Mile Lake were black-bodied, suggesting breeding age. Noting plumage variations may also be helpful in assessing current breeding status at some nesting sites (see One Island Lake below).



Figure 10. While searching for nests on 9 June 1979 in 103 Mile Lake RWC saw a pair of Black Terns in a ground courtship display on a Muskrat pushup. The display, similar to the “erect posture” described in Dunn and Agro (1995), lasted only a few seconds. Permission to reproduce the drawing was obtained from Peter Burke. *The sketch was published in the Black Tern account by Dunn and Agro (1995) and is available at Birds of North America Online <http://bna.birds.cornell.edu/bna>, maintained by the Cornell Lab of Ornithology.*

103 Mile Lake Survey Results

After watching Black Tern activity and behaviour for about 30 minutes on 9 June 1979, RWC saw convincing evidence that a nesting colony had probably been established and that the wetland was again going to support breeding. A three-hour nest search of the entire wetland by canoe and wading ensued with more thorough searches of “hot spots” where breeding was first suspected (Figure 9). No completed (or started) Black Tern nests were located. Nests are not difficult to spot and may vary considerably in size and composition. Most are usually small piles of dead vegetation, gathered near the nest site, and range from 1.3-6.4 cm in height and 10-25 cm in diameter (Dunn 1979, Einsweiler 1988, Campbell et al. 1990) (Figure 2). Recently, a nest found on water in open emergent vegetation in a lake in central British Columbia measured 51 cm in diameter (RWC pers. obs.) (Figure 11). Eleven other wetland species were found breeding suggesting that food was not a limiting factor for Black Terns.

On the return trip to 103 Mile Lake on 28 July 1979, the entire wetland was again scanned for evidence of nesting. More terns were seen foraging



Figure 11. If a permanent and solid substrate is not available Black Terns will collect material nearby to build a secure nest platform. Photo by R. Wayne Campbell, near Vanderhoof, BC, 19 June 2008.

in a greater variety of habitats, including the south end of the lake in the vicinity of San Jose River. None were seen carrying fish and all were in the typical black-bodied plumage of adults. About 15:30 hrs Black Terns began leaving the lake in ones and twos and circled together in a loose flock over the forest off the southwest end of the lake. Over the next 20 minutes or so 82 terns had left the lake and were seen circling together at about 200 m. The loose flock gained altitude climbing to several hundred more metres. They suddenly formed a much tighter flock and departed southwestward. This behaviour was considered an autumn exodus.

Shortly afterwards, the lake was again checked, by canoe only, but no evidence of nesting was discovered. Although initial observations looked promising on 9 June, Black Terns did not nest on 103 Mile Lake in summer 1979. This perplexing situation has been reported by other researchers in North America. Although Carroll (1988) comments that Black Terns may return to nesting areas for many years, Gerson (1988) notes that the species “may suddenly abandon marshes with no visible changes in site characteristics.” Mazzocchi et al. (1997) further mentions that Black Terns may return to a site after an absence of many years.

It is likely that in 1979 some terns from nearby wetlands staged at 103 Mile Lake prior to autumn departure.

One Island Lake Observation

One Island Lake is located 60 km south of Dawson Creek in northeast British Columbia (10U 671726E 6132324N). It is a popular fishing and camping destination with clear waters and has been stocked with Brook Trout (*Salvelinus fontinalis*) and Rainbow Trout (*Oncorhynchus mykiss*) since 1963. Other fish species include Bull Trout (*Salvelinus confluentus*), Northern Pike (*Esox lucius*) and Westslope Cutthroat Trout (*O. clarki lewisi*), Brook Stickleback (*Culaea inconstans*), Finescale Dace (*Phoxinus neogaeus*) and Fathead Minnow (*Pimephales promelas*). Small numbers of Black Terns have nested sporadically in emergent vegetation along the west side of the lake and in sedges (Figure 12) off the southeast end of the island since the mid-1970s (RWC pers. obs., K. Munro pers. comm.).

