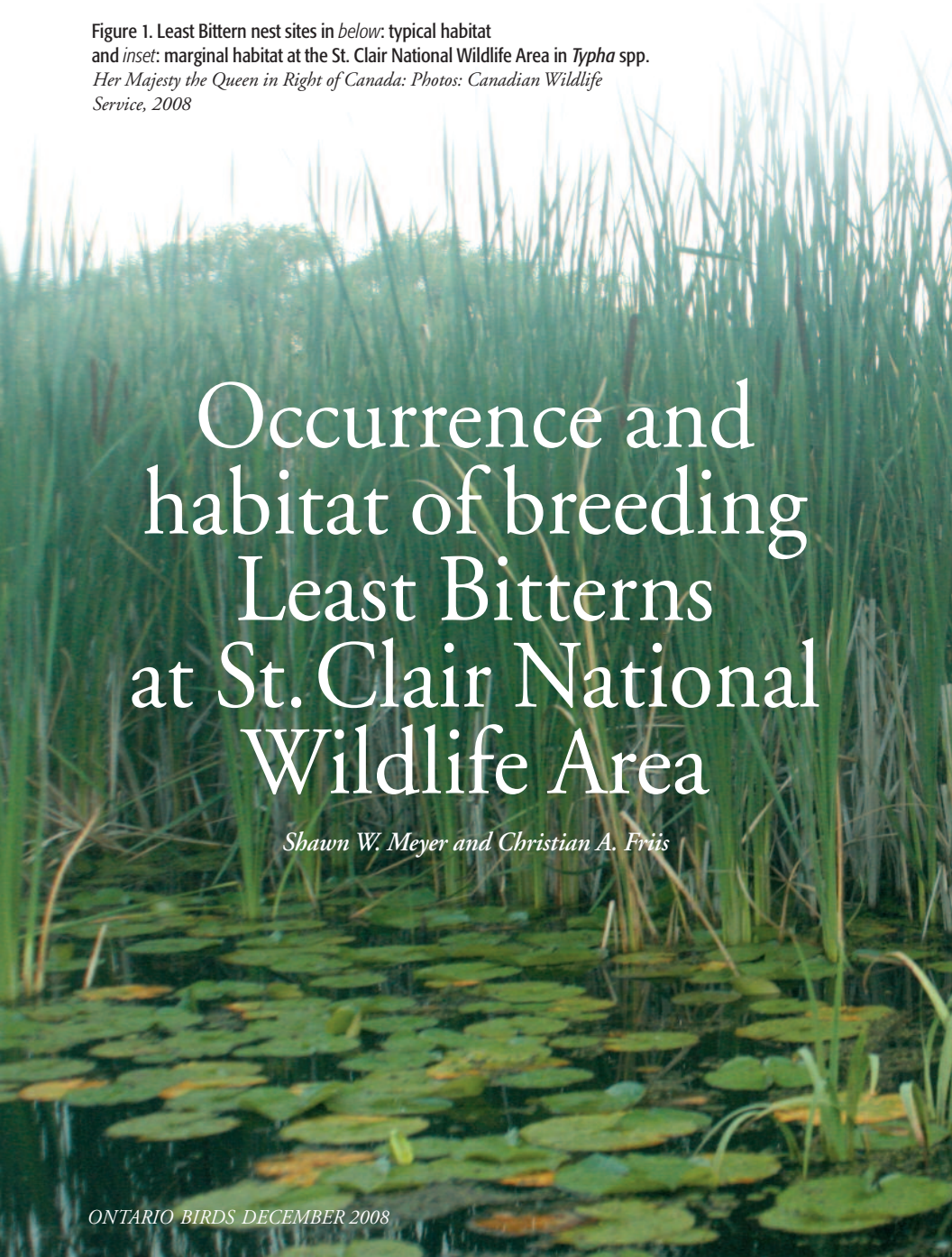


Figure 1. Least Bittern nest sites in *below*: typical habitat and *inset*: marginal habitat at the St. Clair National Wildlife Area in *Typha* spp. *Her Majesty the Queen in Right of Canada: Photos: Canadian Wildlife Service, 2008*

