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ARTICLES

Cover Illustration: Turkey Vulture *by Barry Kent MacKay*

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With wind farms being proposed or constructed on locations including mountain ridges, exposed headlands, in known migration corridors and offshore sites, concern exists that we do not create more Altamonts in our haste to develop wind energy.

What birders in Ontario think about wind energy in relation to birds

Edward Cheskey and Ahmed Zedan

Introduction

Fossil fuels, as a major source of energy, have come under a lot of criticism in recent years as science unveils their contribution to global warming. In addition to the effects on climate change, and the fact that they are non-renewable finite resources, the exploration, extraction and production of fossil fuels has been proven to have detrimental effects on other components of the environment: soil, water and wildlife. As a result, renewable energy has been regarded as necessary to address these increasing concerns. Wind, one of the various natural sources of renewable energy, offers a greener solution that generates fewer carbon dioxide emissions and has fewer impacts on the environment.

Assessment of the impacts of wind energy installations has focussed on bird mortality caused by collisions with blades (de Luca *et al.* 2007), and more recently bat mortality from biotraumas, (calculated as birds(or bats)/turbine/year or more recently birds(bats)/MW/year). Concerns have also been raised about loss of habitat from installations (impact on breeding birds from the footprint of a turbine, including servicing roads, underground cables and transformer stations), displacement of migratory routes

Wind farm near Port Burwell, Ontario.
Photo: Ted Cheskey

through avoidance of wind farm installations and vibration noise (see "Mortality Threats to Birds – Wind Turbines" on the American Bird Conservancy website). Although the impact of wind farms on birds to date has been conveyed as relatively minor, there are a few notable exceptions, such as the Altamont Wind farm in California (Thelander and Smallwood 2007) and some of the wind farms in Spain (Lekuona and Ursua 2007). Recent data from the controversial Wolfe Island wind plant near Kingston, Ontario, has raised concerns that it may join the ranks of the most damaging wind plants in North America (TransAlta Corporation 2010).

In the simplest terms, monitoring the impact of active turbines on birds typically involves regular searches for corpses beneath the turbines.

There are several layers of complexity to this issue, particularly related to monitoring. In the simplest terms, monitoring the impact of active turbines on birds typically involves regular searches for corpses beneath the turbines. Monitoring is often a condition attached to project approvals, at least for the first few years of operation. Most wind producers do not publish the studies and methodologies used to arrive at their mortality estimates, and are under no obligation to do so. The data we gathered in this paper (see Table 1) were derived from research studies, consulting firms' monitoring plans, and wind developer presentations. Stantec's study for TransAlta, of the first six months of operations of the Wolfe Island turbines, is a good example of corporate due-diligence, with respect to birds at least, in the wind energy sector.

Normally, the monitoring is done for the wind farm operator by a contracted field biologist or birder. The challenges of monitoring over open water are obvious and not easily resolvable — it is harder if not impossible, to conduct offshore body counts around the turbines as is done on the land. However, a recent technology developed in Europe, that is being employed at the Cape Wind project off Massachusetts, the first approved offshore wind plant in the United States, may overcome some of the challenges and make some elements of offshore monitoring more feasible. One example of such technology is the infrared collision-detection system developed by Denmark's National Environmental Research Institute, the Thermal Animal Detection System (TADS). While this technology is a big step forward, the high cost of the units and the unresolved issue of identifying casualties remains, meaning that, at best, it provides only a partial solution to this issue.

Often, proponents of wind farms point out that mortality rates from wind farms rank far below those resulting from tall buildings, vehicles and house cats (see "What Kills Birds" on Curry and Kerlinger website). However, the birds that collide with tall buildings, or are killed by house cats, are not necessarily the same species as the casualties of the wind turbines, as the Wolfe Island data has demonstrated (TransAlta Corporation 2010). The species most impacted during the first six months of the Transalta wind farm on Wolfe Island were Tree Swallow

Table 1. Reported avian fatality rates in Canadian and US wind farms

Project Name	Location	Capacity (MW)	No. of Turbines	Fatality Rate (birds/turbine/year)
CANADA				
[1]Erie Shores Wind Farm	ON	99	66	0.41
[2]Prince Wind Power Project (estimate)	ON	189	126	0.39
[3]Pickering	ON	1.8	1	3
[3]Exhibition Place	ON	0.75	1	2
[2]Melancthon 1 Wind Plant (estimate)	ON	133	200	1.4
[4]Chin Chute Wind Farm	AB	30	20	1.55
[5]Taber	AB	80	37	2.42
[5]Kettles Hill	AB	63	35	2.69
[3]McBride Lake	AB	75.24	114	0.36
[3]Magrath	AB	30	20	2.62
Summerview	AB	70	39	1.9
[1]Castle River	AB	44	60	0.19
[3]Cypress Wind Power Facility	SK	10.56	16	1.4
[6]Le Nordais	QC	99.75	133	0
Average				**1.52**
[3] **UNITED STATES**				
Altamont	CA	167.86	1,526	0.791
Diablo Winds	CA	20.46	31	1.19
High Winds	CA	162	90	2.31
San Gorgonio	CA	456.785	2,947	0.042
Tehachapi	CA	0.1274	637	0.071
Ponnequin	CO	31.24	44	0.155
IDWGP	IA	2.25	3	0
Top of Iowa	IA	80.1	89	0.646
Princeton	MA	0.32	8	0

Project Name	Location	Capacity (MW)	No. of Turbines	Fatality Rate (birds/turbine/year)
Buffalo Ridge I	MN	24.82	73	0.884
Buffalo Ridge II	MN	107.25	143	2.27
Buffalo Ridge III	MN	103.5	138	4.45
Copenhagen	NY	0.68	2	0
Madison	NY	11.55	7	0.571
Klondike	OR	24	16	1.44
Vansycle	OR	25.08	38	0.632
Meyersdale	PA	30	20	0.925
Somerset	PA	10.4	8	0
Buffalo Mountain	TN	1.98	3	9.33
Searsberg	VT	5.94	11	0
Nine Canyon	WA	48.1	37	3.59
Stateline	WA/OR	299.64	454	1.93
NE Wisconsin	WI	20.46	31	1.29
Mountaineer	WV	66	44	2.59
Foote Creek Rim	WY	41.4	69	1.49
Average				**1.464**

[1] Holder, 2008.
[2] Invenergy Canada, 2009.
[3] Barclay, *et al.*, 2007.
[4] Glendinning, 2008.
[5] Enmax Corporation, 2008. (includes birds and bats combined)
[6] Kingsley and Whittam, 2005.

(*Tachycineta bicolor*), Bobolink (*Dolichonyx oryzivorus*), Purple Martin (*Progne subis*) and Turkey Vulture (*Cathartes aura*). These species do not show up on the Fatal Light Awareness Program (FLAP) list of birds from building strikes, nor are likely frequent victims of house cats, though rural cats may prey on Bobolinks. With wind farms being proposed or constructed on locations including mountain ridges, exposed headlands, in known migration corridors, and offshore sites, concern exists that we do not create more Altamonts in our haste to develop wind energy. Clearly, all of these impacts require our collective attention, and where we can, as a society, we should be mitigating those actions that we know are damaging to wildlife.

One thing that seems clear about wind farms and their impact on birds is that each case is different and what happens in one area cannot be applied to other areas. A look at some mortality data (Table 1) demonstrates that most projects report very low casualty rates.

With the recent passing of the Ontario Green Energy Act, the number of wind installations in the province will increase dramatically. Wind energy producers are proposing wind farms wherever there is wind, which of course includes many areas that are well-known for their significance to birds. The Ontario government is scrambling to put in place regulations to manage the development of offshore wind projects.

In 2009, proposals for wind farms in or near globally significant Important Bird Areas around Point Pelee and on Prince Edward Point caught the attention of some naturalist groups and conservation organizations, including Nature Canada and Ontario Nature (the South-Point Wind proposal for 15 turbines in Pigeon Bay, 2009, and the Gilead proposal for 12 turbines near Prince Edward Point National Wildlife Area, 2009). Indeed, concerns over potential impacts on birds of these two proposals prompted this survey. The purpose was to ask birders in Ontario for their opinions on wind energy, whether they had concerns about the impact of wind farms on birds, and how they felt about the presence of wind farms at two of the most popular birding locations in the province. From the perspective of Nature Canada, our interest in conducting the survey was also to raise awareness in birders of this issue.

However, this survey was not intended as an in-depth or scientific review, but more an initial exploration of this issue with a hope that it would encourage people to look at issues more closely. By increasing understanding of potential impacts to birds we may help to limit or reduce the ways in which we impact them.

Methods

In September and early October 2009, 264 birders from across Ontario, and a few beyond, completed an online survey about their perception of modern wind energy projects (usually called "wind farms") and the impact of these installations on birds.

OntBirds, the Ontario Field Ornithologists list-server was used as the primary distribution tool on 21 September, in addition to some untracked viral spreading of the survey by e-mail. Survey

Top of a modern wind turbine.
Photo: Ted Cheskey

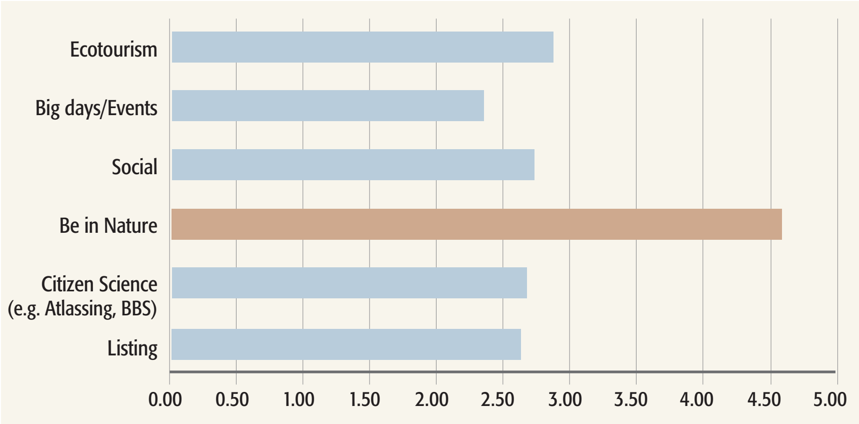


Figure 1. Motivation to go birding (rank) 1 (low) to 5 (high)

Monkey, a web-based polling or survey tool (www.surveymonkey.com), was used to gather survey responses. Two groups of questions were asked. The first group of questions was for the respondents to describe themselves and their interest in birding. The second set was to elicit opinion on some general topics such as climate change, and specifically on wind energy, and whether turbines should be allowed near significant bird sites.

Results

About the respondents:

- 264 surveys completed
- All but three respondents were from Ontario
- Gender of respondents: 42% female; 58% male
- 56% have birded for more than 20 years and 90% for more than five years
- "**to be in nature**" was by far the strongest motivation to go birding, independent of education and income (Figure 1).

Birders are known to be motivated by different activities and in our attempt to get a better understanding of their source of motivation we found that one of the categories offered in Figure 1 — being in nature — was ranked the highest. This was consistent in all income and education categories. However, there does appear to be a relationship between education and citizen science, suggesting that citizen science projects are an increasing motivation as the level of education increases.

When asked about their travel habits for birding, most respondents said that they go on at least one over-night trip annually and have travelled long distances to go birding (Table 2). Likewise most respondents do not only bird locally, but also bird by car. The only exception was the lowest income earners who avoid using their cars for birding locally.

Responses to the question "the last time I went birding was" demonstrates that Ontbirds respondents are very active and bird on a regular basis, 62% within the week and 85% within the month.

