

Birds and Bird Habitat: What Are the Risks From Industrial Wind Turbine Exposure?

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Abstract

Bird kill rate and disruption of habitat has been reported when industrial wind turbines are introduced into migratory bird paths or other environments. While the literature could be more complete regarding the documentation of negative effects on birds and bird habitats during the planning, construction, and operation of wind power projects, there is sufficient evidence to raise concerns. Authoritative and mandatory vigilance monitoring and long-term surveillance over the life of the industrial wind facility are lacking. By the time the documentation of the rate of bird kills, including that of endangered species is available in an environs of an industrial wind turbine facility, the damage may be irreversible. This article briefly explores the negative environmental impacts of the siting of industrial wind turbines and associated infrastructure, including transformer stations and transmission lines, in proximity to migratory bird corridors, wetlands, and nesting grounds. Research is required prior to proceeding with further industrial wind development in these environs. The authors propose that there is sufficient scientific evidence to require invoking the precautionary principle and halting further development until these risks are resolved.

Keywords

birds, bird habitat, industrial wind turbines, migratory bird corridors, wetlands, nesting grounds, precautionary principle

Introduction

In spite of the need for more research available on this topic, there is sufficient evidence available to sound the alarm regarding the siting of industrial wind facilities in proximity to migratory bird corridors, wetlands, and nesting grounds. Current research indicates that in addition to the risk from the industrial wind turbines themselves, road construction, transformer stations, and transmission lines may also have an adverse effect.

The Canadian Wind Energy Industry (Canadian Wind Energy Association [CanWEA], 2006), states, “Studies show that modern wind farms with sensitive siting have no significant adverse effect on bird populations.”

CanWEA (2011) also states,

There are a few ways that wind turbines might interfere with birds—one is the potential impact to their natural habitat, another is through possible collisions with the turbines themselves. A well-sited wind farm goes a long way towards minimizing the risk to birds and brings about a natural and healthy co-existence between wind energy and avian creatures of all stripes.

In Ontario, Canada, during the construction phase, the wind developer is required to consider the impact of birds and bats as part of the approval process. Based on a construction plan report and a post construction monitoring plan, indications are bird habitat may be disturbed during the construction phase and that bird or bat kills may occur during the operations of individual turbines (NextEra, 2010a; NextEra, 2010b).

Nature Canada (Personal communications, November, 2010) raised concerns about an industrial wind development in a sensitive bird area in Ontario:

Ostrander Point encompasses a staggering array of superlative natural heritage features, many of which are identified in the Natural Heritage Assessment/Environmental Impact Study (Gilead Power Corp/

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Stantec Consulting). A number of these natural heritage values are particularly sensitive to wind development, road construction, or both.

At the same time, while there is an indication that mitigation could include various steps such as blade feathering or shutdown of the wind turbines, there is no authoritative process that defines the triggers for mitigation.

Environmentalists concerned with the risk to bird habitat, migratory bird corridors, wetlands, and nesting grounds are limited by the various government processes in place for implementing industrial wind energy. As a result, litigation may be used in an attempt to resolve the issues.

A Brief Overview of Available Research

As early as 1992, Winkelman (as cited in Stelling, 2008) is reported to have observed nocturnal bird collisions with wind turbines through the use of thermal image intensifiers. He identified a significant probability of 1 in 40 passing birds (2.5%) occurred at rotor height.

Manville (2005) noted that more wind turbines add to the pressure of other negative sources such as power lines and traffic.

In addition to collisions, other factors such as shadow flicker and low-frequency noise could negatively disrupt bird and bird habitat.

Buxton (2006) raised concerns regarding low-frequency noise and infrasound and their impact on birds:

The adverse effects of low frequency noise (LFN) and infrasound are generally understood although not widely appreciated because by and large, up until recently most creatures do not encounter them for long periods of time or at levels that are perceived to be dangerously low. (p. 3)

He goes on to say, "Birds will often fail to return to a nest that has been disturbed even when eggs or young are present" (p. 16).