Occurrence and habitat of breeding Least Bitterns at St. Clair National Wildlife Area

Shawn W. Meyer and Christian A. Friis

Introduction

The Least Bittern (Petit Blongios) (*Ixobrychus exilis*) is a small buffy-coloured heron (~ 30 cm long and 80g in weight) that breeds primarily in southern marshes in Manitoba, Ontario, Quebec, New Brunswick, and potentially Nova Scotia. Its contrasting black head and back against its white underside and buffy wing patches readily distinguishes this marsh bird from all others. In Ontario, it breeds primarily in cattail (*Typha* sp.), but has also been observed nesting in bulrush (*Scirpus* sp.), grasses, horsetail (*Equisetum* sp.), sedges (*Carex* sp.), willows (*Salix* sp.) and dogwood (*Cornus* sp.). In Ontario, Least Bitterns typically initiate breeding in mid-May, with pair formation, territory defence and eventual egg laying (egg dates: 15 May to 2 August) (Peck and James 1983). It is a very secretive marsh bird and, therefore, difficult to detect. Its soft, low-pitched "coo-coo-coo" is often unnoticed, and its avoidance of call broadcasts (Tozer *et al.* 2007) results in poor detection rates, and thus, an incomplete population estimate in Ontario (Woodliffe 2008). Habitat degradation and habitat loss continue to threaten this and other marsh bird species, and have resulted in the Least Bittern being designated as a Threatened species in Ontario and Canada.

Ontario's population of Least Bittern is concentrated around Lake St. Clair, Long Point and areas south of the Canadian Shield, from approximately Peterborough to Kingston, including the marshes of eastern Lake Ontario (Woodliffe 2008). In the Lake St. Clair vicinity, marshes associated with the shoreline provide breeding habitat for many Least Bitterns. The St. Clair National Wildlife Area (SCNWA) is one such marsh. It was designated for inclusion on the Ramsar List of Wetlands of International Importance in 1985, and it currently consists of two units: (1) Main Unit (~244.0 ha) and (2) Bear Creek Unit (~89.5 ha). It is recognized for its high biodiversity and national significance to wildlife, and has become a perennial birding "hotspot" in southwestern Ontario. Both historical and current records from the SCNWA suggest that numerous Least Bitterns nest within these marshes. The purpose of this article is to document the occurrence and habitat of breeding Least Bitterns in both units of the SCNWA, with additional reference to other southwestern Ontario sites. This information will support the identification of critical habitat for this species at risk, as well as help guide SCNWA management.

Observations

Data for breeding Least Bitterns were collected between 9 May and 15 July 2007 and 8 and 9 July 2008. They were collected in 2007 while conducting marsh bird and Least Bittern surveys in the SCNWA and while collecting nesting habitat data in 2008 to help identify critical habitat for Least Bitterns on the SCNWA. Nest record data were collected

Figure 2. Least Bittern feeding platform in *Typha angustifolia* at the St. Clair National Wildlife Area.
Her Majesty the Queen in Right of Canada: Photo: Canadian Wildlife Service, 2008

following the methodology of the Ontario Nest Records Scheme (Peck *et al.* 2001). In all instances, disturbance to the adult birds and/or young was minimized. For example, data collection around the nest was limited to a few minutes and was not collected during inclement weather such as rain or heavy winds. Global Positioning System (GPS) coordinates were collected using a Trimble GeoXT (accuracy ± 1.0 m). Results are summarized into four sections: (1) nesting, (2) semi-colonialism, (3) nest-site fidelity and (4) reproductive success. If data were collected over multiple visits to a particular nest, either the highest recorded breeding level (i.e., eggs < chicks < fledglings) or that of the last recorded visit was used in the summary.

Nesting

In total, 14 and 27 active Least Bittern nests were found in 2007 and 2008, respectively (Table 1) (Figure 1a and 1b).

Table 1. Habitat type, nest contents, locations and characteristics of Least Bittern nests recorded at the St. Clair National Wildlife Area in 2007 and 2008.

