

## Potential Effects of Offshore Wind Turbines on Millions of Birds Migrating Across Eastern Lake Ontario near Main Duck Island

*A Scientific Evaluation prepared for the Kingston Field Naturalists*

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Main Duck Island is part of a chain of islands in eastern Lake Ontario that stretches from Prince Edward Point near Picton, Ontario, to Stony Point, New York. It is 209 hectares (518 acres) in size. Main Duck Island is currently uninhabited, though it is the site of a fully automated lighthouse. The island was acquired by Parks Canada in 1977 as a nature reserve.

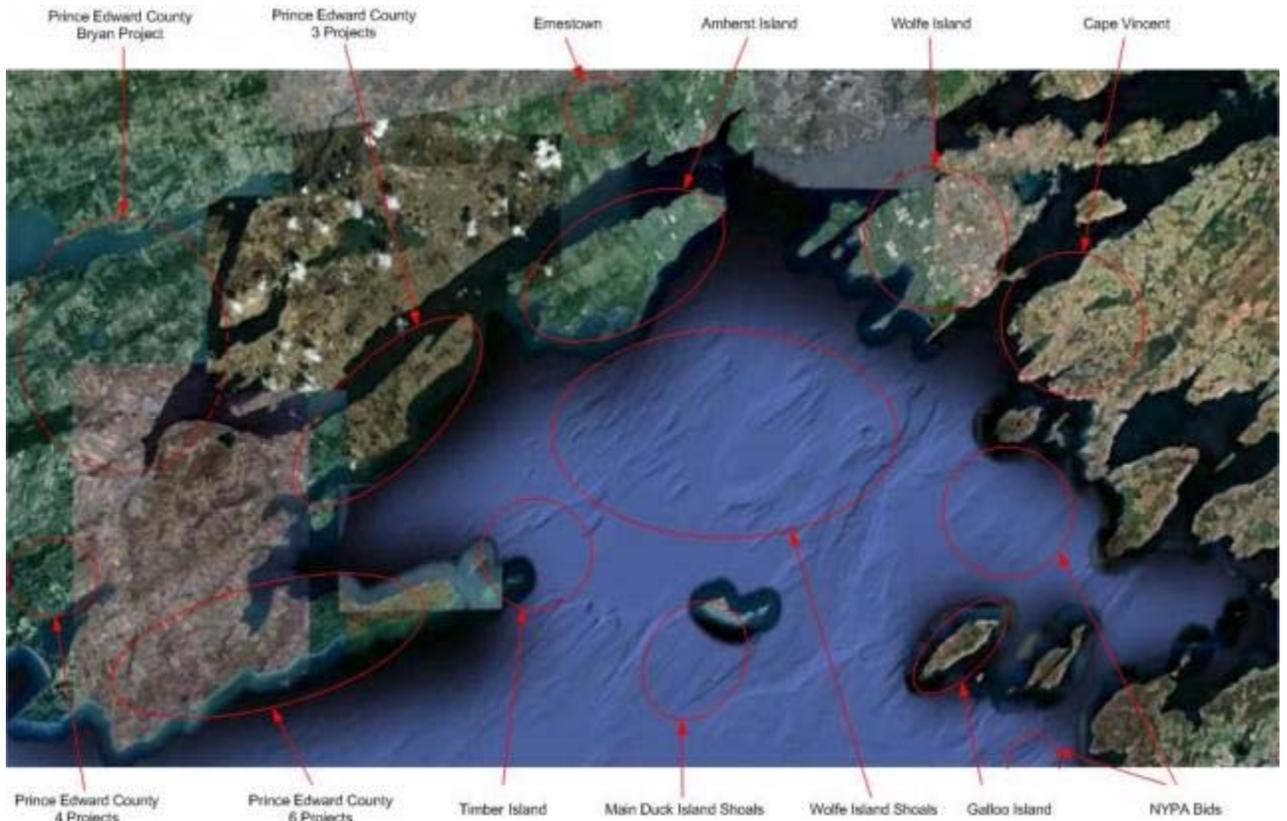
According to Parks Canada: *The island chain is a migration corridor for birds. During annual spring and fall migrations, numerous species have been counted, two of which are designated "Canadian Species at Risk" by the Committee on the Status of Endangered Wildlife in Canada. Henslow's Sparrow is in the 'endangered' category and the short-eared owl is in the 'special concern' category.*

Using information from Prince Edward Point and Ostrander Point at the western end of this migration corridor, it is estimated that over 12 million migratory birds pass through this area each year.