On 19 June 2008, Eileen Campbell and the senior author watched a Black Tern catch a small fish close to shore off the campsite on One Island Lake (10U 672645E 6132188N). The bird had the typical blackish plumage but also identifiable white mottling on its head. Instead of flying west across the lake to where the species has previously been known to nest, the tern flew northwest along the shore and disappeared from sight. About two hours later they made a follow-up check of the use of the nesting



Figure 12. Black Tern nest with three eggs. Small numbers of Black Terns have nested sporadically at two sites in One Island Lake since the mid-1970s. Photo by R. Wayne Campbell, One Island Lake, BC, 14 June 1996.

platforms that had been set out for Black Terns the year before in a small nearby wetland (Figure 13). The site is about 3.2 km northwest of the campsite at One Island Lake (10U 670026E 6134209N). Surprisingly, apparently the same bird, presumably a male, was observed passing a small fish to its mate on one of our platforms containing 3 eggs (Figure 14) and quickly departed in a southeasterly direction towards One Island Lake. It is noteworthy that Black Terns did not nest in two of the known locations in One Island Lake in 2008, probably due to high water levels (K. Munro pers. comm.).



Figure 13. Eileen Campbell scanning unnamed marsh northwest of One Island Lake, BC, for birds prior to setting out nesting platforms for Black Terns. *Photo by R. Wayne Campbell, 2 June 2007.*



Figure 14. A Black Tern nest containing an egg and two recently hatched chicks constitutes an irrefutable breeding record for a species. Note the edge of the artificial nest platform at the bottom of the photo. *Photo by R. Wayne Campbell, 27 June 2007.*

These incidents further illustrate the issue of assuming a species is breeding in a suitable wetland from behavioural observations alone.

Monitoring Issues and Conservation

Wetlands, especially marshes, are favourite habitats for birders and photographers to visit. The number and diversity of species, the constant feeding and behavioural activity, the chance to spot a secretive rail or bittern, and the possibility of seeing wetland-obligate species like Black Tern and Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) are alluring attractions. During the breeding season, however, it is often assumed that many of the species seen are probably nesting and numbers are a reliable index to the nesting population. This assumption may be more accurate for sedentary species, like Horned Grebe (*Podiceps auritus*) and Virginia Rail (*Rallus limicola*), which do not leave the site to feed. Short visits to wetlands can be equated to conducting a basic inventory that indicates the presence or absence of a species and the diversity of species using the habitat at the time. Sometimes breeding is confirmed (Figure 15).



Figure 15. Highway 5A, between Kamloops and Merritt, is a favourite route for birders because of the numerous wetlands and associated waterbirds. Black Terns are frequently reported at Stump Lake, where they occasionally nest. During 41 years of records the species has been recorded in flight over the lake on 11 occasions (27%) and confirmed nesting on three occasions (7%). *Photo by Mark Nyhof, 3 July, 1983.*

Despite endeavours to identify breeding sites for Black Terns in British Columbia, it cannot be assumed that observations suggestive of activity of pairs in suitable nesting habitat, such as nest-building, courtship behaviour, or carrying food, is confirmation of breeding. The most conclusive evidence of nesting still remains: locating a nest with eggs and/or nestlings or recently fledged young incapable of sustained flight, especially between late May and late July (see Campbell et al. 1990, p. 291).

It has been well documented that the breeding ecology of Black Tern is unpredictable and not well understood and that the species may change breeding sites from year to year in response to changes in local water cycles, weather patterns, changes in vegetative structure, and/or available food resources (Dunn and Agro 1995). The two examples previously described introduce some of these issues but the reasons for not nesting or changing behaviour still remain unclear. For example, Black Terns may start nest-building, suddenly abandon the activity, and re-nest at a new

site from one to 42 km away (Eichhorst and Reed 1985, Mazzocchi and Muller 1993). Even within the same wetland, initial nest-building may be started several times at different locations within the same breeding season without success (RWC pers. obs.).