Year	Dominant Vegetation at Nest	Number of Nests	Average number of eggs or young ± SD	Nest Exposure (number of nests)	Average water depth at nest (cm) ± SD
2007	*Typha angustifolia* Narrow-leaved Cattail	7	Eggs = 3.57 ± 1.81	Well hidden (2) Partially hidden (5)	52.14 ± 17.64
	Typha glauca Common Cattail	3	Eggs = 4.00 ± 1.00 Young = 0.67 ± 1.15	Well hidden (1) Partially hidden (1) Exposed (1)	49.00 ± 21.07
	Typha spp. Cattail species	2	Eggs = 2.50 ± 3.54 Young = 1.00 ± 1.41	Partially hidden (2)	39.00 ± 21.21
	Scirpus validus Softstem Bulrush	1	Eggs = 4	Exposed	22.00
	Sparganium eurycarpum Large-fruited Burreed	1	Eggs = 4	Exposed	N/A*
	TOTAL	**14†**	**Eggs = 3.50 ± 1.70 Young = 2.00 ± 0.00**	–	**45.78 ± 18.52**
2008	*Typha angustifolia* Narrow-leaved Cattail	12†	Eggs = 2.50 ± 1.68 Young = 0.50 ± 1.24	Well hidden (8) Partially hidden (3)	66.82 ± 15.96
	Typha glauca Common Cattail	5	Eggs = 1.60 ± 1.95 Young = 1.40 ± 1.95	Well hidden (3) Partially hidden (1) Exposed (1)	54.60 ± 7.89
	Typha spp. Cattail species	2	Eggs = 4.50 ± 0.71	N/A*	N/A*
	Sparganium eurycarpum Large-fruited Burreed	7†	Eggs = 2.29 ± 1.70 Young = 1.29 ± 1.70	Well hidden (4) Partially hidden (2)	57.00 ± 21.55
	Acorus calamus Sweetflag, Calamus	1	At least 1 egg*	Partially hidden	75.00
	TOTAL	**27**	**Eggs = 2.37 ± 1.74 Young = 0.81 ± 1.47**	–	**61.96 ± 16.47**

* - data were not collected at nest to avoid disturbance. † - one nest was excluded from summary due to lack of data

Average height of nest above water (cm) ± SD	Average cup depth of nest (cm) ± SD
84.29 ± 19.81	4.33 ± 0.82
65.00 ± 24.06	6.33 ± 3.21
95.00 ± 14.14	7.50 ± 3.54
23.00	2.00
N/A*	N/A*
74.14 ± 26.80	**5.08 ± 2.36**
66.18 ± 22.57	3.38 ± 2.26
72.40 ± 25.67	3.75 ± 2.36
N/A*	N/A*
29.67 ± 6.65	2.33 ± 1.63
30.00	20.00
56.43 ± 26.34	**4.00 ± 4.36**

Only active nests (i.e., nests with eggs and/or young) were recorded because Least Bitterns are known to build dummy nests or platforms for feeding and brood rearing (Gibbs *et al.* 1992) (Figure 2). In 2007, 12 nests were built in cattail with one in softstem bulrush and one in burreed (*Sparganium* sp.). Nest heights, to the bottom of the nest, varied between a low of 23 cm (bulrush) and a high of 115 cm (cattail) with a median of 77 cm (mean = ~74 cm). Average cup depth was 5 cm in vegetation that was growing in approximately 46 cm of water (Table 1).

In 2008, 19 active nests were found in cattail plus eight in non-persistent emergent vegetation (e.g., burreed and sweetflag [*Acorus calamus*]) (Figures 3a, 3b, 3c and 3d). Nest heights, to the bottom of the nest, varied between 22 cm (burreed) and 120 cm (cattail) with a median of 50 cm (mean = ~56 cm). Average cup depth was approximately 4 cm and nesting vegetation was on average in 62 cm of water (Table 1).