Main Duck Island is now situated between two proposals for large offshore windfarms. – The Wolfe Island Shoals project proposes 130 turbines north of Main Duck Island. The Trillium Power Wind 1 project proposes 138 turbines south of Main Duck Island.

The reports of bird casualties filed by the Wolfe Island Wind Farm of 86 turbines, indicate that the windfarms proposed north and south of Main Duck Island will have a very negative impact on birds passing through the migration corridor.

**Potential Effects of Offshore Wind Turbines on Millions of Birds Migrating Across Eastern Lake Ontario near Main Duck Island, Kingston Field Naturalists, July 2012**



## Summary

There are numerous published reports regarding the high diversity and abundance of birds using and passing through this significant Important Bird Area habitat. Some were quoted in the 2007 Environmental Review Report (ERR) for the Wolfe Island Wind Turbines Project: most weren't. Another proposed turbine project at Ostrander Point, P.E.C. was recognized in the Environment Canada guidelines as having "very high site sensitivity". Data from Ostrander Point is relevant to the issue of offshore turbines because that geographic area is the jumping off and arrival point for huge flocks of birds crossing the lake near the proposed offshore projects. Since no data exists for movements in the open Lake area the Prince Edward Point and Ostrander Point data set is an excellent proxy for predicting impacts. These shoreline sites are a designated Important Bird Area (IBA) - bird habitats that are used in landing, staging. The potential for negative impacts exists from the perspective of bird use. In view of the high mortality experienced from turbines on Wolfe Island and the sketchy field survey data presented by the biological consultants for the Ostrander project we determined that the migratory birds which use the offshore islands as stepping stones for crossing the Lake were at risk of similar or perhaps greater impacts from the proposals for a total of 268 offshore turbines north and south of the Main Duck Island, part of the Canada's national park system. While a strong case could be made for a full Environmental Assessment and a Cumulative Effects Analysis based on the massive footprint of the permits requested for

**Potential Effects of Offshore Wind Turbines on Millions of Birds Migrating Across Eastern Lake Ontario near Main Duck Island, Kingston Field Naturalists, July 2012**

turbines (MNR website) around the eastern end of Lake Ontario, we restricted our focus on offshore turbine effects on migratory birds and emphasize the certainty of the turbine threat to millions of birds crossing the Lake twice per year. Not only are we unable to include a cumulative effects analysis of the hundreds of turbines proposed for this area and E. Lake Ontario waters and shores but we also exclude impacts of the sub-marine phase of construction and bottom transmission line impacts on fish and other elements in the lake ecosystem.

Evidence of bird migration collected at Ostrander Point during one fall migration gave a count of 400 red-shouldered hawks (Weir 2008). Other reliable counts are provided demonstrating that waves of millions of birds can be expected to encounter the combined total of 238 turbines in the proposed Wolfe Island Shoals and Trillium Power Wind 1 projects north and south of Main Duck Island, and will risk destruction during each passage across the lake. Based on the provincial guidelines for siting turbines, plus the probability of significant negative impacts we suggest that no turbines be built in this highly sensitive site. There is sufficient scientific basis for concluding that turbines will strike and kill very large numbers of migrating birds, including endangered species. The impacts on fish of the construction of cement foundations, underwater blasting and excavating and transmission lines and structures would add to the case against construction.

## Preamble

The executive of KFN asked the authors to provide an evaluation of the potential impact of the Wolfe Island Shoals and Trillium Power Wind 1 projects on migratory birds crossing eastern Lake Ontario. We have no commercial interests or personal ties in the proposed area nor will we receive any remuneration for this analysis. Our role here is not as a “stakeholder” with questions about turbine ineffectiveness or health, noise or aesthetic concerns. We have attempted to provide a science-based assessment by summarizing reliable information on impacts on bird populations to the federal and provincial authorities who enforce regulations to protect wildlife habitat and species threatened with extinction. Our assessment is based on facts about the local wildlife, its habitat. To the extent that government sets aside ecologically unique lands for protection and then takes a discretionary approach to protective laws by failing to enforce those laws then we may have no hope of preserving even a semblance of complete ecosystems and migratory birds for generations to come.