Table 2. Travel habits related to birding

Answer Options for Travel Habits	Yes (%)	No	Response Count (Total number of respondents)
I only bird locally	63 (25.5)	184	247
I go on at least one over-night birding trip annually	179 (74.9)	60	239
I have travelled long distances (over 1000 kilometres) to go birding	162 (66.1)	83	245
My big days always involve a lot of driving	78 (35.0)	145	223
I try to avoid using my car when I go birding if possible	81 (34.9)	151	232

Table 3. Statements to which birders agreed or disagreed to

Agree or disagree with the following statements:

Answer Options	Agree (%)	Disagree (%)	Not sure	Response Count
I support wind energy in Ontario	149 (57.5)	57 (22.0)	53	259
Wind turbines have almost no impact on birds	48 (18.6)	142 (55.0)	68	258
Offshore wind turbines should be encouraged in all windy areas of the Great Lakes	64 (24.5)	115 (44.1)	82	261
It is important to me that we reduce our consumption of fossil fuels	239 (91.9)	10 (3.8)	11	260
Global warming is an issue that is of great importance to me	216 (83.1)	24 (9.2)	20	260
Wind farms should not be located in or near Important Bird Areas or migration bottlenecks	182 (70.3)	26 (10.0)	51	259
Wind farms are a tourist attraction that I would travel to see	19 (7.3)	226 (87.3)	14	259
			answered question	261
			skipped question	3

Opinions on wind farms and birding

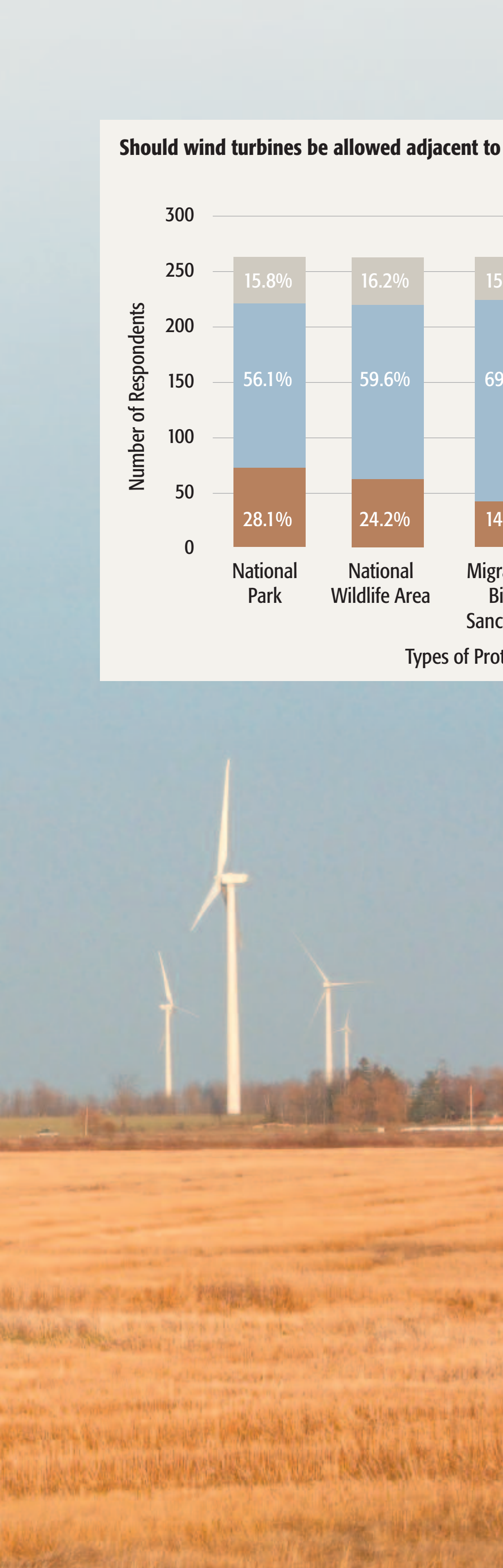
One series of questions asked birders to agree or disagree with a number of provocative statements. The question was not asked if the respondent had actually visited or observed a wind farm, but given the number of wind projects in Ontario, and their visibility in places like Wolfe Island, Port Rowan – Port Burwell, Bruce County, Shelburne and Toronto's Exhibition Place, it is assumed that most birders would have observed wind turbines.

There are many stories in these results. On the two questions related to global warming, Ontario birders are strongly concerned about global warming and the vast majority of respondents (92%) consider it important to reduce consumption of fossil fuels. The concern for global warming appears to translate into strong support for wind energy from nearly 60% of respondents, with only about 20% not supporting wind energy. Despite the support for wind energy, approximately 55% of the respondents believe that wind energy impacts birds, and an even stronger proportion (70%) believe that wind projects have no place in important bird areas or in avian migratory corridors. The message from our sample of Ontario birders is fairly clear — let's have wind projects in Ontario, and reduce dependence on producing energy from fossil fuel combustion, but not in a way that will have detrimental impacts on birds.

With wind farms proposed in or near two of the iconic birding locations in Ontario, Point Pelee National Park and Prince Edward Point National Wildlife Area, we asked the birders if the presence of a wind farm at these birding hotspots would discourage them from continuing to go birding there.

Roughly half of our respondents disagreed with the statement that the presence of a wind farm would discourage them from visiting Point Pelee or Prince Edward Point. Approximately 37% of the respondents agreed with the statement.

Wind farm near Shelbourne, Ontario. *Photo: Ted Cheskey*



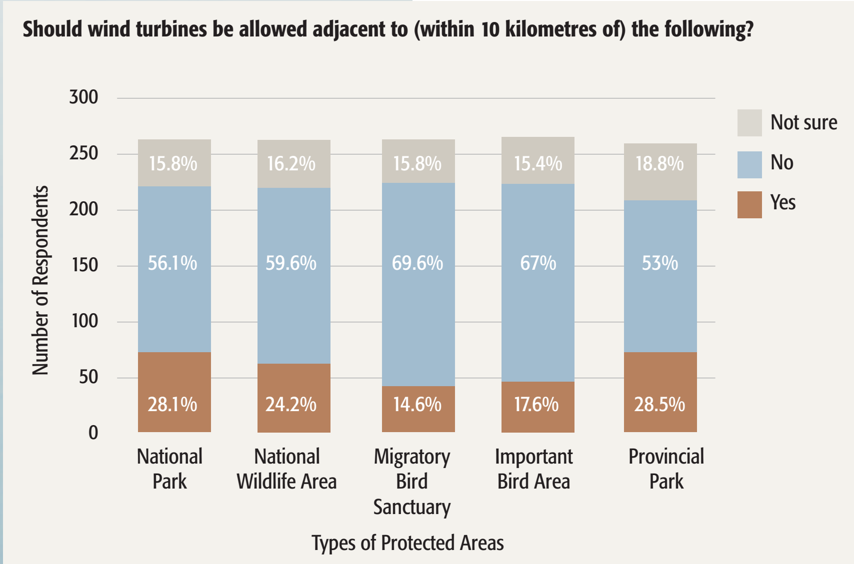


Figure 2. Birders opinions with respect to the location of wind farms.

While the result could be interpreted as confirming that most birders would not be dissuaded from pursuing their passion at their preferred places, a substantial number of respondents, over one-third, would, in fact, be discouraged. From the point of view of visitation to these locations, where birding tourism, also known as avitourism, brings significant dollars into the community, such a result could represent the loss of a significant number of visitors.

The last question asked birders where wind farms should or should not be allowed, and just how close to sensitive natural areas these features should be located (Figure 2).

In ranked order of agreement, respondents felt wind farms should not be located near Migratory Bird Sanctuaries (69.6%), Important Bird Areas (67%), National Wildlife Areas (59.6%), National Parks (56.1%), and at Provincial Parks (53%). Of note is a comment made by a number of respondents that though they may have answered yes to some of these questions, they added that ten kilometres was too great a distance for the buffer, and if the question had used a different number, perhaps five for example, they may have answered differently.

Most birders recognize that wind energy in the wrong place can pose a threat to bird populations.

Interestingly, Migratory Bird Sanctuaries (MBS) do not represent the most significant locations for birds, but rather a category of protected area within Environment Canada's protected area network. Most MBSs are not recognized based on scientific evaluation, but rather based on a local request or interest — a proportion of them are owned privately. Though a type of federal protected area, MBSs are only accorded protection during the seasons when birds are present — the habitat is not protected per se. The International Union for the Conservation of Nature (IUCN) lists a majority of Canada's MBSs as category IV protected areas (this IUCN category includes areas that are intended to "protect particular species or their habitats", with active management interventions being required to maintain habitats or site suitability for particular species. Management of category IV protected areas may be generally focused on restoring natural areas that have experienced "substantial modification").

Important Bird Areas (IBA), a program of BirdLife International, to identify and recognize the most important places for birds on the globe (delivered in Canada by both Nature Canada and Bird Studies Canada in partnership) is the only program specifically focused on significant sites for birds. National Wildlife Areas (NWA), another type of protected area administered by Environment Canada, are owned by the federal government and have a higher degree of protection, though they are managed more flexibly than a park for example, and in some, controversial industrial activities can take place (e.g. CFB Suffield where over 1,000 natural gas wells are proposed).

Conclusions

Based on the sample from this study, Ontario birders reflect a fairly wide spectrum of interests, income and education, yet share similar concerns about climate change and global warming, and generally see wind energy as an important industry to combat this threat. However, most birders recognize that wind energy in the wrong place can pose a threat to bird populations. The wrong place includes Migratory Bird Sanctuaries, Important Bird Areas, National Wildlife Areas and national or provincial parks. Some birders, over one-third of those sampled here, said they would be discouraged from visiting the iconic birding locations of Point Pelee or Prince Edward Point if wind farms were built near them.

Ontario is on the cusp of major wind energy developments. In June 2010, the province proposed regulations to open up the development of off-shore wind farms.

The government is proposing a five kilometres buffer around all of the Great Lakes shorelines and major islands for example. These regulations are part of the approvals process of the Green Energy Act, which passed into law this past year, and is designed to lift many of the bureaucratic barriers to developing green energy projects such as wind farms (*Green Business* article, September 2009).

We believe that birders in Ontario have a special interest in the airspace through which our birds pass and could be interested in expressing their views about how wind energy is rolled out in Ontario.

Acknowledgements

Nature Canada and Ontario Nature wish to thank respondents for taking the time to do this survey and contributing many very thoughtful comments which were not necessarily captured in this report. We would also want to thank the OFO Board of Directors for supporting this study.

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Distinguished Ornithologists
Erica Dunn and David Hussell

Erica Nol

Erica Nol (centre) presenting the Distinguished Ornithologist Award to Erica Dunn and David Hussell at the OFO Annual Convention in Port Dover on 25 September 2010. *Photo: Jean Iron*

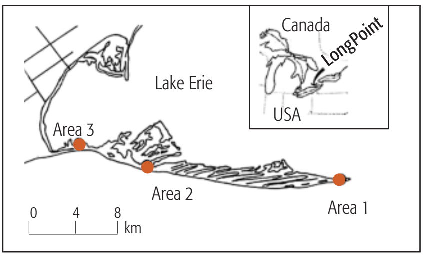
I am very pleased to present this citation for the Ontario Field Ornithologists Distinguished Ornithologist Award to Drs. Erica (Ricky) Dunn and David Hussell. I met the two in 1976, when I came to Long Point Bird Observatory (LPBO), for my first job in ornithology. I was hired to work with Ricky on the ecology of Black Terns (*Chlidonias niger*) in the marshes of Long Point Bay (and as a bit of coincidence, to be an employee, at least on paper, of Trent University). David was the Executive Director and Ricky was commuting from Peterborough where she worked for two years. It was an impressionable period of my life: launching the canoe at Old Cut (before Old Cut was the familiar Old Cut of BSC today) while Ricky showed me the basics of tying knots, handling bird eggs, and becoming a more organized person. I also learned how to extract and band birds and much about the secret life of Tree Swallows (*Tachycineta bicolor*), with David's always thoughtful and patient approach to the science of bird banding.