Figure 3a. Least Bittern nest in *Typha x glauca* at the St. Clair National Wildlife Area. *Her Majesty the Queen in Right of Canada: Photos: Canadian Wildlife Service, 2008*

top: **Figure 3b. Least Bittern nest *Sparganium eurycarpum* (encircled),**
right: **Figure 3c. Least Bittern nest *Acorus calamus,***
above: **Figure 3d. Least Bittern nest *Typha angustifolia* (encircled), at the St. Clair National Wildlife Area.** *Her Majesty the Queen in Right of Canada: Photos: Canadian Wildlife Service, 2008.*

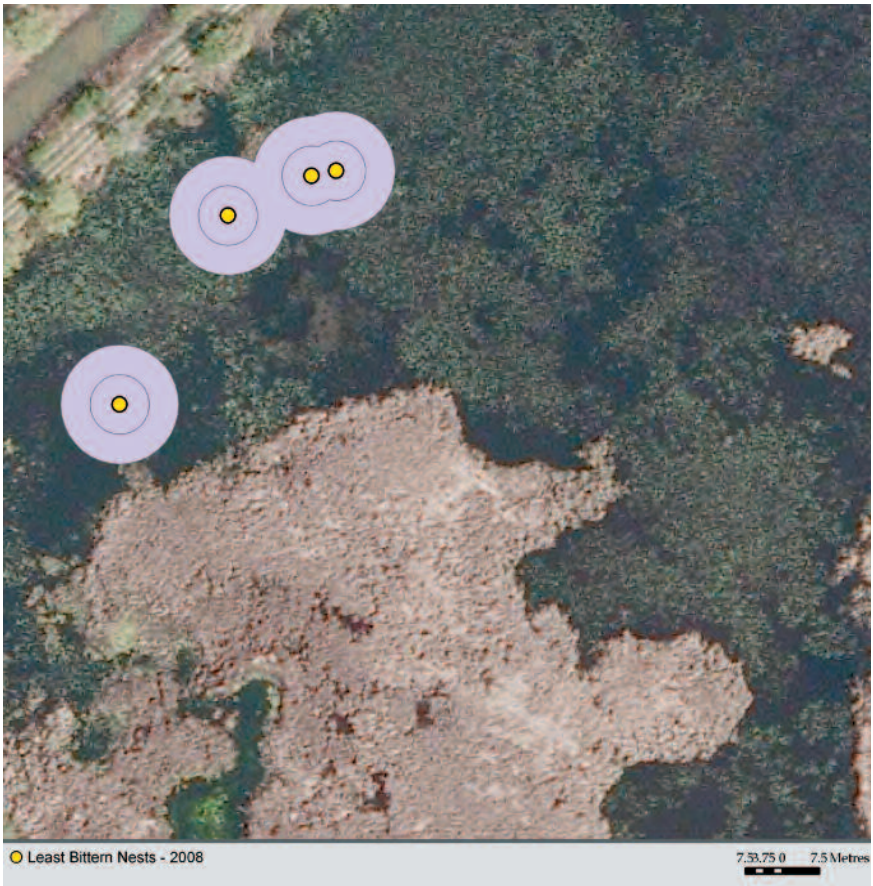
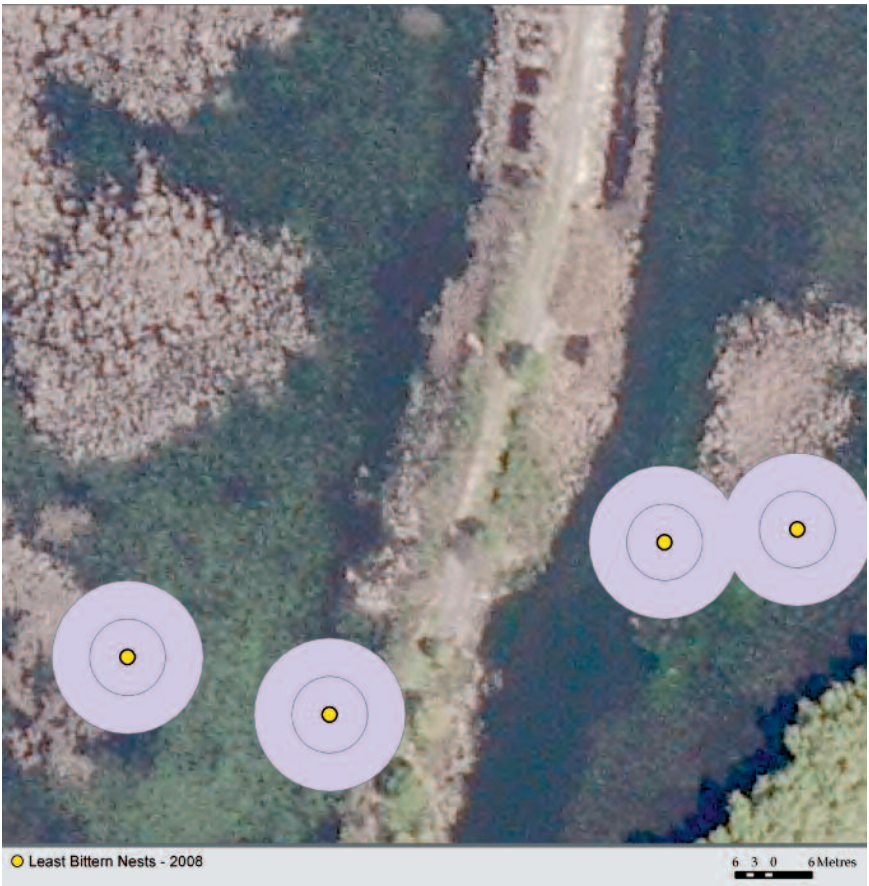