The lead author has a biology degree (Queen’s University) and a Ph.D. degree in ecology (Duke University). He retired as a Senior Scientist from Utah State University where he taught courses on conservation biology and the application of behavioral science to wildlife management including population responses of birds (e.g. bald eagles, sage grouse, waterfowl, shorebirds, etc.) to human disturbance and habitat destruction. Impacts on wildlife from ORVs, logging activities, grazing, and industrial facilities were also studied.

## Introduction

Main Duck and Yorkshire islands are located at the eastern end of Lake Ontario, near the international border. These islands, once owned by former American Secretary of State John Foster Dulles, are currently part of the Thousand Islands National Park.

Windstream Energy Ltd. (Ian Baines, CEO) has been awarded a Feed-In Tariff by the Ontario Power Authority, and applied to develop an array of 130 turbines called The Wolfe Island Shoals Project, located approximately 5 kms north of Main Duck Island.

Trillium Power Wind Corporation has proposed a 414 megawatt windfarm of 138 turbines, the closest of which will be just 500 metres south of Main Duck Island.

These locations will impact the flyway or migratory flight path of birds coming from, and going to, the protected wildlife habitat areas Prince Edward Point jutting south-east into Lake Ontario. Since the whole South Shore and Point have long been recognized as important habitat for hundreds of bird species, this scientific evaluation will present results from ornithological records, observations and scientific publications that reference “Prince Edward Point” and adjacent areas. An information source of particular scientific relevance is Dr. Ron D. Weir’s *Birds of the Kingston Region*, 2<sup>nd</sup> edition 2008. The author presents comprehensive records from his personal censuses, extensive field surveys as well as from over four decades of Christmas Bird Counts, and natural history on 343 bird species in this area, especially on the Ostrander Point area and National Wildlife Area on Long Point and Prince Edward Point in Prince Edward County.

## Background

**Wildlife habitat** is defined as "areas where plants, animals, and other organisms live, and find adequate amounts of food, water, shelter, and *space needed to sustain their populations* (emphasis added). Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and **areas which are important to migratory or non migratory species**". This latter phrase defines the shoreline where counts have been made and the “space needed to sustain their populations” defines the offshore airspace used in migration.

**Significant Wildlife Habitat** is defined as a natural heritage feature, is considered significant where it is:

“ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System.” Again it is clear that migratory airspace is essential habitat for bird population survival.

Prince Edward Point including Ostrander Point (P.E.Pt/Ost.Pt ) is an area of **Significant Wildlife Habitat** as defined by the Significant Wildlife Habitat (SWH) Reference Manual definition above:

P.E.Pt/Ost.Pt is a Level 4 Important Bird Area (IBA) - by definition, an IBA site is vital to the long-term conservation of the world's birds. A goal of IBA is to identify and conserve a network of sites necessary to ensure the long-term viability of naturally occurring bird populations. P.E.Pt/Ost.Pt is of global significance for congregatory bird species, and continentally significant for congregatory species and waterfowl. This is established in Ontario in OMNR's Significant Wildlife Habitat Technical Guide (SWHTG) which lists Prince Edward County shore as "significant for waterfowl" (page 306, Appendix K).

The same document establishes that areas beyond wetland (marshes, bogs, etc.) such as meadows and grasslands are also important:

"The following landforms characteristically provide significant waterfowl habitat and need to be examined: peripheral lands: uplands, such as grass and shrub habitats, as well as pastureland within a significant distance can provide important nesting habitat." (Page 308 Appendix K):

Prince Edward Point meets the criteria above for Significant Wildlife Habitat by having ample and productive habitat for: diverse species of waterfowl; corridors or flight paths across the point from marshes and open lake to upland feeding sites; offshore staging areas for migratory waterfowl; seasonal concentrations of wintering raptors (e.g. hawks and owls aggregating in unusual numbers in winter to feed on meadow voles in years of irruptions in their population cycles).

Prince Edward Point and Ostrander Point is particularly significant habitat for one migratory species, the Short-eared Owl, because it has been officially listed as a **Species of Special Concern** both Provincially and Nationally It is threatened by loss of grassland and marshes in Ontario.