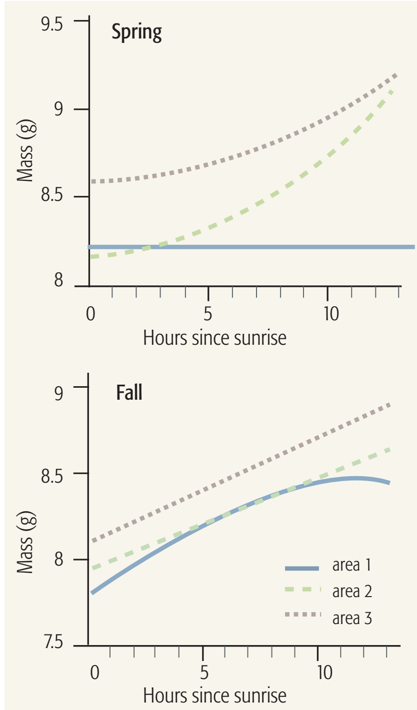
Ricky and Dave were excellent mentors, and I learned a tremendous amount about ornithology during that year, including the basics of how to analyse data, and tips for the presentation of my first paper at a scientific meeting (at the old Ontario Field Ornithologists meetings that some OFO members might remember). Most importantly, the intellectual stimulation at LPBO, often occurring over a cup of tea, shaped and provided the impetus to my own career.

Ricky and Dave met at the University of Michigan when they were graduate students in the Zoology Department. Ricky had spent two years at the Wooster College in Ohio, then went on to Michigan for the remainder of her undergraduate and graduate work, while Dave was there conducting his PhD work, after a short career as a concrete engineer for the Ontario government. Dave is originally from England but emigrated here in 1957 to work as an engineer. Ricky conducted her Ph.D on the physiology of Double-crested Cormorants (*Phalacrocorax auritus*), at a field site off the Isle of Shoals, New Hampshire. Dave pursued his dissertation work on the ecology and life histories of arctic passerines (as a result of having caught a severe case of 'arctic disease' in the early and mid 1960s, travelling from Churchill, Manitoba, in the sub-Arctic, eventually to Devon Island, where the main body of his work was conducted). Judging from Dave's numerous returns to the arctic (and recently in the company of Ricky) and his recent field project on Northern Wheatears (*Oenanthe oenanthe*) on Baffin Island, he has yet to shake the symptoms of that disease.

In the published literature, David and Ricky have had a profound influence, in their lasting approach to shaping the science behind volunteer-based surveys, both here in Ontario and across North America. As the first Executive Director in the 1970s, of the oldest bird observatory in North America, the Long Point Bird Observatory, David started North America's (and I think the world's) first ever Birdathon, which, in very short time, made birding across this continent a major fund-raising activity for non-profit organizations interested in conserving and studying birds. Coupled with Ricky's substantial organizational skills, these first years brought together a large and enthusiastic collection of interested amateur volunteers. Influenced, from his life in the United Kingdom, by the rich and useful information obtained by volunteer-based surveys coordinated by the British Trust for Ornithology, David and Ricky then initiated several Ontario-wide volunteer based surveys. These included the Great Lakes Beached Bird Survey, the Great Blue Heron Survey and the Ontario Bird Feeder Survey. The latter, in 1987, became part of Project FeederWatch, conducted across North America with over 7,000 participants; a survey organized and coordinated by Ricky through the Cornell Lab of Ornithology. This work led to Ricky's book, the highly accessible 'Birds at My Feeder' first published in 1999. Dave was also instrumental in getting the Ontario Breeding Bird Atlas going in the 1980s, sitting on the management committee and chairing the technical committee and the data review committee, where he reviewed thousands of records.

Think how many members of OFO have participated in these various surveys and how much poorer we would know our environment if not for their early effort starting them. Through the deep appreciation of the value of migration data collected at Long Point since the early 1960s, David and Ricky started to use these accumulating data in innovative and influential ways. I have two examples, both of which I use in my ornithology class at Trent University.





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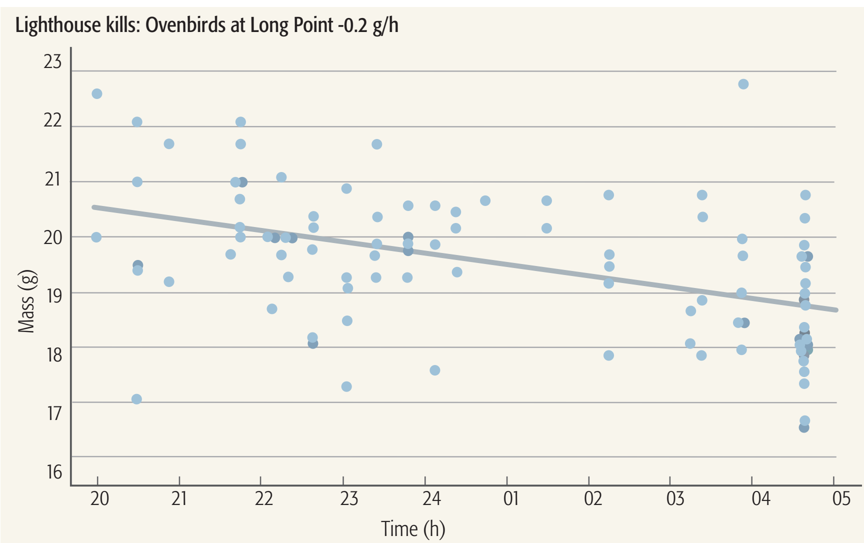

Time of Capture at Long Point Lighthouse. *From:* Hussell, DJT. 1969. Weight loss of birds during nocturnal migration. AUK 86: 75-83

When David left LPBO in 1982, he went to work at the Ontario Ministry of Natural Resources (OMNR), ostensibly to analyse deer hunt data. He was able to convince the powers that be, that analysing hawk migration data was at least as important. He began his extremely helpful move towards analysing data available on hawk migration from Beamer Point Conservation Area, at Grimsby, Ontario. From there he moved to the large amounts of North American data, particularly from Hawk Mountain, Pennsylvania. He used these data to refine methods that he had used on data from passerine migration to detect trends in numbers. At this time, although Ricky was only working part-time because their two boys were still quite young, her organizational skills were used to excellent advantage as she helped Dr. Charlie MacInnes take data from early studies of Canada Geese (*Branta canadensis*) out of file drawers. In very short order she published, with Charlie, six important papers on Canada goose laying dates, factors affecting clutch size, gosling growth, adult body size variation and the effects of neckbands on survival. If we could all have such incredibly efficient research associates!

Between these two outstanding scientists, they have published 132 peer-reviewed publications, as well as numerous other printed contributions

Not surprisingly, not long after, Ricky was hired as a research scientist with the Canadian Wildlife Service. Dave retired and they moved to Ottawa where they lived until Ricky's retirement in 2005. While in Ottawa, among other accomplishments, Ricky introduced the very influential concept of 'responsibility' for a species, the outline of which was published in a 1999 issue of Biological Conservation. The concept is simply, that a species should be considered for careful management, not only if it is rare or endangered, but also if the range where it is most abundant (breeding, wintering or migratory) falls within a single or a small number of political jurisdictions, making it particularly vulnerable to unwise land-use decisions.

Between these two outstanding scientists, they have published 132 peer-reviewed publications, as well as numerous other printed contributions that I am sure most of you have encountered. In providing some context, many university scientists need to publish or we do indeed perish, and so, as a consequence, have long CVs full of publications. Many of these publications are co-authored by graduate students who often do the physical field work, the data analysis, and if we are so lucky, also provide much of the intellectual component of those publications. I would venture that for most senior university scientists only about 20% of their publications are first authored. By contrast, in their combined list of publications, about 70% are first or single authored papers, not benefitting from a cadre of graduate students. Combined citations in the scientific literature of these papers total nearly 2400, and most of those citations are for papers not involving the work that I have mentioned that makes use of volunteer surveys.

Thus, Dave and Ricky have also profoundly influenced the basic research end of ornithology. A few examples include: David's seminal paper on clutch size variation in arctic passerines has been cited by other authors over 350 times, whereas Ricky's collection of papers on energy allocation in altricial birds has been cited nearly 200 times. I wonder how many OFO members know of this 'other life' of these two exceptional individuals.

I must also mention the prominent service to the broader ornithological community by David and Ricky that has been sustained for nearly four decades. Although not an exhaustive list, Ricky has served on at least 16 committees of the American Ornithologists' Union (from endowment, to chairing a committee on Birds of North America online), and then became President from 2006-2008. Additionally, she has served as president and councilor for the Society of Canadian Ornithologists; she was a councilor of the Association of Field Ornithologists, a member of both the COSEWIC Bird Subcommittee, and the Technical Committee of the Canadian Migration Monitoring Network and a long-time member of the Partners in Flight Technical Committee. Dave has served on the Board of Directors of the Federation of Ontario Naturalists, was the Chair of the first Ontario Breeding Bird Atlas Technical Committee, a trustee on the North American Loon Fund, scientific advisor to four different bird observatories, he sat on the advisory council to the Hawk Migration Association of North America and was co-chair of the Canadian Migration Monitoring Network Steering Committee. Thus, they have spread their influence, across amateur and professional ornithology throughout our continent.

With this long list of accomplishments, you will no doubt not be surprised that Dave and Ricky have received many other honours including, jointly, the Doris Huestis Speirs award for outstanding contributions to Canadian Ornithology, and the Eugene Eisenmann Medal for excellence in ornithology and encouragement of the amateur. Ricky has been awarded the Partners in Flight Award for Outstanding Contributions to Bird Conservation and the Janette Dean Award of the Ontario Bird Banding Association for contributions to bird banding (with David Brewer) among others. David has received the Hawk Migration Association of North America's Maurice Broun Award for deep personal commitment and outstanding service to advance raptor migration study and conservation and the Janette Dean Award.

I have no doubt that I have convinced you of the worthiness of your selection of David Hussell and Erica Dunn for this most prestigious award of the Ontario Field Ornithologists.

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Figure 1. Typical nest of Ovenbird (*Seiurus aurocapilla*). Bruce Peninsula National Park. 26 June 2009.
Photo: Michael Patrikeev

DOME-LESS NEST OF THE OVENBIRD FROM THE BRUCE PENINSULA

Michael Patrikeev

The Ovenbird (*Seiurus aurocapilla*), a familiar member of family Parulidae, is common and widespread in forested parts of northern and north-eastern North America (Van Horn and Donovan 1994). This species occurs in every region of Ontario, including the entire Bruce Peninsula (Armstrong 1987, Burke 2007).

Well-camouflaged, domed nests built on the ground "resemble a miniature Dutch oven", hence the name Ovenbird (Gross 1953, Godfrey 1986). The nest is usually constructed in a slight depression on the ground, and made of grass, weed stems, rootlets, leaves and moss, with lining of fine grasses and hair and is invariably covered over (Godfrey 1986). The female creates a circular spot on the

the ground by pushing back the leaf litter (Stenger and Falls 1959), which then is filled with dead leaves, and the nest-cup is woven of slender plant stems, fibrous bark, and hair (Van Horn and Donovan 1994). Then grasses and other plant materials are placed around the edges for dome construction, and the entire nest, dome and cup, are woven into one unit (Hann 1937). A side entrance (Figure 1) is invisible from above (Gross 1953).

On 11 June 2010, I flushed an Ovenbird from an uncovered nest, in a hardwood forest south of Cameron Lake in Bruce Peninsula National Park. The nest was hidden in a growth of sugar maple saplings (10-12 cm high), and contained three newly hatched young. The nest had a well-defined base made of maple and beech leaves and leaf skeletons, and lined with fine grass and fibre, but lacked any traces of a dome. The bird was reluctant to leave the nest, and was photographed brooding small young on 15 June (Figure 2). Detailed observations at this nest were not undertaken due to a black bear presence in the vicinity. The nest was depredated by 18 June.

All 260 nests reported from Ontario by Peck and James (1987) and twenty or so nests previously found by the author were domed or roofed over. No reference to dome-less nests was found in recent nest cards submitted to the Royal Ontario Museum (Mark Peck, pers. comm.) or in literature (Hann 1937, Gross 1953, Godfrey 1986, and Van Horn and Donovan 1994). Though Gross (1953) reported a nest (interestingly, from Birch Point, Toronto), in which "the whole dome or top had been torn off", but the bird "continued incubation apparently unconcerned by its exposed condition".