Black Terns observed in appropriate nesting habitat (Figure 4), even as pairs or in courtship displays, may be related to life history traits other than actual breeding. For example, depending on the date, the site may be a temporary staging area that is used only during spring and autumn migration. The wetland may also be visited only for feeding that may be many kilometres from the tern's nest. Terns also may start and not complete nests and suddenly abandon sites for unknown reasons.

Other unconfirmed breeding information is also speculation that over time can be misleading without examining its original source. This creates problems for researchers and conservationists. For example, hearsay and conjecture on the early breeding status of Yellow-billed Cuckoo (*Coccyzus americanus*)

in British Columbia led to misleading breeding information being published that included southern Vancouver Island, the Canadian Gulf Islands, and the Lower Mainland in the provincial breeding range (Campbell et al. 2014). This misinformation, based on sightings during the breeding season in appropriate habitat, appeared in many publications over the following decades, including field guides (e.g., Reed 1965), standard taxonomic references (e.g., American Ornithologists' Union 1957), provincial checklists and bird books (e.g., Fannin 1891, Brooks and Swarth 1925, Howie 2003), government documents (e.g., Laymon and Halterman 1989), endangered species reports (United States Department of Interior Fish and Wildlife Service 2014), and technical articles (e.g., Laymon and Halterman 1987).

There is not an official management or conservation plan for Black Tern (Figure 16) in British Columbia although one is warranted. Recent status assessments for Black Tern by the Committee on the Status of Endangered Wildlife in Canada did not list this species as either threatened or vulnerable (Gerson 1988, Alvo and Dunn 1996). In 2004, the Biodiversity Centre for Wildlife Studies formally initiated a four-tier program to catalogue colonial wetland-nesting species in British Columbia, including Black Tern. The conservation project also included efforts to enhance breeding success with artificial nest platforms, as flooding and wind and wave action are major reasons for nest failure (Chapman-Mosher 1986, Faber 1996, Mazzocchi and Hickey 1997). A comprehensive electronic database on the tern's occurrence in the province dating back to the late 1800s currently contains 29,128 records entered in at least 25 different data fields. Over 3,000 confirmed breeding records have been extracted from field notebooks (e.g., Glen Ryder's notes for Stum Lake; see Campbell and Henderson 2013), research projects, and unpublished and published literature (including theses). All have been deposited in the BC Nest Record Scheme. A reference library of 450+ technical papers, government and wildlife consultant reports, theses, and other articles for the species in North America has also been amassed and integrated into the Biodiversity Centre for Wildlife Studies' wildlife library.

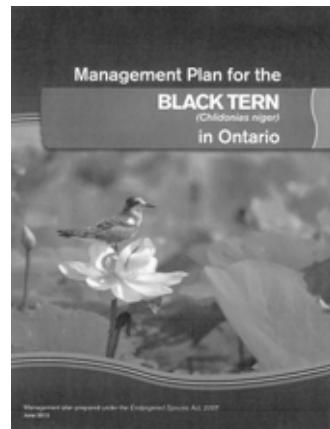


Figure 16. Black Tern is a species of special concern in Ontario with an uncertain future. Colonies have disappeared from traditional sites and declines are being reported at active colonies. In 2012, the Province of Ontario took a proactive step in supporting a report on the possible approaches to manage the species in the province (Burke 2012). A similar conservation plan should be considered for British Columbia especially with the abandonment of significant colonies in the Okanagan and Creston valleys.

Finally, since 2006, several hundred artificial nest platforms (Figure 17) have been set out in marshes and other wetlands throughout the province to enhance breeding success, which is especially challenging for the birds during periods of fluctuating water levels and wind and wave action. All of these platforms have been monitored as time permits.