## **Evidence of the importance of Main Duck Islands as part of the island chain as stepping stones for migratory birds crossing Lake Ontario**

1. Dr. Ron Weir, (a university research scientist and author of the authoritative book: *Birds of the Kingston Region*, 2<sup>nd</sup>. Edition, 2008) has addressed the biological significance of the islands between Prince Edward Point and Stony Point, NY. In a report prepared for a conference on bird migration through the Kingston area, Professor Weir described his systematic observations collected over a wide area for the last 40 years. The data that he and his colleagues collected is an exceptional record. The following relevant excerpts are taken directly from his report.

**Potential Effects of Offshore Wind Turbines on Millions of Birds Migrating Across Eastern Lake Ontario near Main Duck Island, Kingston Field Naturalists, July 2012**

- During the spring and autumn migration periods, the northwards and southward bound migrants, respectively, appear to distribute themselves along a broad front as they pass over the Kingston area.
- Geographical features concentrate the birds as dawn overtakes them and brighter light becomes available. The birds clearly seek land sites for sanctuary, rest and food. During both seasons, the shoreline vegetation of the Kingston mainland, the offshore islands, the peninsula of South Marysburgh township all the way west towards Pt. Petrie are prime sites where large numbers of migrant birds concentrate at dawn. At Prince Edward Point, the geographical features of the land extending out into Lake Ontario **act as a funnel where tens of thousands of migrants can be found.**
- Weather conditions during the night flight play a significant role for the migrants in terms of their flight altitude. Nights with low cloud force the migrants to low altitudes and increase the chances of **a collision with a tall man-made obstacle.** When foggy or rainy conditions are encountered, confusion results as the birds seek out artificial lighting perhaps as a possible corridor through the confusion. This situation usually results in collision with an obstacle and in collisions with each other. The urge to migrate is very strong and they continually try to push onwards.
- The numbers of migrants passing a listening post vary depending on the particular night, the date within the migration period and weather conditions. During April and May, the birds per hour passing the listening post number up to 3,600 per hour and are greatest during mid-May. The total numbers per hour passing during autumn are much greater on most nights, up to 50,000 per hour, and for many more nights through the season.
- With same density of flight between the two listening posts separated by 5km, there would have been 18,000 SWTH per 400 m x 5000 m = 225,000 Swainson's Thrushes passed over during the night. There were 10 other birds passing per hour for every Swainson's Thrush so there were approximately 2.25 million migrants that flew over that night.
- During the early stages of planning for installation of windmills on Wolfe Island, the KFN provided the Ontario MNR and Environment Canada with factual information with respect to the sites on Wolfe Island where bird casualties would likely be the greatest. It appears that this advice was totally ignored by the company undertaking the installation and therefore there should be no surprises about the casualties that are resulting. Sound environmental advice has the potential to minimize the environmental impact in all aspects of development.

2. The Nature Conservancy of Canada has this to say about Main Duck and Yorkshire Islands (The Ark: Publication of the NCC Summer 2007)

- “Parks Canada has managed these islands since 1988, along with the recently enlarged St. Lawrence Islands National Park. They may soon become part of a new Eastern Lake Ontario National Marine Conservation Area. The islands are part of an important migration corridor for many birds, including the endangered Henslow's Sparrow and the Short-eared Owl, a species of Special Concern.”

The point of departure and arrival for birds flying to/from the Main Ducks Islands is Prince Edward Point, a vital concentration point for migrants along the lower Great Lakes. More than 300 species of birds have been recorded on the Point,

including songbirds, waterfowl, owls and hawks. In autumn, thousands of migrating hawks and owls take advantage of the open fields to hunt for rodents. Monarch Butterflies and various bats also pass through during migration. The area is a valuable sanctuary for bird species at risk that need grassland habitat.

3. Ontario Nature had this to say in a letter critiquing the proposed Ostrander Point Wind Energy Park:
  - “We call on the government of Ontario to reject the proposed access roads and Ostrander Point Wind Energy Park, given the significant impacts they will have on the area’s natural value.”

## Species At Risk

The Natural Heritage Reference Manual (June, 1999) speaks of protecting habitat of species at risk of extinction as follows:

"The protection of threatened and endangered species requires that significant portions of their habitat be protected. As the habitat requirements of individual threatened or endangered species are extremely varied, the assessment of what constitutes the significant portion of the habitat must be made on a species by species, case by case basis. The significant portions of the habitat refers to the habitat that is necessary for the survival of populations of endangered and threatened species."