Figure 2. Ovenbird brooding small young in a dome-less nest. Bruce Peninsula National Park. 15 June 2010. *Photo: Michael Patrikeev*

Thus, this nest from the Bruce Peninsula may be one of the first documented dome-less Ovenbird nests, as Dawn Burke and her team (pers. comm.), Ontario Ministry of Natural Resources (OMNR), found three nests with no dome in 2008-2010. One nest had a dome base formed and lower walls started, but never completed (Figure 3). Another nest lacking a proper dome was built into a small mound under a fern, and the third one had only two leaves for a dome (D. Burke and L. Monck-Whipp, pers. comm.). Two of the nests found by the OMNR team were built by second year females (R. Leshyk, pers. comm.). Perhaps the Bruce Peninsula nest was built by an inexperienced second year female also.

Figure 3. Ovenbird nest photographed on 20 June 2008. Notice the rudimentary walls surrounding the nest. *Photo: Daniel Geleynse*

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Figure 1. The Blue Jay is an abundant autumn migrant through southern Ontario, especially along Lakes Ontario and Erie.
Photo: Geoff Carpentier

THE AUTUMN BLUE JAY MIGRATION IN ONTARIO

Geoffrey Carpentier

Although there are many references to the autumn passage of Blue Jays (*Cyanocitta cristata*) through Ontario in the literature (Tozer and Richards 1974, Speirs 1985, Sibley 2001), the migration is not well documented from a quantitative perspective. This paper will summarize the key migratory dates, numbers of birds involved and highest reported totals for selected locations throughout Ontario. Additionally, information will be provided as to why the jays leave and the routes they follow.

The fall passage of Blue Jays through Ontario has long been observed, with reports at least as early as 1906 at Pelee (Bent 1964). Often huge numbers of birds migrate out of the province annually, during a few weeks in September and October.

Table1. Association Between Mast Crop and Blue Jay Numbers

Fall migration	Mast Crop			Predicted Flight	Blue Jay #'s at Holiday Beach
	Red Oak	Beaked Hazel	Am. Beech		
2006	Poor	Excellent	Good to excellent	Small	107,311+
2007	Fair to good	Not reported	Very poor (no nuts)	Strong	446,402+
2008	Good	Not reported	Fair	Small to average	144,467+
2009	Poor	Poor	Poor	Strong	934,592+
2010	Spotty	Not reported	Poor to none	Average	186,846+

Table 1 shows that there is a direct association between the availability of mast from oak, beech, hazelnut and Blue Jay fall flight numbers.

The Blue Jay (Figure 1) is one of 11 species of North American jays, and is a familiar part of Ontario's avifauna. It ranges across much of southcentral Canada, but is generally absent from the territories, and its presence in British Columbia is patchy. It is considered a year round resident throughout much of the eastern and central USA, east of the Rockies and south to the Gulf of Mexico. In Ontario, its range includes all of the central and southern parts of the province, and extends north and west from Sudbury to Thunder Bay. It is uncommon to southern Kenora District and the Missinaibi River, Cochrane District (Cadman *et al* 2007). Its North American population is reported to be about 22,000,000, and has remained stable over the past 40 years (BirdLife International, 2010). Except in the extreme southern parts of its North American range, about 20% of the population is migratory (Hoyo *et al.* 2009).

In Ontario, the Blue Jay is closely associated with forests having high proportions of beech, oak and beaked hazel, so when crops of acorns, beechnuts and hazelnuts are poor, jays migrate out of the province in greater numbers. Ron Pittaway forecasts the flight strength of the Blue Jay migration in his annual Winter Finch Forecasts. Table 1 shows that there is a direct association between the availability of mast from oak, beech, hazelnut and Blue Jay fall flight numbers.

The migratory path of Blue Jays in autumn follows the edges of major waterways (Hoyo *et al.* 2009), with the north shores of lakes Ontario and Erie representing major pathways (m.ob.). In Ontario, the general flight direction is mostly from an E/NE to a W/SW direction (m.ob.), from treetop level to 300 meters (Hoyo *et al.* 2009). Birds travel in loose strings involving a few to hundreds of birds. In the spring, smaller less obvious movements occur, but these are not as closely linked to major waterways, so are not as evident (Hoyo *et al.* 2009).

There are many records of large movements of the Blue Jay through Ontario in the fall, but most are not adequately quantified, and where records do exist, often the reporting is inconsistent or sporadic, primarily due to a lack of dedicated counters. At Holiday Beach Migration Observatory (HBMO) in Essex County, Long Point Bird Observatory (Norfolk County) and Prince Edward Point Bird Observatory (Prince Edward County) numerous records have been documented over the years, with efforts made to report numbers seen. It is, however, seldom reported how the numbers were generated, or how confident the observers were in the number reported. It is presumed that when higher numbers are published, the observers are doing block or time counts to estimate the number of birds going by. Often counts of jays are made when other priorities are set aside. For example, at the hawk counts along the shores of Lakes Erie and Ontario, jays are counted when the hawks are not overwhelming the counters. Counts made at Cranberry Marsh in the autumn of 2010 were actual numbers of birds seen, with efforts made to count every bird as it passed.

Table 2. Summary Highest Counts[1] by Site > 2500 jays/day

Date	# of Jays (Year – Location)			
	CMHW[2]	P. Ed. Pt. [3]	Hawk Cliff	Other
2 September				3,000 (DNS4 – Pelee N.P.) [5]
12 September				4,000 (DNS – Pelee N.P.)
13 September		4,000 (2009)		
16 September		3,000 (2003); <4,000 (16-22 Sept. 2005)		10,000 (DNS – Pelee N.P.)
17 September		5,000 (2009)	4,000+ (2009)	
18 September	5,043 (2005)	3,700 (1977); 3,000 (2003); 4,000 (avg, daily count 18-24 Sept 2009); 3,000 (2009)		17,000 (1999 – Cobourg)
19 September				20,000 (1968 – Pickering); 13,000 (1999 – TW6); 5,000 (DNS – Pelee N.P.)
20 September		9,000 (1975); 2,500 (2003); 4,000 (2009)	3,000 -50,000 (2007)	6,500 (1981 – Rondeau P.P.); 2,400-3,500 (2007 – TI[7])
21 September		2,500 (1975); 4,000 (2005)		3,710 (1999 – HP[8])
22 September	2,936 (2010)	2,500 (2001)		
23 September			6,000+ (2010)	
24 September		3,500 (2003); 3,000 (2005); 5,000 (avg. daily count 24-30 Sept. 2010)	20,000 (2009)	7,200 (1985 – LPBO[9]); 4,000 (2009 – TI)

Date	# of Jays (Year – Location)			
	CMHW[2]	P. Ed. Pt. [3]	Hawk Cliff	Other
25 September		2,500 (2005); 3,000 (2007)		2,000-4,000 (2009 – TI)
26 September	2,810 (2010)	2-5,000/daily 26 Sept – 02 Oct /08		3564 (1997 – HP)
27 September		8,000 (2008)		3,000 (1977 – Rondeau P.P.); 15,000 (1981 – Rondeau P.P.); 10,000 (1985 – Toronto – reverse migration); 5,800 (1985 – Pickering – reverse migration); 2,500-4,000 (2005 – TI)
28 September	5,000 (2001); 4,000 (2003)	3,500 (1980);	5,000 (2008)	5,000 (DNS – Pelee N.P.)
29 September	5,545 (2007); 3,747 (2010)	2,500 (2008)	2,771 (1997); 30,000 (2010)	4,000 (1952 –Port Stanley); 2,500 (2006 – TI)
30 September		2,900 (2005); 5,000 (2008)		3,000 (1993 – HP); 2,771 (1997 - HP)
2 October		6,000 (2003)		3,011 (1961 – LP[10])
3 October				2,448 (1998 – HP); 3,000-3,800 (2008 – TI); 3,000 (DNS – Pelee N.P.)
4 October				10,000 (1962 – Rondeau P.P.); 4,500-4,600 – (2008 -TI)
5 October		2,500 (2002)		2,500 (1979 LPBO)
6 October			3,000 (2010)	
7 October				3,000 (1979 – Rondeau P.P.)
5 October		2,500 (2002)		2,500 (1979 LPBO)
6 October			3,000 (2010)	
7 October				3,000 (1979 – Rondeau P.P.)

1 Totals for HBMO (www.hbmo.org) are excluded from this table as there were too many records of >2500 birds in their database. However, Table 3 provides details for the highest daily total and dates for HBMO sightings for each of the years 2001-2010.
2 Cranberry Marsh Hawk Watch, Durham R.M.
3 Prince Edward Point Observatory
4 Date not specified
5 Data presented here courtesy of Stirrett (1973)
6 Thickson's Woods, Whitby, Durham R.M.
7 Toronto Islands
8 High Park Hawk Watch
9 Long Point Bird Observatory/Bird Studies Canada
10 Lorne Park, Burlington

To offer an indication of the magnitude of the flight, Table 2 illustrates the reported number of times that more than 2,500 jays were seen at various locations throughout Ontario in a single day.

The two hawk monitoring stations, located along the Lake Erie shore (Hawk Cliff and HBMO), annually record the passage of tens or hundreds of thousands of Blue Jays. Based on data on the HBMO website, their 28-year average is 292,126 jays/year. This number is somewhat lower than the actual number of jays that pass the observatory because on some days, during the peak of the migration, no counts were conducted, no jays were reported or only a general reference was made to their passing. Interestingly, the numbers of jays observed at peninsulas along the Lake Erie shore are much lower than one might expect, due their proximity to these stations. The highest daily numbers reported at Long Point, Point Pelee and Rondeau were 7,200, 10,000 and 15,000, respectively. Typically, most records in these areas were for 100s or low 1,000s of birds. This may be explained by the presumption that the majority of the jays are closely following the east-west Lake Erie shoreline and seldom stray too far from this path, avoiding long southerly flights to follow the jutting shore at Long Point, Rondeau and Point Pelee. Niagara Region (K. Roy, pers. com.), Hamilton (Curry 2006), Kingston (Weir 1989) and the Sarnia River valley (pers. ob.) frequently experience modest, but never large, movements of birds in the fall.

Since HBMO maintains the most complete and consistent record of the autumn migration of Blue Jays in the province, I have relied on their data to demonstrate trends and indications of the magnitude of the fall flight. Table 3 identifies the highest daily total for each of the years 2001-2010 at HBMO.

Table 3. Holiday Beach Migration Observatory Highest Daily Count 2001-2010

Year	Date	# of Jays
2001	28 September	264,410
2002	6 October	15,000[1]
2003	28 September	79,863
2004	10 October	74,410
2005	4 October	34,040
2006	29 September	55,659
2007	28 September	54,270
2008	4 October	68-74,000
2009	1 October	158,300
2010	9 October	41,000

[1] Chartier (2005) reported on the impacts of West Nile Disease in Corvids in Ontario. This highest daily total for 2002, compared with other years, is indicative of how greatly the jays were impacted in that year.

In order to determine the peak fall migratory dates for the jays, Table 4 reports on daily flights during the period 2006 to 2010 at the HBMO.