Maintaining breeding populations of Black Terns in British Columbia will require knowledge of all aspects of Black Tern ecology and behaviour. Monitoring techniques need to be refined to better detect population trends and determine causes. Perhaps a combination of regular wetland surveys and "in-marsh" nest searches may be part of the solution. In the meantime, we need to educate birders, naturalists and biologists on the value of their observations and make them aware that speculation that presence/absence or suggestive breeding activity in a wetland may not necessarily confirm the site is being used for nesting.

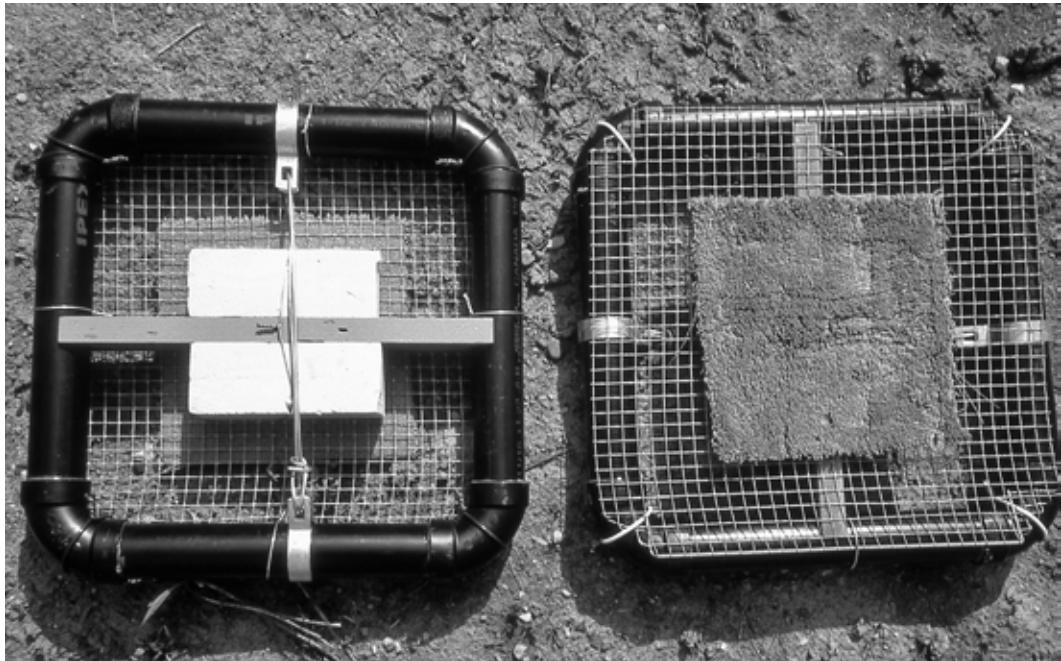


Figure 17. Three prototypes of artificial nest platforms for Black Terns were developed and anchored in wetlands in south-central British Columbia. The most successful, with over 70% occupancy and lasting over seven years of the rigors of winter freeze-up, was a combination of wire mesh and Polyvinyl chloride (PVC) pipe. Bottom view of platform (left); top view (right). Photo by R. Wayne Campbell. ↗

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About the Authors

Wayne started surveying marshes in British Columbia as an egg collector in the late 1960s and through 2016 has searched and monitored about 680 wetlands to asses breeding populations for at least 42 wetland-dependent species (see page 7, Figure 8).



Figure 18. Wayne Campbell on a line-transect in a cattail marsh searching for nests near Radium, BC. Photo by Eileen C. Campbell.

Mark is a co-participant of the Black Tern nest enhancement program initiated by the Biodiversity Centre for Wildlife Studies. He designed and built the nesting platforms. He has been a loyal contributor to the BC Nest Record Scheme and since 1979 has added more than 10,000 records to the database. From 2000-2011 he conducted breeding bird surveys for 40 routes on Vancouver Island and Haida Gwaii, providing valuable information, on the distribution of forest birds and the habitats where they occur (see Figure 3).