According to the IBA the Least Bittern, a species nationally listed as Vulnerable occurs on Wolfe Island. The Black-crowned Night-Heron and Black Tern have all bred in the area. The ERR for Prince Edward Point and Ostrander Point needs to complete the most comprehensive study yet done for these species because it represents the largest threat to them in decades.

Both Henslow’s Sparrow and the Short-eared Owl are designated “Canadian Species at Risk” by the Committee on the Status of Endangered Species in Canada (COSEWIC). The sparrow is in the “endangered” category and the owl is in the “special concern” category (CWS website). Both have been reported to nest on Wolfe Island (IBA). They should be the subject of a thorough monitoring study.

Prince Edward Point and Ostrander Point are regarded as having some of the highest quality grassland bird habitat in Ontario (Ontario Partners in Flight 2005). The birds relying on this critical habitat will be migrating into the proposed W.I. Shoals Offshore Wind Project.

Species At Risk in Ontario are listed on the OMNR website. A large number of birds are either Endangered (facing imminent extinction), Threatened (likely to become Endangered) or Species of Concern (may become threatened because of a combination of biological characteristics and identified threats). Some in the Endangered category which

are at risk of destruction from wind turbines include: Golden Eagle, Henslow's Sparrow, King Rail, Red Knot and Piping Plover. A longer list of Threatened Species are legally under provincial protection: Bobolink, Chimney Swift, Cerulean Warbler, Least Bittern, Peregrine Falcon, and Eastern Meadowlark, which has declined by 74% over the past 39 years without evidence of leveling off. Turbines pose risks to species that are very unlikely to be killed by cats, cars or collision with buildings. Birds migrating along the shores or across Lake Ontario over the stepping-stone islands need comprehensive study by MNR before any decision on offshore turbine implementation.

## A Critique of Current Environmental Analysis: Evaluation of the Draft ERR for Ostrander Point Wind Project

In 1998 Canada's commissioner on the environment and sustainable development audited the federal EA process. In 77 of 187 projects reviewed "information on the existing environment was not provided or was too sketchy to allow a reader of the screening report to assess whether the assessment has considered all significant environmental effects" (from David Boyd, *Unnatural Law: Rethinking Canadian Environmental Law and Policy* 2003.) This comment applies equally to the ERR for the proposed Ostrander industrial wind project. I outline below how thoroughly "sketchy" is the field survey information provided for anyone attempting to assess the ERR.

- As an example, the winter raptor survey consisted of observations by biologists walking along roads over 3 days, totaling 18 hours, searching for raptors. Table 3.1 titled: "Summary of Winter Raptors Results" shows a list of species, none of which is a raptor species because no raptors were seen. Almost nothing can be learned of raptor presence in that limited period of sampling. Turbines have the potential to kill birds every hour, every day, all year long. On the other hand, Field Naturalist groups spend hundreds of hours within a 24-hour period over widely distributed local regions. Why not use that data? Consider the compilation in R.D. Weir's recent book. He notes (page 125) that counts of 85, 92, 250 and 400 Red-shouldered Hawks have been observed between 1985 and 1996 during hawk migrations at Prince Edward Point. The ERR did summarize a number of bird studies concluding that: "The Ostrander Point site has a very high site sensitivity, due to its location within the Prince Edward County South Shore IBA, proximity to the Prince Edward Point Bird Observatory and P.E.Pt. National Wildlife Area, and proximity to the Lake Ontario shoreline"
- OMNR's Significant Wildlife Habitat Technical Guide establishes that areas beyond wetland (marshes, bogs, etc.) such as meadows and grasslands are also important: "peripheral lands: uplands, such as grass and shrub habitats, as well as pastureland within a significant distance can provide important nesting habitat." (Page 308 Appendix K): This should be seen as a directive to the Wind project that habitat surrounding wetlands and marshes needs to be included in any environmental review for the impacts of the turbine construction and operation. The ERR did not take this into account.