Table 4. Holiday Beach Migration Observatory – Sightings Summary 2006-2010

Date	# of Jays Reported[1]				
	2006	2007	2008	2009	2010
1 September	N/R	N/R	observed	No count	N/R
2 September	N/R	N/R	N/R	N/R	4,920
3-11 September	N/R to a few	N/R	0-3	N/R	0-1
12 September	N/R	N/R	N/R	900	N/R
13 September	N/R	observed	N/R	2,015+	N/R
14 September	N/R	N/R	N/R	1,775	N/R
15 September	N/R	342	N/R	2,850+	N/R
16 September	N/R	1,000	N/R	11,365	N/R
17 September	N/R	N/R	N/R	29,100+	N/R
18 September	N/R	11,390	N/R	12,340+	14
19 September	N/R	11,610	N/R	15,800+	2,730
20 September	N/R	40,000	100s	12,170	9,720
21 September	Steady small #s	36,250	1,000	4,175	885
22 September	N/R	1,000s	1,500-2,000	1,100+	600
23 September	N/R	45,700	N/R	11,980	1,190
24 September	2,000	15,730	N/R	110,800	
25 September	N/R	13,000	N/R	73,250	4,200
26 September	N/R	6,440	42,570	9,625	15,600
27 September	11,000	52,000	N/R	5,900	9,100
28 September	1,000s	54,270	N/R	1,200	N/R
29 September	55,659	25.,900	N/R	N/R	2,728
30 September	N/R	N/R	N/R	3,000+	14,875
1 October	10,520	N/R	A few 1,000s	158,300	9,015
2 October	7,750	18,000	N/R	N/R	199
3 October	Streaming past	30,310	N/R	20,000	4,920
4 October	observed	N/R	68,000-74,000	16,320	6,059
5 October	8,420	N/R	5215	152,750	3,480
6 October	N/R	N/R	N/R	44,350	5,710
7 October	N/R	29,700	N/R	1,650	N/R

8 October	4,000	41,260	N/R	72,900	4,238
9 October	550	6,500	N/R	A few	4,1000
10 October	5,230	1,800	25,000	10,000	7,785
11 October	N/R	N/R	N/R	56,375	6,064
12 October	N/R	N/R	N/R	15,850	5,002
13 October	2	N/R	N/R	13,150	N/R
14 October	230	observed	N/R	2,000	520
15 October	775	A few	N/R	1,500	380
16 October	N/R	A few	N/R	575+	490
17 October	175	2,000+	N/R	Steady flow (a.m.)	N/R
18 October	Small number	N/R	N/R	8,200	N/R
19 October	N/R	1,000	79	1,810	N/R
20 October	N/R	Large flocks noted	N/R	3,155	N/R
21 October	N/R	1,000	N/R	2,440	N/R
22 October	N/R	N/R	N/R	1,200	N/R
23-31 October	N/R	200 on 29 Oct.	N/R	500 on 25 Oct. and 825 on 26 Oct.	36–74 reported on 2 dates
Total[2]	**107,311+**	**446,402+**	**144,467+**	**934,592+**	**186,846+**

[1] N/R represents dates when no number or report was made.
[2] When numbers were expressed as a range, the lower number was used to calculate the total reported, and when the numbers were reported as 1,000s or 100s, only 1,000 or 100 was added to the total.

A review of the data presented in Tables 2, 3 and 4 indicates that much larger numbers occur in southwestern Ontario, on average, and the flight continues slightly longer than in areas east of the two Lake Erie hawk watches. The birds are clearly moving west/southwest over a broad front and funnel down to the shores of Lakes Erie and Ontario from both easterly and northerly directions (Figure 2). They gradually increase in number as eastern birds join more westerly and northerly ones as they pass the hawk watches.

The typical peak migratory period occurs between approximately 15 September and 15 October with the greatest numbers reported in late September and early October. Of note were two reports on 27 September 1985 (see Table 2) in Toronto and Pickering where large numbers of birds were observed undertaking a significant reverse migration (i.e. west to east). The flight past Prince Edward Point (1,500 birds on 17 October 1992) represents a relatively large number for that date and location.

Figure 2. A typical autumn migrating flock of Blue Jays. *Photo: Jerry Jourdon*

It is often difficult to analyze the correlation between weather conditions and the flight magnitude, since much of the data are reported in a manner that does not show these correlations. For example, the weather for a given day is accurately reported at the hawk watches, but the timing of the Blue Jay flights is not. If the winds are good in the morning and shift to a more southerly direction mid-day, the data often do not indicate the time when the jays started and stopped moving. That said, a review of the weather data reported on the HBMO website indicates that the most favourable conditions, during the first and middle parts of the migratory period, appear to involve light winds from a northerly or easterly direction, with cold or cool overnight temperatures, followed by warm daytime temperatures. Persistent rain and strong sustained winds, in excess of about 15-20 km/h, greatly hinder or halt migration. Later in the season, lights winds from almost any direction do not seem to unduly influence the migration, as the urge to migrate overwhelms the impacts of less than ideal migratory conditions. Interestingly, and to demonstrate this point, several strong flights at HBMO in early October 2010 occurred under rainy, blustery conditions or very unfavourable winds.

Much more work is needed to fully understand the complex migration of Blue Jays in Ontario. It is suggested that, where resources exist, more accurate counting be undertaken at key migratory checkpoints along the shores of Lakes Ontario and Erie. Censuses should be quantified following standardized counting procedures and linked closely to time of passing and weather conditions.

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Photo: Angela Massey

Black Terns in the Dryden District of Northwestern Ontario, 2001-2010

Darlene J.M. (Scott) Salter

The Black Tern (*Chlidonias niger*) is a small dark tern which nests in emergent vegetation in marshes. Its main breeding range in Ontario is along the Great Lakes up to the southern edge of the Canadian Shield. There are scattered nesting areas in northern Ontario (Cadman *et al.* 2007) but these have received very little study or documentation. The main purpose of this article is to report on nestings by Black Terns in one area of the Dryden administrative district of the Ministry of Natural Resources (MNR) in northern Ontario during the period 2001-2010.

My first encounter with Black Terns in the Dryden district occurred in June 2000 while scouting a potential Breeding Bird Survey Route southeast of Eagle Lake. We were checking out a stream crossing at Km 4 on Century Road when we heard sharp kik-kik calls overhead. Six Black Terns were crossing the road as they followed the stream to a marsh south of Century Road. In 2001, I volunteered to survey squares for the 2001-2005 Ontario Breeding Bird Atlas. Square 15WR00 included the stream and the marsh where I saw the Black Terns in 2000. In the spring of 2001, while looking for breeding evidence for Black Terns and other species within the square, we found an access into the marsh. A side road took us to a site where we could view most of the large wetland. Beavers (*Castor canadensis*) had dammed an abandoned 50 year-old wooden bridge spanning the stream, creating a large beaver pond upstream from the dam and an expansive cattail marsh on both sides of the stream. From our lookout, we could see at least two dozen Black Terns foraging in the marsh and entering possible nest sites in the emergent vegetation. Using a canoe on our next visit, we were able to explore the marsh and confirm nest sites.

Confirming a nest site proved to be easy. Black Terns are not shy around humans. While foraging, they remain focused on their prey, hovering, dipping and wheeling about until we paddle too close to a nest site. Then shrill alarms are sounded and all the available Black Terns join in the effort to chase us away. Once we paddle a safe distance away from the nest site, the terns resume feeding until we near another nest site and then the alarm is sounded again. We always make a conscious effort not to disturb the nest sites for too long and endanger the eggs or chicks. Photographing the structure and contents of one or two nests is all we try to accomplish while being dive-bombed. The location of the photographed nests and other sites of agitation are recorded using a Garmin GPS unit.

The Black Tern marsh at Km 4 south of Century Road was named the Nabish Cattail Marsh because it is part of the extensive Nabish Lake wetlands. Nabish Lake is a unique marshy lake fed by five major streams. Water from the Nabish wetlands eventually reaches Rice Bay in Eagle Lake through the Rice River. Rice River derives its name from the Wild Rice (*Zizania palustris*) found in the river and bay. From a bird's eye view, the Nabish wetland complex looks like a giant octopus with the round Nabish Lake forming its head. During the month of July, Fragrant White Water Lily flowers (*Nymphaea odorata*) cover most of the shallow lake's surface. A floating mat of fen and marsh plants extends from the shoreline providing nesting habitat for a high diversity of wetland birds including Lincoln's Sparrow (*Melospiza lincolnii*), Le Conte's

Figure 1. Location of Kuenzli Bay, Bottle Bay, Nabish Lake and Nabish Cattail Marsh Nest Sites.

Sparrow (*Ammodramus leconteii)*, Sedge Wren (*Cistothorus platensis*) and even Yellow Rail (*Coturnicops noveboracensis*). Following the stream, the Black Terns fly back and forth between Nabish Lake and the Nabish Cattail Marsh (Figure 1).

In 2005, on our first entry into the Rice River north of Century Road, we had to haul the canoe over a large mat of vegetation that was blocking the mouth of the river in order to gain access into Nabish Lake. Fragments of the floating vegetative mat along the shoreline break loose during storms and are pushed by the wind to different locations. We made eight visits to the Nabish Cattail Marsh and four canoe trips into Nabish Lake, confirming active Black Tern nests in both wetlands.

Since 2005, we have continued to survey the Nabish Cattail Marsh and Nabish Lake for Black Terns and other bird species. With the help of CFWIP grants to cover transportation costs, we have expanded our search into other rich wetlands. Using canoes and motors boats, we have located six more Black Tern nesting sites. Two sites, Kuenzli Bay and Bottle Bay, are in sheltered marshes on Eagle Lake (Figure 1). The other four nesting sites are within the Wabigoon/Dinorwic Lakes watershed. Black Tern colonies have been recorded at the entrance into Butler Lake from Wabigoon Lake, at the mouth of the East Wabigoon River into Dinorwic Lake, Dinorwic Lake narrows into Rock Lake (Kaminnassin Bay) and the marsh in Rock Lake (Figure 2). So far no other Black Tern colonies have been found outside of the Eagle Lake, Dinorwic Lake and Wabigoon watersheds. All known Black Tern nesting sites are linked to Eagle Lake, Dinorwic Lake and Wabigoon Lake by large streams or rivers.

Figure 2. Location of Butler Lake, Dinorwic Lake, Rock Lake and East Wabigoon River Nest Sites.

Habitat

The Black Tern's preferred habitat is a "hemi-marsh" (i.e. a wetland with 50:50 open water and emergent vegetation). It breeds in cattail (*Typha* sp.), phragmites (*Phragmites* sp.) and bulrush (*Scirpus* sp.) marshes of at least five hectares (12.5 acres). Fairly extensive stretches of open water adjacent to the marshes are important (Messier and Rail 1996). Black Terns have been known to accept either artificial or restored wetlands provided they are biologically rich and water levels are stable throughout the breeding season (Dunn and Agro 1995). The Dryden district sites are biologically rich marshes. Black Terns share their territory with a high diversity of wetland bird species including: Common Loons (*Gavia immer*), Red-necked Grebes (*Podiceps grisegena*), Pied-billed Grebes (*Podilymbus podiceps*), Virginia Rails (*Rallus limicola*), Soras (*Porzana carolina*), Red-winged Blackbirds (*Agelaius phoeniceus*), Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*), American Bitterns (*Botaurus lentiginosus*) and even the rare Least Bittern (*Ixobrychus exilis*). The terns seem to be tolerant of their non-predatory feathered neighbors. In fact, there may be a mutual benefit of safety in numbers. On Butler Lake, Red-winged Blackbirds rose up with the terns to mob a family of Common Ravens (*Corvus corax*) passing overhead. At Nabish Lake, several Black Terns mobbed a Bald Eagle (*Haliaeetus leucocephalus*) as it made a pass over a pair of loon chicks. Until they learn to dive, loon chicks are easy prey for the growing population of Bald Eagles. Black Terns return to nest in an area year after year as long as the habitat remains suitable, but once emergent vegetation becomes too dense or too sparse, or the water levels change markedly, the birds move abruptly to new areas (Cadman *et al.* 1987). The abandonment of a nesting site in the Dryden district is a common occurrence.

Food

The many descriptions of Black Terns foraging are very poetic: "fluttering like a dark butterfly over marshes", "flies swallow-like over surface of water or land" and "acrobats slice through the sky with grace". They perform an aerial ballet as they hover over the water looking for minnows and invertebrates. They dip into the water, plucking minnows and insects from the surface. Insects are also snatched from the air. We recorded Black Terns carrying minnows at all of the nesting sites that were surveyed more than twice. In addition to feeding their chicks, male terns carry minnows to their prospective mates, as part of a courtship display (Anonymous 2006).

Nesting

The Black Tern is loosely colonial or semi-colonial in its nesting habits. In Ontario, colonies are typically small, usually consisting of fewer than 20 pairs (Cadman *et al.* 2007). Estimating the number of pairs can be difficult since we have found from experience that not all adults leave their nests even when their neighbors band together to ward off intruders. Also, Black Terns will forage several kilometers from their colony. I estimated the number of pairs by using the highest number of adults seen together in the air at one time. Locating all the nests would be too great a disturbance.