Buxton (2006) also noted the low-frequency and other noise may interfere with important communication requirements:

Birds and song birds in particular have to discriminate between their own and other species calls and songs. This need is an important aid to communication for mating, group bonding, feeding, danger awareness, flocking and at the other extreme, isolation for territorial requirements. (p. 47)

Concerns have been expressed regarding the size of modern-day wind industrial turbines: "The increasing height and increasing rotor-swept area putting turbines well within the zone of risk for migrating birds, not to mention impacts to birds during take-offs and landings . . ." (Stelling, 2008,

p. 27) and "the potential for single-night, mass mortality events when mass migration and inclement weather coincide, where weather ceilings force birds down well within rotor swept areas" (p. 28).

A long-term study (Everaert & Kuijken, 2007) supports these concerns: "Large modern turbines of 1500 kW or more can have as much as, or even more collision fatalities than smaller turbines."

In Pennsylvania, United States, concerns have been raised about the challenge to obtain information related to the more recent wind turbine models.

Crable (2011) reported that the Game Commission has an agreement with the wind developer(s), which states, "It is understood between the parties that information resulting from the cooperator's compliance with this agreement shall be treated with the highest affordable level of confidentiality available unless otherwise agreed to in writing by both parties."

Based on inquiries about bird deaths at the Turkey Hill project, the developer Renewable Energy PPL said that it "was following the Game Commission's protocol in keeping it in confidence" (Crable, 2011).

It was further reported that a professor of biology and ecology at Penn State-Altoona noted that

There is no independent scientific peer review of anything submitted by the wind companies, as these data are not permitted to be seen by anyone else . . . "This is contrary to the very basic premise of how good science works. (Crable, 2011)

Concerns About the Lack of Authoritative Guidelines

Authoritative guidelines based on scientific research continue to be a priority.

As early as 2001, English Nature, the Royal Society for the Protection of Birds (RSPB), World Wildlife Fund-United Kingdom, and the British Wind Energy Association jointly produced a guidance document for nature conservation organizations and developers when consulting over wind farm proposals in England:

Special Protection Areas (SPAs) arise from the Birds Directive (Council Directive 79/409/EEC on the Conservation of Wild Birds) which requires Member States to take special measures to conserve habitats for certain rare or vulnerable species and for regularly occurring migratory species of birds. (p. 9)

In 2003, the U.S. Department of the Interior, Fish and Wildlife Service drafted guidelines and advised planners:

Wind energy facilities can adversely impact wildlife, especially birds and bats, and their habitats. As facilities with larger turbines are built, the cumulative

effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations. The potential harm to these populations from an additional source of mortality makes careful evaluation of proposed facilities essential.

The U.S. Department of the Interior, Fish and Wildlife Service (2003) guidelines were reported to be based on peer-reviewed scientific avian studies written by biologists (Braun et al., 2002; Hunt, 2002; Leddy et al., 1999; Orloff & Flannery, 1992; Woodward et al., 2001; as cited in Stelling, 2008) and included studies of bats (Johnson et al., 2002; Keeley et al., 2001; Manes et al., 2002; Manville, 2003; as cited in Stelling, 2008).

The lack of authoritative and mandatory guidelines and/or standards based on scientific research is resulting in inadequate protection for birds and bird habitat.

Stelling (2008) cites Dr. Petrie: "There has not been a rigorous coordinated approach to the assessment of suitable sites, or to addressing concerns about existing proposals. There also do not appear to be sufficient guidelines for the placement of wind farms . . ."

Michael Daulton (Natural Resources Committee, 2007) noted during testimony:

Currently, there are no mandatory federal regulatory standards, and few state standards, regarding the design or siting of wind power facilities to reduce risks to birds and other wildlife.

The U.S. Fish and Wildlife Service (FWS) and several states have published guidelines, but these are merely advisory in nature, and in most cases compliance is voluntary. Some federal land management agencies have adopted guidelines for wind power developments on public lands, but the guidelines fail to provide adequate measures for mitigating the risks to birds.

With respect to guidelines, the WWF (2004) in a position paper stated,

The development of wind farms should be managed sensitively and framed within regional and local spatial planning guidelines. This should include development of national, regional and local wind targets, assessing high value habitats and identifying no-go areas for wind development. In this way, any environmental impacts and conflicts with other land or marine uses would be identified and minimised.