**Potential Effects of Offshore Wind Turbines on Millions of Birds Migrating Across Eastern Lake Ontario near Main Duck Island, Kingston Field Naturalists, July 2012**

- The ERR states “The National Audubon Society also believes that bird mortality as a result of wind turbines is a very small fraction of all anthropogenically induced mortality, and is much less than mortality as a result of other means of electricity generation that contribute to global warming” (Levesque, 2006). However a more recent Audubon press release notes: “Wind power facilities can also degrade or destroy habitat, cause disturbance and displacement, and disrupt important ecological links. These impacts can be avoided or significantly reduced, however, with proper siting, operation and mitigation”. □ But, paradoxically, the ERR states: “The Ostrander Point site has a very high site sensitivity, due to its location within the Prince Edward County South Shore IBA, proximity to the Prince Edward Point Bird Observatory” Since wind turbines, transmission lines and habitat destruction result in bird mortality the P.E. Pt. siting, the best bird habitat available, would appear to be a very poor choice for wind turbines. The ERR does not present evidence to the contrary.
- Turbines can have a variety of direct and indirect effects on wildlife. Other than counts of dead birds there is relatively little research on wind turbine effects, especially the larger, newer designs (National Research Council, National Academy of Sciences, USA 2007 draft report abstract). This blue-ribbon scientific body could not come to any definitive conclusions regarding impacts of wind turbine arrays on wildlife due to the paucity of systematic studies on them. An environmental impact assessment of the construction and operation of a large array of wind turbines cannot predict their negative impacts on bird populations unless the location has a comprehensive study. Extrapolation from turbines in other locations may be highly unreliable because bird activity and abundance are almost never sufficiently similar that generalizations can be drawn.
- The draft ERR for Ostrander Point failed to analyze the impacts of pre-construction and construction activity.
- The draft failed to analyze the wildlife habitat destroyed and impacts of the total miles of roads and trails to the proposed turbines and facilities. The land open to OHV access could constitute sources of disturbance to nesting and feeding birds for the life of the turbines.

Research on impacts of construction machines, turbines operation and human activities suggest the following types of impacts:

- A. Direct displacement, both temporary and permanent, from habitat by stimuli from people and machinery. This effect results in denying access to critical food or other resources by the affected wildlife.
- B. Degradation or destruction of plants and soil organisms by large machines during construction. This effect destroys the basis for ecosystem function.

- C. Direct mortality by construction vehicles, turbine rotors and towers during construction and operational phases. Increased mortality rates in turtles and birds could lead to the disappearance of species already in decline.
- D. Indirect effects on populations of wildlife by changes in the plants and other habitat components that wildlife depend on to survive and reproduce. Biologists refer to this as degradation of habitat quality with known negative outcomes.

The draft ERR has failed to provide a habitat inventory and the systematic studies that would permit reliable prediction of the impacts of this large project. At the very least a “best-practices” approach would have presented detailed maps of the plant communities as cover maps that might permit expert opinion to suggest what species would suffer impacts..

The Wolfe Island Shoals and Trillium Power Wind I Projects should not be permitted to proceed until studies necessary to determine impacts on birds, bats and the aquatic ecosystem are completed; studies sufficient for government agencies to provide the level of protection that Ontario’s laws require.

## Risks from the Proposed Offshore Wind Projects

The presence of bird species listed as “at risk” under federal SARA or COSEWIC are afforded the greatest degree of protection from disturbance and mortality from human-induced influences. Species near to extinction are, by definition, unable to sustain additional levels of mortality. Mortality from wind turbines on raptors can be very high and sustained, especially on congregations of eagles, hawks and owls. The Bald Eagle is highly vulnerable because it has a very low reproductive rate and is long-lived. This means that any small continuous increase in the mortality rate, such as turbine collisions, has the potential for sliding the species toward local extinction. We have very little research on whether negative impacts from turbines on Prince Edward Point and Ostrander Point can be mitigated. In any case it is likely that the corporation operating the turbines would require considerable research before initiating improvements so species at risk might go locally extinct in the interim.

## Twelve Million Migratory Birds Meet The Great Wall of Offshore Turbines: Further Long-term Data

At the Bird Migration Conference, Kingston, 8 March 2011, David Okines presented his calculation of some 12,183,600 birds a year going over the area between Presqu’ile in the west to Wolfe Island in the east. (These birds would cross Lake Ontario or the St. Lawrence River where hundreds of wind turbines have been built or are proposed (such as the 236 turbines planned for the areas N and SW of Main Duck Island.) To date no studies of the **cumulative effects** of all the turbines have been completed, despite a federal agency requiring them (Canadian Environmental Assessment Act – S.C. 1992, c.