The Nabish Cattail Marsh was abandoned by the terns for two dry seasons during 2003 and 2006 and then they returned to nest in 2004, 2005 and 2007-2009. In 2005, the marsh had at least 12 adults in the air indicating 6-12 possible nests while Nabish Lake had at least 20 adults in the air at one time indicating 10-20 possible nests (Table 1). On our last 2005 canoe trip into Nabish Lake, on 20 July, eight fledged juveniles were flying with 20 adults. Also in 2005, Black Terns were reported but not surveyed at the south end of Dinorwic Lake and Rock Lake (also called Kaminnassin Bay in Dinorwic Lake). Black Terns were not seen in this area during the 2007-2010 surveys. Two other sites, at Dinorwic Lake and Rock Lake, have been abandoned since 2006.

From the lowest number of two adults on the East Wabigoon River in 2010 and the highest number of 30-32 adults on Kuenzli Bay in 2008-2009, I estimated from 1-20 breeding pairs in each of the known nesting sites in the Dryden district. The number of breeding pairs for each site varies from year to year. The terns had a bad year in 2010 when water levels rose dramatically in June, following monsoon–like rain storms. Only Butler Lake had a healthy Black Tern population with at least 20 adults. There were no Black Tern nests in the Nabish Cattail Marsh, Bottle Bay, Kuenzli Bay, Dinorwic Narrows or Rock Lake, though a single bird was present at Bottle Bay. Only one pair was seen nesting in the East Wabigoon River whereas in 2007 there were at least 24 adults nesting there. As can be seen in Table 1, the number of terns present at the six main sites in 2008-2009 declined by more than 50% in 2010. Hopefully, the numbers will rebound in 2011.

Table 1. Number of adult Black Terns observed during censuses of the indicated marshes, 2001-2010. See text for interpretation of number of nests. H indicates casual reports of Black Tern activity.

Location	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Nabish Cattail Marsh	24	20	0	12	12	0	2	12	6	0
Nabish Lake					20	3	0	13	12	7
Eagle Lake										
Kuenzli Bay					10	12	16	30	32	0
Bottle Bay								8	3	1
Butler Lake*	H	H	H	H	H	H	H	H	30	20
East Wabigoon River							24	10	0	2
Dinorwic Lake			15	12	H	0	0	0	0	0
Rock Lake				12	H	0	0	0	0	
Total	**24+**	**20+**	**15+**	**36+**	**42+**	**15+**	**42+**	**73+**	**77**	**30**

* Marilyn Bilsbarrow, my guide and resident on Wabigoon Lake, has seen Black Terns in Butler Lake for 15 years or more. I surveyed Butler Lake for the first time in 2009.

Figure 3. A typical Black Tern nest.

Figure 4. A young Black Tern. They leave their nest at the first sign of any danger or disturbance.
Photos: Darlene Salter

The nest of the Black Tern is small and very flimsy, nearly flush with the water and usually built on an upturned cattail root, floating vegetation mat, patch of mud, or even flotsam (Figure 3). The majority of egg dates at the Dryden sites occurred between 26 June and 9 July with anywhere from 1 to 3 eggs per nest. These dates are 2.5 to 4 weeks later than the majority of nesting for Black Terns in Ontario (Peck and James 1983). The eggs are beige to brown with dark irregular blotching. The color and pattern is an effective camouflage, making the eggs difficult to see on the heap of reeds or mud. With the exception of Nabish Lake, all of the nests that I have encountered are in emergent vegetation that conceal the nest. The nest, loosely constructed with aquatic plants, usually reeds, is surrounded by a moat or water channel. I have watched downy chicks slip off the nest and swim off into the emergent vegetation when the adults cry out in alarm. I have come to the conclusion that the moat surrounding the nest serves as a quick means of escape for the flightless chicks and the nearby emergent vegetation hides the chick from aerial predators and protects them from aquatic predators especially large fish.

Nabish Lake is the exception because the terns have been nesting on rafts of upturned Fragrant White Water Lily roots for two breeding seasons, 2009-2010. The root rafts are in open water with no emergent vegetation to hide in. Nabish Lake has no large fish, only minnows and the downy chicks disappeared under water lily leaves as the adults dive-bombed us (Figure 4). The entire shoreline of Nabish Lake has wide floating mats of emergent vegetation but the terns preferred the open water adjacent to the root rafts to the mats of emergent vegetation. On 28 July 2010, at the Nabish Lake colony, one fledged juvenile, two downy chicks and an adult incubating an egg were observed. This illustrates that Black Terns will nest again if their eggs or chicks are lost to predators. It is possible to record fledged juveniles and downy chicks on the same date and location. The chicks are fed at the nest site until they fledge at 20-24 days. Once they are airborne, they follow the adults and learn to snatch food out of the air and pluck it off the water. They also join the adults in defending other nests.

Discussion

With the exception of Butler Lake none of the Black Tern colonies in the Dryden district are stable from year to year. Water levels and human disturbance seem to be the controlling factors. A property owner on Kuenzli Bay in Eagle Lake, was issued a permit by the Dryden MNR around 2007 to dredge a boat channel right through the center of the Black Tern colony on Kuenzli Bay. While the Black Terns continued to nest in Kuenzli Bay until 2010, the colony became very agitated whenever any boats passed through the dredged channel in the marsh. Their nesting and feeding activities were disrupted until the boat left the channel.

Heavy precipitation and increased damming by beavers may have resulted in no nesting activity in the Nabish Cattail Marsh in 2010. Instead of placing a beaver baffler into the dam at the cattail marsh, the forestry company that holds the license for the Wabigoon Forest paid to have 15 beavers trapped. With the lack of maintenance, the beaver dam broke on 24 July 2010, draining the cattail channels where the terns nested and we canoed. During October, the Dryden MNR under the guidance of Species at Risk Biologist, John Van den Broeck, reconstructed the beaver dam using boulders and fabric. A beaver baffler was installed into the dam to prevent future flooding. Unless the water levels are restored to fill the cattail channels in the Nabish Cattail Marsh, the Black Terns, Red-necked Grebes, Virginia Rails, Soras, American Bitterns and the documented Least Bittern will not return to nest in 2011. If the beaver baffler maintains the water at an optimal level, then the Black Terns may return to nest.

Black Tern populations in Canada have been declining at a significant rate of 3.1% since 1968 — equivalent to an overall loss of 68% of the population by

2006 (Anonymous 2006). Population surveys of nesting Black Terns along the Great Lakes shoreline indicate an overall decline of 35% between 1991 and 2001 (Cadman *et al.* 2007). While Black Terns are listed as a Species at Risk in Ontario, they are designated as Special Concern, not Threatened. I recommend Black Terns be listed as Threatened so that known Black Tern nesting sites can receive protection from harmful human activities such as dredging boat channels, trapping out beaver and forestry road construction. Beaver activities such as building beaver dams, dredging channels through cattails, uprooting cattails and the use of feeding platforms create Black Tern nesting sites. Beavers and muskrats (*Ondatra zibethicus)* are an essential component in the creation of ideal Black Tern nest sites, a mound surrounded by water but protected within emergent vegetation. The MNR needs to change their nuisance beaver policy in regards to forestry roads. Beaver bafflers should be used to control water levels where possible rather than trapping out the beaver.

This article is based on 10 years (2001-2010) of recorded observations at different Black Tern nesting sites.

Acknowledgements

I wish to thank my hardy volunteers, Joanne Bridgewater, Carolle Eady, Lisa Harvey and Angela Massey who helped to paddle the canoe in search of Black Terns and Marilyn Bilsbarrow who guided me in her motorboat to the Butler Lake Black Tern colony. John Vandenbroeck and Chip Weseloh kindly assisted me in the preparation of this article.

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Successful Diurnal Foraging by a Barred Owl in Open Field Habitat in Winter

Donald A. Sutherland and Ian L. Jones

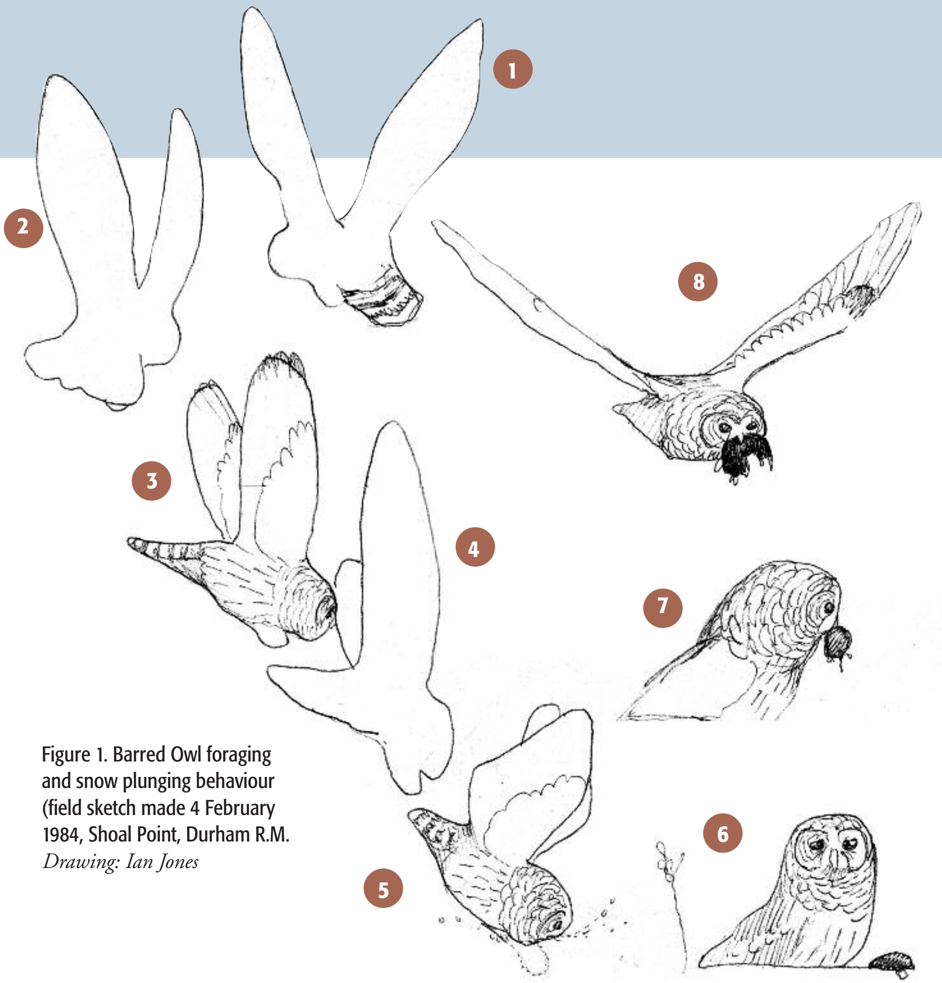


Figure 1. Barred Owl foraging and snow plunging behaviour (field sketch made 4 February 1984, Shoal Point, Durham R.M. *Drawing: Ian Jones*

The Barred Owl (*Strix varia*) is considered a semi-nocturnal to nocturnal hunter with hunting activity highest immediately following sunset (Elderkin 1987, Mazur and James 2000). Despite the earlier assertion by Bent (1938) that there is plenty of evidence that this species does much of its foraging in daylight, there evidently have been few published accounts documenting such behaviour. Reports suggesting diurnal foraging have come largely from pellet analysis. Several authors (Errington 1932, Errington and MacDonald 1937) have reported the remains of such primarily diurnal bird species as Blue Jay (*Cyanocitta cristata*) and Dark-eyed Junco (*Junco hyemalis*) in the pellets of the Barred Owl. While suggestive of diurnal foraging, such reports are not entirely conclusive. Caldwell (1972) reported an observation of a Barred Owl foraging at midday along the grassy roadside verge through a forested area of central Michigan. Nero (1993) related several instances of apparent diurnal snow-plunging by Barred Owls, but reported that such behaviour was apparently rare. Jackson and White (1995) documented several instances of daytime foraging by Barred Owls in Louisiana. Most recently, James (2007) reported an observation of diurnal foraging and snow-plunging in open field habitat in Durham Regional Municipality, Ontario. The observation reported herein documents an instance of successful foraging by a Barred Owl in open field habitat at midday in winter.