American Bird Conservancy President, George Fenwick, wrote the Secretary of the Interior and Bureau of Land Management in the United States (American Bird Conservancy, 2010):

. . . stressed the need for guidelines to be consistent across all agencies.

"I find it ironic that the Interior Department is asking us to believe that the wind industry will follow voluntary guidelines when their own land management agency is not even doing so," Fenwick said.

"The notion that the wind industry is predominantly made up of small, environmentally conscious operations is one that must be quickly dispelled. These are large, corporate-scale utility companies, not unlike coal and oil conglomerates, in business to make corporate-scale revenues, and with a checkered environmental track record to date. The industry could have been acting voluntarily to reduce bird mortality for more than 20 years, but has failed to do so," Fenwick said.

What Are the Risk Factors?

The risk factors and mechanism by which birds can be affected by industrial wind turbines have been proposed by several groups.

In 2004, Thomsen and Köster presented a position policy paper to Nature Canada:

The main potentially detrimental effects of wind farms on birds, as identified in BirdLife International's position statement on wind farms and birds are

- Collision with the moving turbine blades, with the turbine tower or associated infrastructure such as overhead powerlines, or the wake behind the rotors causing injury, leading to direct mortality. Disturbance displacement from around the turbines or exclusion from the whole wind farm.
- Disturbance displacement from around the turbines or exclusion from the whole wind farm. Reduced breeding productivity or reduced survival may result if birds are displaced from preferred habitat and are unable to find suitable alternatives. Disturbance may be caused by the presence of the turbines, and/or by maintenance vehicles/vessels and people, as well as during the construction of wind farms.
- Barriers to movement disrupting ecological links between feeding, wintering, breeding and moulting areas and extended flights around wind clusters, leading to increasing energy demand potentially reducing fitness. Large individual wind farms, or the cumulative effect of multiple wind farms, are the main concerns.
- Change to or loss of habitat due to wind turbines and associated infrastructure.

These general principles have been supported by the National Audubon Society. During the Congressional Testimony on Wind Power, Daulton (Natural Resources Committee, 2007) testified that

Wind energy facilities can have detrimental impacts on birds, bats, and other wildlife in four fundamental ways:

1. Collision mortality
2. Loss or degradation of habitat
3. Disturbance and subsequent displacement from habitat
4. Disruption of ecological links

An authoritative assessment of these risk factors continues to be inadequate resulting in a lack of mitigation and resolution of the issues.

Daulton (Natural Resources Committee, 2007) went on to say,

Currently, collision mortality is being assessed at only a small minority of the wind energy facilities in the country. In some regions, it has not been assessed at all.

Development of wind power facilities results in destruction of habitat from support roads, storage and maintenance yards, turbine towers, and associated infrastructure.

Disturbance from human activity and turbines may displace animals from the habitat. While this is seldom lethal, it may cause birds and other animals to abandon preferred habitat and seek lower-quality habitat elsewhere, where disturbance is less. This may result in reduced survival or reduced breeding productivity, which may cause lower or declining populations.

Large wind energy facilities may interfere with the ability of birds and other wildlife to travel between feeding, wintering, and nesting sites. Alternatively, they may cause birds to make longer or higher flights between such areas. This results in higher metabolic costs, and therefore may reduce survival and reproduction.

Environmental Groups Express Their Concerns

Increasingly, biologists around the world are recognizing that industrial wind developments are adding to the already significant impact of humans on bird populations. Lynas (2011) interviewed Clive Hamblen, author and lecturer in Biological and Human Sciences, Hertford College, University of Oxford, United Kingdom. Hamblen states,

I think wind farms are potentially the biggest disaster for birds of prey since the days of persecution by gamekeepers, and I think wind farms are one of the biggest threats to European and North American bats since large scale deforestation. The impacts are already becoming serious for white-tailed eagles in Europe, as is abundantly clear in Norway. A wind farm—built despite opposition from ornithologists—has deci-

mated an important population, killing 40 white-tailed eagles in about 5 years and 11 of them in 2010. The last great bustard in the Spanish province of Cadiz was killed by a wind development. In my experience, some “greens” are in complete denial of these impacts, or hopefully imagine that these bats and birds can take big losses: they can’t because they breed very slowly.