**Potential Effects of Offshore Wind Turbines on Millions of Birds Migrating Across Eastern Lake Ontario near Main Duck Island, Kingston Field Naturalists, July 2012**

37, Section 16, 1(a)). We consider this a serious, if not fatal, omission in the process of assessment of impacts because the combination of multiple, independent turbine projects constitutes an additive obstruction and mortality source for millions of birds two times per year, every year. Under United States law cumulative effects analyses (CEAs) are required for construction projects because the animals under consideration are affected negatively by all spatial and temporal disturbances or obliteration of their habitat. It is not rational to just consider each project in isolation when birds face all of them. Turbines strung out across the open lake and adjacent shoreline could be compared to a fish net across a river. The over-water airspace is essential habitat for migratory birds.

Systematic sampling by the Point Edward Point Bird Observatory (PEPTBO) beginning in 1994 provided the data for Mr. Okines presentation. This site overlapped the locations where the Kingston Field Naturalists started observations through the 1970s and 1980s. For 130 days each year passerines (songbirds), hawks and owls were the targeted birds during spring and fall sampling. Okines concluded that the migratory strategy of different species varies with diurnal passerines avoiding over-water passages (Blue Jays, raptors, flying over or near Wolfe Island) while nocturnal passerines flew straight over the open Lake (thrushes and warblers). Both of these migratory strategies place the birds at risk from turbine collisions.

We present a brief account of the numbers of birds observed over 5 days in spring/fall which may be helpful in comprehending the scale of numbers and risks. All species, average: 40,000/25,000; peak counts: 85,000; ducks 37,000; seabirds: 13,000/22,000. Peak spring counts for individual species were: 225,000 Long-tailed duck; 5500 White-winged Scoter. Fall hawk counts for 5 days gave peaks of 900 and 2300 in different seasons. Okines summarized by reporting that the PEPTBO (1 km wide zone) count each and every year was over 750,000 birds.

Additional precise information on the flight path of masses of nocturnal flights was presented in the slide-talk, images from Nexrad radar located near Watertown, NY. Again migrating birds were concentrated in the Prince Edward Point, Amherst Is., Kingston and Cape Vincent, NY area. This zone is an international flyway for all species, including ducks, geese and swans and is an internationally recognized Important Bird Area (IBA). This is the exact area where over 1000 turbines are placed or planned (Cape Vincent, Galloo Island, Main Duck Is., Wolfe Island, Amherst Island, Ostrander Point, and around PEC). In terms of impacts on migratory bird a worse choice of locations is hard to envision.

## Comparison of Bird Species Killed by Wolfe Island Turbines vs City Towers

Consistent with the schedule for post-construction monitoring outlined in the Post-Construction Follow-Up Plan for Bird and Bat Resources for the Wolfe Island Wind

**Potential Effects of Offshore Wind Turbines on Millions of Birds Migrating Across Eastern Lake Ontario near Main Duck Island, Kingston Field Naturalists, July 2012**

Plant, mortality monitoring was carried out by employees of Wolfe Island Wind Monitoring, an independent consulting firm, according to a schedule and methods prepared by Stantec. The results of these surveys were presented in five monitoring reports covering the periods: May-Jun 2009, Jul-Dec 2009, Jan-Jun 2010, Jul-Dec 2010 and Jan-Jun 2011. In addition to carcass searches, trials to determine various corrective factors for searcher efficiency and scavenging rates were conducted during each of these monitoring periods.

Large raptors were collected during each reporting period and the table below indicates the dates for seven species.

**Table 1: Dates for reported mortality for several raptors**

Rough-legged Hawk	Red-tailed Hawk	Osprey	Turkey Vulture	American Kestrel	Merlin	Northern Harrier
16-Mar-11	14-Jul-09	3-May-10	11-Aug-09	1-Jul-09	31-Aug-09	13-May-10
28-Mar-11	11-Nov-09		14-Aug-09	31-Aug-09		
11-May-11	17-Nov-09	2-May-11	30-Sep-09			
		23-May-11	3-Nov-09			
	8-Feb-10		9-Nov-09			
	9-Apr-10		18-Nov-09			
	14-Apr-10					
	15-Apr-10					
	16-Apr-10		2-Sep-10			
	17-May-10					
	10-Jun-10					
	28-Oct-10					
	28-Mar-11					
	1-Apr-11					

From the dates of collection, all three Ospreys would be nesting birds as would be the two American Kestrels, one Northern Harrier and one Merlin. The three Rough-legged Hawks are wintering raptors that do not nest in the Kingston area. Approximately half of the thirteen Red-tailed Hawks and half of the seven Turkey Vultures would be nesting birds. The other half would be migrating birds.