Figure 4a *above* and 4b *right:*
Locations of selected active Least Bittern nests at the St. Clair National Wildlife Area showing proximity to nearest neighbouring nest (inner ring = 6 m / outer ring = 12 m).
Maps produced by CWS-ON – Background Data: True Colour Ortho Photos, 2006 © First Base Solutions, 2006.

Semi-colonialism

Although the term "semi-colonialism" is not defined clearly in the literature, our results confirm anecdotal evidence that some Least Bitterns at the SCNWA tend to nest in small colonies (13 of 41 nests). Least Bitterns have been documented as semi-colonial nesters in southern Florida, where the range from nearest neighbour was 1.0 to 6.1 m (Kushlan 1973).



To illustrate this range with nests from SCNWA, all active Least Bittern nests were mapped using ArcGIS 9.2 software from GPS coordinates collected in the field. A concentric ring corresponding to a 6-m radius was then overlayed on active nest locations in close proximity to one another to show potential semi-colonialism. A 12-m radius was also overlayed for comparative purposes, and to investigate possible ranges to nearest neighbour at this latitude (Kushlan 1973). In 2007 and 2008, evidence of semi-colonialism existed in one and three distinct areas of SCNWA, respectively (Figures 4a and 4b). In these four areas groups were of four, four, two, and three nests, with a range from closest to furthest distance of 4.5-64, 20-108, 35 and 46-135 metres, respectively.

Nest-site Fidelity

No record of Least Bittern banding at SCNWA or in the surrounding vicinity is known. Therefore, determining nest-site fidelity of individual birds is not possible. The results, however, show that some Least Bitterns are nesting within a few metres of where birds nested the previous year (Figure 5). This suggests re-occupancy of the same territory in subsequent years by returning pairs.

Figure 5. Selected Least Bittern nest locations between 2007 (blue) and 2008 (yellow) at St. Clair National Wildlife Area, illustrating proximity between nesting seasons (inner ring = 1 m / outer ring = 5 m). *Maps produced by CWS-ON – Background Data: True Colour Ortho Photos, 2006 © First Base Solutions, 2006.*

Discussion

Our results show that Least Bitterns use flooded emergent vegetation for nesting, will nest in close proximity to one another (i.e.,semi-colonially), and will use similar locations in the marsh each year if habitat conditions do not change. Results from this study also quantify the extent to which Least Bitterns nest in non-persistent emergent vegetation (e.g., burreed) in SCNWA, and show that Least Bitterns nest in some numbers where habitat conditions are appropriate. Future research will be required to help understand what "ideal" habitat conditions are, as well as more details of the breeding biology of Least Bittern in Ontario, to help guide its recovery and assist SCNWA management.