Birds of prey often soar where wind farms are best-sited, and may be attracted to their deaths by the vegetation and prey around the turbines. A similar deadly ecological trap has been proposed for bats, with some species attracted by insect prey or noise around the turbines.

Dr. David Suzuki (personal communications, 2008) responded to concerns raised regarding the placement of industrial wind turbines in sensitive bird areas:

I am by nature, disinclined towards massive wind-farms because they concentrate power in corporate hands . . .

We know from the California experience where a windfarm was placed right in an area where raptors migrate that the blades do kill birds.

Obviously they have to be sited where this is minimized.

The Premier of Ontario is reported to not have given much thought regarding the risks relating to sensitive eco sites:

When Dalton McGuinty visited *The Globe and Mail's* editorial board earlier this year, one topic seemed to catch him off guard.

How, the Ontario Premier was asked, could his government be considering putting wind turbines off the shores of Point Pelee, in Lake Erie's Pigeon Bay? As one of the most ecologically sensitive corners of the province, wasn't it the sort of place that should be deemed off limits for energy development? After broadly extolling the virtues of his Green Energy Act, Mr. McGuinty stumbled through an acknowledgment that he hadn't really given this specific issue much consideration. "You've raised something which I've not thought about," he said. "I'm glad you're not in opposition." (Radwanski, 2010)

WWF (2004) has also expressed its opinion:

On a wind project consideration of environmental issues WWF believes:

1. Proposals for wind farm developments within IUCN 1-2 protected areas and/or national parks should not be allowed, unless a comprehensive Environmental Impact Assessment (EIA) clearly

- indicates that the proposed development will not cause adverse effects on the integrity or conservation objectives of statutory protected area.
2. Wind turbines can have a possible impact upon wildlife if sited in the wrong place and as such should not be placed in important bird nesting grounds or within identified bird migration routes, such as RAMSAR sites.

In Ontario, the Green Energy and Economy Act of 2009 is intended to streamline the approval process for thousands of industrial wind turbines. A centralized decision-making process is in place, which removed jurisdictional authority from local municipalities (Gallant, 2011).

The streamlining of the approval process has resulted in sites being proposed without careful consideration of the implications.

S. Petrie (personal communication, March 15, 2008) states,

The current rush for approvals and substantial competition between companies has resulted in the consideration of sites that are critically important for migratory birds and bats, e.g., closely associated with Ramsar Sites, Important Bird Areas, Biosphere Reserves, National Wildlife Areas, Provincial Parks, etc.

In most instances there has been an inadequate use of existing scientific literature pertaining to the potential impacts of turbines on wildlife (waterfowl, bats, passerines [songbirds]). There is ample European literature on the subject which has not been adequately utilized in the planning process.

Harris (2008) stated in a press release: "Dr Mark Avery, the RSPB's Conservation Director, said: 'We have been appealing to the government for many years to publish maps like these primarily to help developers avoid sites that are important to wildlife.'"

Nature Canada (2011a) has expressed its concern regarding a project being proposed in a globally recognized migratory bird path at Ostrander Point, Ontario:

The wind park is only a few kilometers from the Prince Edward Point National Wildlife Area, the only NWA specifically recognized for its importance for migrating landbirds. Environment Canada has described the site where the turbines are proposed as "one of the best areas for birds in southern Ontario."

For us at Nature Canada, the Gilead project is a good example of a wind energy project that is being proposed in the wrong place—in fact the worst possible place in terms of risk to birds. If approved, we believe the project is likely to have significant impacts on a very rich breeding bird community and on migratory birds that depend on Ostrander Point's natural habitats.

Recently, Nature Canada (2011b) posted a petition addressed to the Prime Minister of Canada on its website:

To get wind power right in Canada, I urge governments to enact policies and regulations that ensure the following:

Wind turbines and wind farms should not be located in Important Bird Areas or other areas with particular significance to congregating, migrating or breeding birds.

Researchers, biologists, and environmental groups have accumulated evidence regarding the risks to migratory birds and habitats, including collision mortality such as that experienced by bats and raptors. In addition, members of the public have expressed their concerns.