Also, Bobolink, a species at risk in Ontario, Common Snipe and Purple Martin have been found in large numbers during these surveys (Table 2)

**Table 2: Dates for reported mortality for Snipe, Bobolink and Martin**

Wilson's Snipe	Bobolink	Purple Martin
9-Jun-09	28-May-09	29-Jun-09
18-Jun-09	23-Jun-09	
		12-Aug-09
13-Apr-10	27-Jul-09	12-Aug-09
14-Apr-10	30-Jul-09	17-Aug-09
21-Apr-10	31-Jul-09	4-Sep-09
22-Apr-10	4-Aug-09	4-Sep-09
23-Apr-10	11-Aug-09	9-Sep-09
26-Apr-10	27-Aug-09	9-Sep-09
25-Jun-10	27-Aug-09	
	10-Sep-09	10-Aug-10
1-Dec-10		26-Aug-10
	8-Jun-10	27-Aug-10
18-May-11		2-Sep-10
20-May-11	23-Jul-10	10-Sep-10
14-Jun-11	12-Aug-10	
	3-May-11	
	12-May-11	
	16-May-11	

With the exception of the one Wilson's Snipe collected in December 2010, which was a very late migrant, all these birds are nesting birds. The sixteen Bobolinks are a very high number. From the Breeding Bird Survey of Ontario, the density of nesting pairs is estimated at 3 per square kilometer south of the Canadian Shield (R. D. Weir, *Birds of the Kingston Region*). Therefore, the total population on Wolfe Island should be of the order of two thousand birds, five hundred of which would be found in the western portion of the island where the turbines are concentrated.

These numbers represent the birds that were collected. To estimate the actual birds killed, the numbers must be multiplied by a factor that is calculated from the searcher efficiency, the scavenging rates and the percentage of the area searched. These were determined during the monitoring overseen by Stantec and result in a factor of two for raptors and a factor of six for all other birds.

Therefore, we can estimate that turbines have killed approximately 100 Bobolink during the reporting period of approximately two years. Hence, in the western portion of the island, approximately 10% of the population falls victim to the blade every year.

The Wilson Snipe is four times less abundant than the Bobolink in our area so the reported mortality (13 birds) is also significant for that species. Finally, the Purple Martin

is ten times less abundant than the Bobolink in our area so the 13 birds collected are even more significant.

Birds also suffer casualty from collision with buildings, predation, hunting and other causes. Fatal Light Awareness Program (FLAP) has documented over 46,000 birds as victims of collisions with Greater Toronto Area (GTA) towers between 1993 and 2009. Several species at risk are found in large numbers in the list tabulated by FLAP (Michael Measure, private communication). Nearly 200 Canada Warblers, 180 Bay-breasted Warblers, 132 Blackpoll Warbler, 456 Black-throated Green Warblers and 336 Wilson Warblers have been collected during that time period. Clearly, the mortality due to collision with towers is significant for passerines.

However, large raptors, snipes, bobolinks and purple martins have not been found to be victims of collision with towers. Over seventeen years, one Northern Goshawk and one Red-tailed Hawk have been collected. No snipes or purple martins have been collected and only three bobolinks have been found.

It is clear that lighted structures are a real risk to migrating passerines and city dwellers like the Peregrine Falcon but present a lesser danger than wind turbines for the species highlighted in this summary.

## Conclusions

The airspace over Eastern Lake Ontario is migration habitat, used twice every year by millions of birds, including waterfowl, shorebirds, raptors, and songbirds.

The studies carried out by Wolfe Island Wind Monitoring indicate that many of these birds will be at risk from the proposed wind turbine projects.

Information from the region around Main Duck Island, indicates that at least 12 million birds move through the area each year. The actual number may be many millions higher.

Further studies are needed to get a more accurate estimate of the number of birds passing by Main Duck Island each year, before the potential impact of the proposed windfarms north and south of Main Duck Island can be assessed.

We are also concerned about the cumulative impact of the 1,106 turbines in the 17 industrial wind projects built or planned in Eastern Ontario. The total impact of this huge array of turbines has not been analyzed scientifically. We believe a Cumulative Effects Analysis should be carried out to international standards, before any further permits are granted for the construction of wind turbines.

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