Reproductive Success

Targeted Least Bittern surveys were completed at SCNWA in 2007 as well as at Long Point and Big Creek National Wildlife Areas. Data from these surveys show nesting at all sites and in relatively high numbers. Although reproductive success was not completely documented (all sites combined: 13 of 21 nests had eggs or young on the last visit; 4 of 21 failed at egg stage; 4 of 21 had adults on the nest when visited), it is probable that many of these birds, and those not detected, successfully reproduced in 2007. Similarly at the SCNWA in both years, reproductive success was not documented (23 out of 27 nests had eggs in July 2008; 5 of 14 in July 2007).

Nesting

To our knowledge, this is the first study in Ontario that quantifies the use of emergent vegetation by nesting Least Bitterns at a wetland. Numerous studies have documented the use of emergent vegetation (e.g., cattail, sedges, bulrush, etc.) by breeding Least Bitterns (Weller 1961, Manci and Rusch 1988, Gibbs *et al.* 1992, Bogner and Baldassarre 2002,

Winstead and King 2006a, Winstead and King 2006b, Rehm and Baldassarre 2007) and more specifically, nest habitat characteristics of Least Bittern in Ontario (Peck and James 1983). Our results corroborate ranges of nest habitat characteristics from Ontario data but differ from ranges in other North American studies (e.g., nests from this study were generally placed higher above water and in deeper water) (see above references). Future studies should examine microhabitat characteristics (e.g., plant stem density and residual vegetation cover) around nests to help refine critical habitat for nesting Least Bittern.

Semi-colonialism

Although most members of the Ardeid family nest colonially, Least Bitterns are predominantly solitary nesters, and are known to nest in loose colonies (Kushlan 1973, Gibbs *et al.* 1992). This study presents the first documented evidence of semi-colonial nesting of Least Bitterns at SCNWA and confirms previous anecdotal evidence (John Haggeman, pers. comm.). More locations of semi-colonialism were evident in 2008 (n = 3) than in 2007 (n = 1) suggesting that changes may have occurred in either population demographics (ratio of adults to sub-adults) or resource availability. The return of many sub-dominant birds may explain semi-colonial nesting of Least Bitterns at SCNWA presumably because sub-dominant birds are less aggressive and/or experienced when defending territories. Banding with further observation would corroborate possible changes in population demographics as well as confirm natal philopatry.

Changes in resources, specifically nesting habitat and prey availability, may also explain the high concentration, including semi-colonialism, of breeding Least Bitterns at SCNWA. The germination and growth of wetland plants is determined by many factors (e.g., turbidity, soil type, available nutrients) but ultimately water levels drive the distribution and extent of wetland plants such as cattail and burreed (Keddy and Reznicek 1986, Mitsch and Gosselink 2000). Low water levels in 2007 resulted in the germination of some non-persistent emergent vegetation, but without a complete drawdown (i.e., where water levels are significantly lowered in a managed marsh), cattail cover was generally not affected. Consequently, in 2008, more non-persistent emergent vegetation, in conjunction with higher interspersion, likely provided more high quality breeding habitat for Least Bitterns compared to 2007. This, in turn, affected other biotic communities (e.g., fish, amphibians and aquatic invertebrates) which have been shown to depend on wetland plant species (Turner and McCarty 1998, Angradi *et al.* 2001) as well as wetland habitat quality (Burton *et al.* 2008). Many of these faunal species are prey for Least Bittern (Gibbs *et al.* 1992) and thus likely affected food availability, and potentially allowed them to nest in high densities (i.e., semi-colonially).