Observation

At 1107h on 4 February 1984 the authors encountered a Barred Owl sitting 4-5 m in an isolated, 15 m ash (*Fraxinus* sp.) in the middle of a wet shrub meadow/fallow field approximately 30 m east of Shoal Point Road, Town of Ajax, Durham Regional Municipality (43° 50' 29" N, 78° 59' 42" W), Ontario. The day was overcast, calm and 3°C and the landscape was generally snow-covered. While under observation, the bird was alert, swiveling its head constantly in response to the observers' squeaking and 'pishing', alternating between watching the observers and 'scanning' its surroundings. After a minute or two, it suddenly averted its attention from the observers, fixing its gaze instead on a point out in the field.

Leaving its perch, it flew approximately 30 m out over the field before abruptly turning mid-flight, hovering briefly, and then plunging head first into the snow, thrusting its talons forward at the point of impact (Figure 1). It then became very alert, sitting upright, again swiveling its head and watching. Mantling slightly, it raised the prey in one talon, picking at it with its bill. From its relatively large size, dark coloration, distinctive feet and long, pinkish thickened tail, and pink-tentacled snout the prey was very obviously a Star-nosed Mole (*Condylura cristata*). After a short period of observation, the owl then picked up the mole in its bill and took flight, flying a metre or two above the ground, west across the road and a further 20 m to a perch approximately 5 m in an aspen (*Populus* sp.) at the edge of a white cedar (*Thuja occidentalis*)-aspen-ash swamp (Figures 2a, b). The observers then walked into the field to examine the point of capture. The general area of capture was covered by a 10-15 cm layer of very wet to saturated snow underlain by meltwater. Numerous subnivean small

Figure 2a. Barred Owl in flight carrying Star-nosed Mole in its bill, 4 February 1984, Shoal Point, Durham R.M. *Photo: Ian Jones*

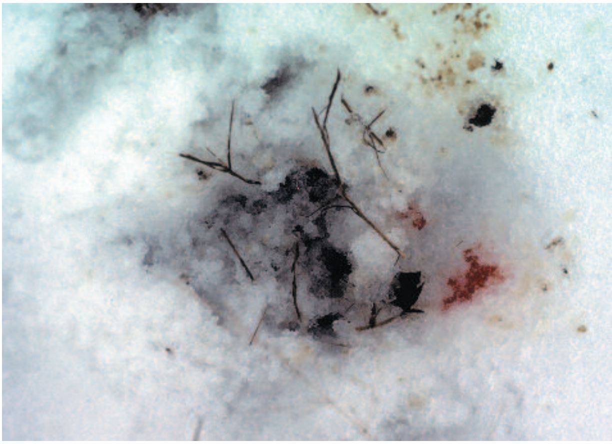
Figure 2b. Enlarged detail showing prey: note dark pelage, pink feet and long, naked tail, thickened in the middle *Photo: Ian Jones*

mammal tunnels were evident, one of which terminated at the entrance to a subterranean mole-tunnel around which the snow was stained red with blood (Figure 3).

Discussion

Normally sedentary, the Barred Owl periodically vacates northern portions of its range in winter coincident with reduced prey abundance (Mazur and James 2000). The winter of 1983-84 was marked by a major incursion of Barred Owl in southern Ontario; 61 individuals were reported in areas generally south of the species' breeding range (Weir 1984). Barred Owls typically avoid open areas. In a study of habitat use by the Barred Owl throughout the year in central Minnesota, Nicholls and Warner (1972) demonstrated that irrespective of time of year, open habitats were utilized least by individuals and habitats such as alder thicket swamp, marsh and old field were avoided. Hunting in the open in daylight may be induced by hunger (Nero 1993; James 2007). Nero (1993) reported that in Manitoba during the winter of 1986-87 one individual captured for banding was noticeably thin. Young birds without a breeding territory are far more likely to feed in daylight hours, especially during post-fledging dispersal in late summer through fall, and individuals in poor

Figure 3: Plunge hole, showing mole tunnel entrance and blood-stained snow, 4 February 1984, Shoal Point, Durham, R.M. *Photo: Ian Jones.*



condition that have survived the winter are also more likely to feed in the open during daylight hours (M.F. Elderkin, pers. comm.). Barred Owls may be induced to forage in open areas during daylight hours, particularly in winter, when open habitats may harbour higher prey densities. Daylight foraging by Barred Owls in open habitats may be a more common or even expectable, particularly during periodic winter incursions in southern Ontario.

Acknowledgements

The authors wish to thank Mark Elderkin (Nova Scotia Dept. of Natural Resources, Kentville, NS) for information from his study of Barred Owls in Nova Scotia.

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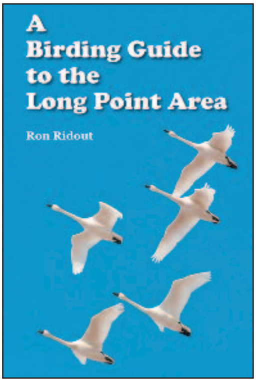
BOOK REVIEW

A Birding Guide to the Long Point Area. 2010. Ron Ridout, Bird Studies Canada, P.O. Box 160, Port Rowan, Ontario N0E 1M0, 146 pages, 14 x 21.5 cm. $24.95.
ISBN 978-0-9810904-1-2.



There are few places in southern Ontario that offer as wide a variety of habitats as the Long Point Area, and fewer still that combine such an excellent reputation as a migrant trap with such an extensive complement of breeding birds. The Long Point Area has amassed a bird checklist of 388 species with an impressive 176 species confirmed as breeding in the region. It is the home to the headquarters of both the Long Point Bird Observatory (LPBO) and Bird Studies Canada (BSC) and is fast becoming a world-famous birding and bird research destination.

In honour of the 50th anniversary of LPBO in 2010, BSC staffer and founding Ontario Field Ornithologists President Ron Ridout has produced a new birding guide to this exceptional area. Ron is uniquely qualified to produce such a guide, given his many talents as a birder, tour leader, biological consultant, photographer, artist and graphic designer. He has been birding at Long Point for 35 years and has lived in the area for 23 years. Few people know the area as thoroughly. This second edition of the birding guide to the Long Point area takes much inspiration from the first edition written by Bev Collier, Jeff Skevington and Terrie Woodrow in 1990, and greatly expands and thoroughly updates the information in a much more visibly pleasing and user-friendly design.

The book is bound with a spiral coil and has a folded back cover which can conveniently be used as a bookmark, much like the design of the popular American Birding Association's 'Lane Guide' series of bird finding guides. Inside the folding back cover is an excellent area-wide map which provides an overview of the 43 birding sites which receive extensive treatment. The book is well organized, with excellent introductory sections on how to use the book, safety and security precautions, and useful internet sites dealing with birding, local weather and accommodations. Another section chronicles the typical birding year month-by-month. For those interested in 'green' birding options, there are sections on cycling routes and canoeing the Big Creek watershed.

The bulk of the book presents detailed information about the 43 birding sites that are profiled. Users will find it very handy (in the age of the hand-held global positioning system) that each site treatment begins with the UTM coordinates and Lat/Long for the entrance point to the site. Each site usually has a representative habitat photograph and an aerial photograph onto which suggested walking routes are overlaid. Most accounts point out particular 'Birding Tips' and routinely give very precise details about where specific target species may be found and frequently where past rarities have occurred. These site profiles also contain many practical 'Be Aware' tips on the specifics of land access and vehicle and personal safety that it would take one many trips to learn otherwise.

The book has a section on target species, wherein very precise and up-to-date information is given on the most likely locations to find each of 140 of the most sought after bird species in the Long Point area along with a synopsis of their local status.

The book ends by incorporating the Seasonal Checklist of the Birds of the Long Point Area (previously published separately by Vic Fazio, David Shepherd and Terrie Woodrow in 1985 and updated by Ridout, Fazio and Ian Richards in 2000). It has been updated to reflect the breeding status, relative abundance, and typical and extra-limital dates of occurrence for all bird species on the checklist. The frequency and occurrence bar charts are based on perhaps the best data set in the entire province and will be invaluable to both novice and very experienced birders alike. There is a treasure trove of information packed into these bar charts.

In summary, this birding guide is well organized, remarkably free of typographic errors, graphically eye-pleasing, and packed with up-to-date and precise information on where, when and how to find birds at Long Point. It is very easy and intuitive to use and I would recommend that it be an essential part of the toolkit for anyone making birding trips to the Long Point area regularly. For my money, this is the best example of a bird finding guide that has been produced for any locality in Ontario thus far. It is available from the Bird Studies Canada online store at: http://www.bsc-eoc. org/shopping/shop.jsp

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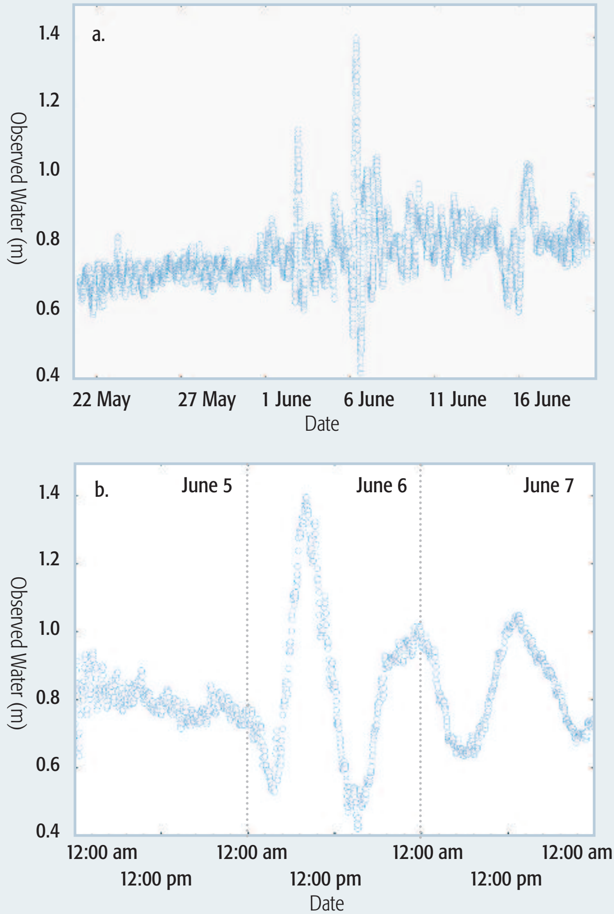
Successful renesting of Caspian Terns on Mohawk Island, Lake Erie, after complete colony failure

Laura E. King and Shane R. de Solla

The Caspian Tern (*Hydroprogne caspia*, formerly *Sterna caspia*) is the world's largest tern and nests globally in dense colonies in and around bodies of water. In Ontario, on the Great Lakes, they nest regularly on Lakes Huron, Ontario, and Erie, generally on islands, peninsulas, or protected beaches. Caspian Terns nest on sand, gravel, or limestone substrates with little or no vegetation (Ludwig 1965, Quinn and Sirdevan 1998). At Mohawk Island (also known as Gull Island), in eastern Lake Erie between the communities of Port Maitland and Lowbanks, a colony nests on a beach consisting almost exclusively of crushed Dreissenid (zebra and quagga) mussel shells. The earliest recorded colony on Mohawk was 80 pairs in 1996 (Morris 2010) and since then the colony has fluctuated between 165 and 441 nests from 2002 to 2009. Mohawk Island is a federally protected National Wildlife Area (NWA) and hosts important breeding colonies of Double-crested Cormorants (*Phalacrocorax auritus*), Herring Gulls (*Larus argentatus*), and Ring-billed Gulls (*Larus delawarensis*). The island previously provided breeding habitat for Common Terns (*Sterna hirundo)* but their last reported nesting was in 2004 (Morris 2010), although the species has been sighted in 2009 and 2010 flying near the island. Other waterbirds and passerines (various species of ducks, swallows, etc.) are sighted on and around the island regularly.

During the course of our research on Double-crested Cormorants, we visited Mohawk Island several times during the summers of 2009 and 2010. On 6 June 2010, a large seiche (a standing wave in a closed body of water such as a lake) caused a nearly one metre rise in water levels in eastern Lake Erie (Figure 1). Lake Erie is prone to large seiches because of its location, shape, and shallow western basin (NOAA 2003, Litchkoppler 2009). When storms blow in from the southwest, as is common, a seiche is set up on the lake, and the water from the southwestern end of the lake is pushed towards the northeastern end. This can temporarily cause very high water levels in the northeastern end, where Mohawk Island is located.

Figure 1. Water levels (relative to sea level) at Port Colborne, Ontario, east of Mohawk Island;
a) from 21 May to 20 June 2010;
b) from 5 June to 7 June 2010. Data from Port Colborne weather buoy (42.866667 N, 79.25 W).
Canadian Hydrographic Service, Fisheries and Oceans Canada.



Seiches and often their associated storms are an important part of the ecology and structure of the Great Lakes (Trebitz 2006), moving nutrients to open waters (Bouchard 2007) and affecting multiple species including mussels (Bowers and de Szalay 2005) and fish (Roseman *et al.* 2001).

Before our first trip to the island, we were told it had been submerged two days prior (M. Walker, pers. comm.). When we arrived, we found multiple piles of whole and broken eggs clustered together from 10 to 20 m from the eastern edge of the island (Figure 2). The tern colony was located on the east portion of the island, from about 20 m inland to within 20 cm from the water's edge (Figure 3). Given that the algae mats were washed throughout the centre of the island, it was apparent this seiche was high enough to destroy virtually all of the Caspian Tern nests on the island. We counted 271 whole or broken tern eggs, but many eggs may have been lost, so the number of eggs destroyed is likely higher. Any chicks that hatched by 6 June would also have been also lost. On 8 June, one lone Caspian Tern chick, newly mobile, ran across the beach at our approach. After that one day, it was not seen again. Most Ring-billed Gull nests and many Herring Gull nests were also destroyed, as the seiche covered much of the island (Figure 3). Double-crested Cormorants nest

Figure 2. Caspian Tern eggs destroyed by the 6 June 2010 seiche. 8 June 2010.
Photo: Shane de Solla

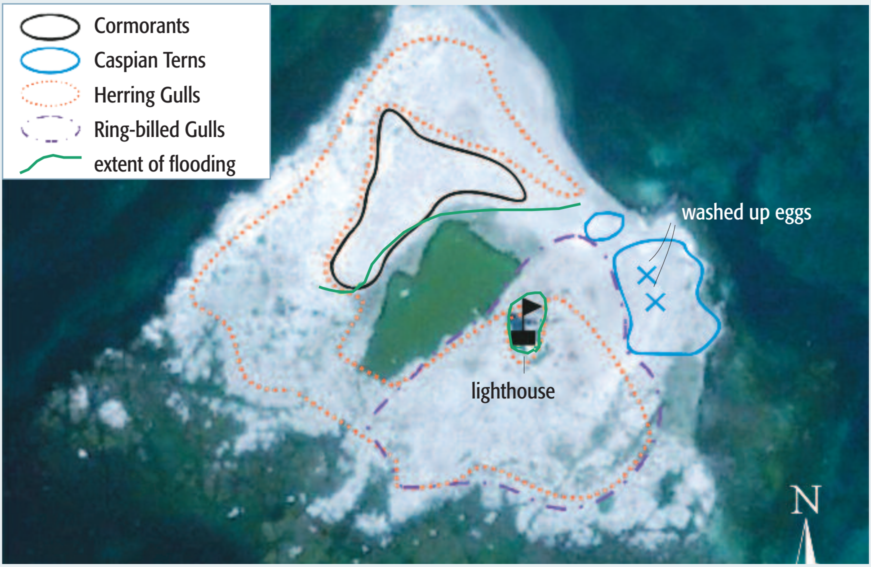


Figure 3. Approximate location of Caspian Tern (*Hydroprogne caspia*), Herring Gull (*Larus argentatus*), and Ring-billed Gull (*Larus delawarensis*) colonies, with estimated extent of flooding caused by a seiche, 6 June 2010. *Modified from Google Earth*

primarily at the highest elevation of the island, surrounded by some Herring Gull nests, and thus these were largely spared; however, some cormorant clutches of late nests at lower elevations may have been destroyed. During our visits in early June, the terns in the colony were loafing but not incubating, and actively foraging throughout the day. On 10 June, we observed several pairs of terns mating (Figure 4), and by 6 July, we noticed many terns sitting in nest depressions. That same day, we checked the colony and found that most nest depressions in one area contained either one or two eggs. We counted 361 nests on 8 July and by then several chicks had hatched, and by 15 July many days-old chicks were discovered in nest depressions (Figure 5). We observed a few new Ring-billed Gull nests, but no new Herring Gull nests, on the days following the seiche.

The ability of a female to lay a new clutch of eggs after the original is destroyed is termed renesting. Renesting is common to ground nesters, including ducks, coots, turkeys, terns, and gulls, who typically face a variety of challenges such as predation and/or nest destruction through changing environments. Terns generally lay one clutch per season, but if clutches and/or chicks are destroyed, renesting can occur. Renesting has been documented previously in all species of terns, including but not limited to Caspian Terns (Cuthbert 1985, 1988), Least Terns (*Sterna antillarum*) (Massey and Fancher 1989), Black Terns (*Chlidonias niger*) (Eichhorst and Reed 1985), and Common Terns (Wendelin *et al.* 2000).

Figure 4. Caspian Tern colony (with Ring-billed Gull colony and Herring Gull in foreground) on Mohawk Island, Lake Erie. The majority of the Caspian Terns are standing, but a few in the foreground can be seen sitting on nests. On the right side of the photo, in the background, a copulating tern pair can be seen. 10 June 2010. *Photo: Laura Elizabeth King*

Caspian Terns on the Great Lakes often begin to lay eggs around 5 May, with young by 1 June (Ludwig 1965). Peak laying period on the Great Lakes typically is 7 May–1 June (Cuthbert and Wires 1999). Juveniles then fledge from colonies in July and August; however, laying can continue up to the beginning of August if renesting is occurring. Our observed colony lost hundreds of eggs, and presumably many chicks, on June 6; if previous research applies to the Mohawk Island colony, it would seem that the peak laying period was already over by the time they lost their nests.

When a large number of pairs lose nests at once due to flooding, the colony can move to a slightly different site within the general area (Cuthbert 1988), which we partially observed in that a portion of the colony moved a short distance (approximately 20 metres). Suitable Caspian Tern nesting habitat on Mohawk Island is limited to the eastern-most portion of the island, and only on crushed mussel shells. Furthermore, the majority of the surrounding territory was occupied by Herring or Ring-billed Gulls. If more habitat had been available, it is probable that the Caspian Tern colony would have moved farther away from the original site of nest destruction.

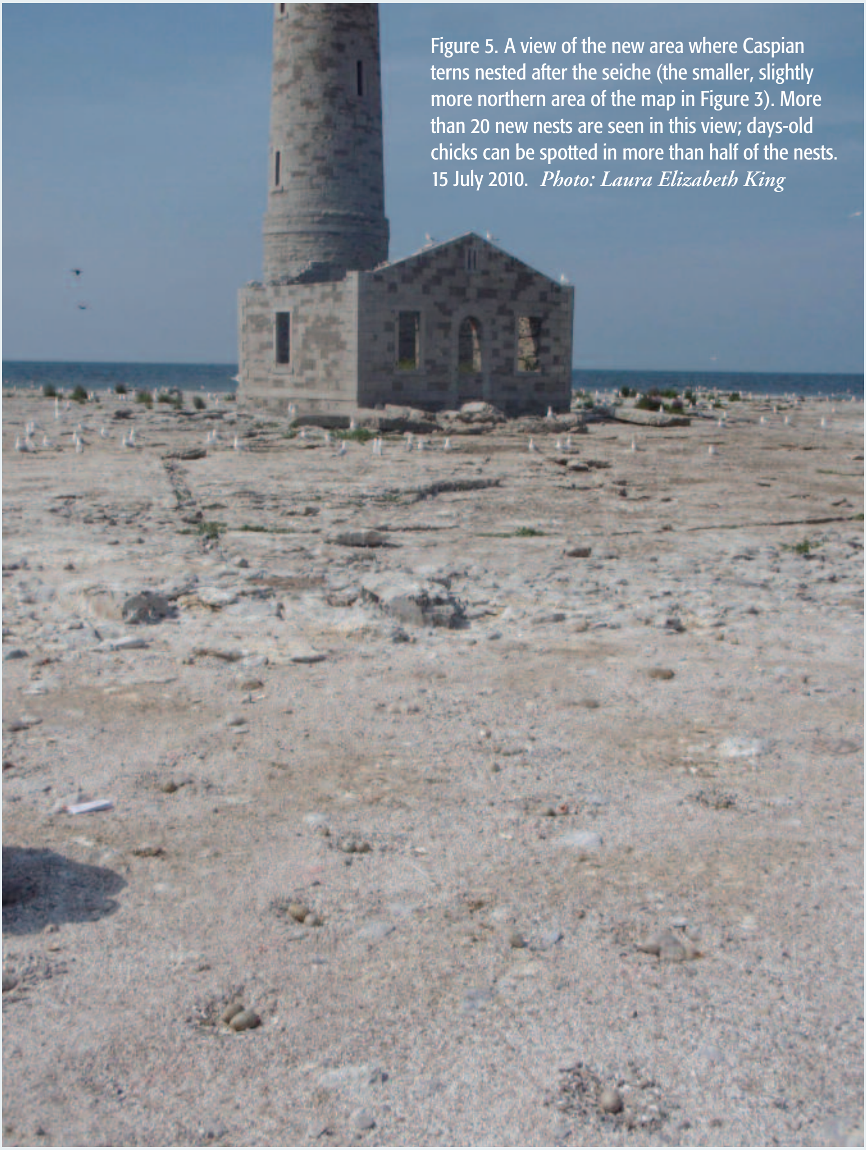


Figure 5. A view of the new area where Caspian terns nested after the seiche (the smaller, slightly more northern area of the map in Figure 3). More than 20 new nests are seen in this view; days-old chicks can be spotted in more than half of the nests. 15 July 2010. *Photo: Laura Elizabeth King*

Many factors affect renesting, depending upon the individual and the species. Renesting has been connected with female age, nesting experience, body condition, investment in previous clutch(es), available food, or date (Arnold *et al.* 2010). In American Coots (*Fulica americana*), renesting may be more affected by time and habitat quality than by the amount of food available to the female.

Water levels may also be an important renesting cue (Arnold 1993). In Mallards (*Anas platyrhynchos*), renesting is dependent on variables such as nesting season length, stage of incubation, and date of nest loss. There is some evidence that older females and those in better condition are more likely to renest, but overall the best predictor of renesting was date of nest initiation (Arnold *et al.* 2010). Replacement clutches tend to have fewer and smaller eggs than the initial clutch (Brown and Morris 1996). Furthermore, the egg mass of renests tend to be lower the later the initial egg loss occurred (Wendelin *et al.* 2000). The seiche on Mohawk Island occurred soon (approximately three weeks) after the Caspian Terns first started nesting, whereas both species of gulls, being earlier nesters, would have had less opportunity or incentive to renest.

In terns, it is likely that predictable environmental cues, especially water levels, allow pairs to time and place nests to avoid flooding and thus renesting (Reinert 2006); however, unpredictable seiches can still cause colony washout, especially when available habitat is constrained by island size, proximity to competing colonial waterbirds, and availability of suitable nesting substrate. Tern renesting in the few studies to date has been variable — Shugart *et al.* (1979) calculated up to 66% of pairs renested; Cuthbert (1988) reported 46% of pairs who had nests wash out renested within two to three weeks; Penland (1976, 1981) found that as little as 7% of the pairs renested. Specific experiments to determine factors affecting renesting in Caspian Terns have not been performed, but this would be an interesting area for future studies.

Given that weather is often unpredictable in the island nesting areas of Caspian Terns, an adaptation to be able to renest quickly following nest loss is highly advantageous. At this colony on Mohawk Island, Lake Erie, the majority of pairs seemed to be able to lay two eggs again within the breeding season and successfully raise their clutch, despite sporadic human disturbances and the inherent habitat limitations of a small and crowded island.

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