Although most polygynous species in North America are found in wetlands and grasslands (Cech *et al.* 2001), polygyny has not been documented in Least Bittern (Gibbs *et al.* 1992). Resource availability (specifically food) has been shown to affect rates of polygyny in other birds, such as the Marsh Wren (*Cistothorus palustris*), Savannah Sparrow (*Passerculus sandwichensis*) and Red-winged Blackbird (*Agelaius phoeniceus*) (Kroodsma and Verner 1997, Wheelright and Rising 1993, Yasukawa and Searcy 1995). Thus, further studies should examine the dynamics among wetland vegetation, prey availability and breeding behaviour of Least Bittern (possibly polygyny) particularly in relation to wetland water-level management.

Nest-site Fidelity

Although the results of this study do not confirm nest-site fidelity in Least Bitterns, the data show that in some instances the same nesting areas (within 5 m) were used between years. Birds were generally evenly distributed across the SCNWA, and whether birds returned to the same area because the habitat was of high quality, or they simply used an area repeatedly, remains unclear. There is undoubtedly high quality breeding habitat (i.e., nesting and prey resources) at these sites, and future studies are required to help determine the extent to which Least Bitterns use a marsh complex as a whole and at finer scales. Studies that identify the microhabitat around nests that are used successively over time will help to elucidate answers to this question. In addition, reproductive success of these nests as well as others will need to be documented in order to determine what resources (i.e., habitat, prey) are important for breeding Least Bitterns.

Reproductive Success

The annual breeding phenology of many birds is determined by environmental cues, such as the weather (Reed and Elphick 2001). Colder temperatures and more days with winds greater than 50 km/h in 2008 may explain the high proportion of nests detected with eggs in early July of this year (Table 2).

While Least Bittern nesting dates at SCNWA fell within the range of expected egg dates (Peck and James 1983), on average, most of these birds would be expected to initiate nesting closer to the

Table 2. Mean temperature and days with a wind speed greater than or equal to 50 km/hr in the months of May and June of 2007 and 2008 (Environment Canada 2008).

Year	Mean temperature (^{O}C)		Number of Days with winds >50 km/hr (Maximum wind speed)	
	May	June	May	June
2007	13.93	19.16	3 (69)	6 (67)
2008	11.24	19.72	10 (72)	7 (85)

peak nesting period. Harsh weather in 2008, however, may have delayed nesting or resulted in a high proportion of birds re-nesting due to nest loss. High winds can result in nest failure due to eggs rolling out of nests (SWM and CAF pers. obs.) and may explain the increased use of non-persistent emergent vegetation in 2008, as compared to 2007, as a result of birds attempting to re-nest. Conversely, it is also possible that many of the nest observations in 2008 were birds attempting to double brood; Least Bittern fledglings, many greater than two weeks old, were observed at this time. Bogner and Baldassarre (2002) documented double brooding of Least Bitterns in New York State. SCNWA is at a similar latitude as northern New York State. Therefore, it is possible that Least Bitterns in Ontario may double brood and this behaviour should be looked for in Ontario.

Although natal philopatry has not been confirmed in Least Bitterns (Gibbs *et al.* 1992), it is possible that high reproductive success in 2007 resulted in a high return of sub-adults to the SCNWA in 2008. This, then, may have resulted in many inexperienced and sub-dominant birds returning in 2008 and nesting in less-preferred vegetation (e.g., burreed and sweetflag) because dominant birds had already established breeding territories in the marsh. This may also explain the location of some Least Bittern nests in marginal habitat, such as fringing cattail separated from main stands (Figure 1b).

Conclusion

Results from these observations show that, at a minimum, 27 pairs of Least Bitterns nested within both units of the SCNWA in 2008. In 2007, there were 14 nesting pairs within both units. This suggests that Least Bitterns will quickly respond to high quality habitat conditions by breeding in high densities and semi-colonially. Observations from this study, however, also indicate that further research is required in order to help understand the breeding biology of Least Bittern in Ontario, as well as continue to adaptively manage the SCNWA for the future benefit of all wildlife.

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Erratum:

Great Egret sighted in the Azores

The caption for Figure 1 on page 136 should read: This map shows the Nottawasaga Island banding location (star) of a Great Egret and the Azores Islands where the bird was resighted during November 2005-January 2006. *Map courtesy of Andrew Jano.*