What Is the Estimated Bird Kill?

There are challenges for determining bird kills and disruption of habitat. Some point to a flaw in the count process. By the time a count is made, scavengers have destroyed the evidence. To avoid this, 7/24 would be required at key times of the year in order to achieve more precise monitoring.

Cheskey and Zedan (2010) note, "In the simplest terms, the impact of active turbines on birds typically involves regular searches for corpses beneath the turbines."

However, in spite of these challenges, informed determinations are being made.

The postconstruction monitoring report by a wind developer in Ontario (Transalta Corporation, 2010) reported that regarding the Wolfe Island, Ontario facility,

correcting seasonally for searcher efficiency, scavenger and other removal rates, and the percent area searched, the 12 raptor/vulture and 88 other bird carcasses recovered represent approximately 602 bird fatalities over the course of this Reporting Period.

The estimated total bird mortality for the Reporting Period is 6.99 birds/turbine (3.04 birds/MW). The mortality rate for the six-month Reporting Period at the EcoPower® Centre, at 3.04 birds per MW, is consistent with the results in nearby New York and other studies summarized by Arnett et al. (2007).

However concerns have been raised about monitoring methods by wind developers (Cheskey & Zedan, 2010):

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.

Blackwell (2010) followed up on this report:

"Shockingly high" numbers of bird and bat deaths caused by one of Canada's biggest wind farms should serve as a warning to planners of other projects that may be built in crucial wildlife zones, one of the country's key conservation groups says.

The monitoring reveals shockingly high numbers of fatalities of both birds and bats," said Ted Cheskey, manager of bird conservation programs at Nature Canada. He said the figures underline what his organization has been arguing all along, that "there should not be wind turbines put in important bird areas or migratory corridors."

Mr. Cheskey said Wolfe Island is an internationally recognized "important bird area," or IBA, for raptors—birds of prey such as owls and hawks that hunt for small mammals to eat. The numbers of those birds killed is worrying, he said, as is the mortality of swallows, which are in decline across Ontario.

The hundreds of bats killed is also cause for "grave concern," he said, especially because they are less well understood than birds. "They are being massacred [and] we could be driving more species to extinction without understanding how or why."

The Fraser Institute (Katz, 2010) commented on the same report:

. . . provincial officials certainly noticed the Wolfe Island numbers. In response to the May 2010 report, for example, Erin Cotnam of the Ontario Ministry of Natural Resources observed that the number of raptor and vulture fatalities—13 in the six-month period—were "among the highest" of any wind farm in the province (Cotnam, 2010). Environment Canada characterized the raptor fatalities as a "primary concern [that] merits continued, close monitoring."

Mark Duchamp, who has monitored bird and bat kills, estimates there are eight million bird and 16 million bat deaths per year: "The alarming rate at which bird life is being chopped up, and lost to habitat fragmentation by turbines, is beyond frightening" (M. Duchamp, personal communication, February 14, 2011)

It is apparent that the risks to raptors such as eagles are significant.

In Norway (Jais, 2011), it was reported,

But what to me is a really scaring prospective is the way wind power development has been introduced in this country.

During the last five and a half years, the wind power plant on Smøla has been killing 40 white-tailed eagles, 27 of them adult or sub adult birds, and 11 of them during 2010. There are no mitigating measures taken so far, and hardly any to think of, and there is no indication of adaptation among the eagles to such constructions.

In Ireland, Lucey (2011) reported that a rare sea eagle collided with a wind turbine: "Although such collisions are common in Europe and the US, it is the first time a sea eagle has died here, or in Britain, due to a wind turbine." The article went on to say, "The effects of wind farms on protected birds is one of the single biggest obstacles to planning in Europe." Transmission lines can pose a risk to birds. For example, in Wyoming, Mountain-Prairie Region Press Releases (U.S. Fish and Wildlife Service, 2009) reported,

PacifiCorp—one of the largest electric utilities in the West—pleaded guilty today in Federal court in Casper, Wyoming, to unlawfully killing golden eagles and other migratory birds in the State. The company, which does business in Wyoming as Rocky Mountain Power, was ordered to pay over \$10.5 million for killing eagles and other protected birds.

The plea agreement responded to an information charging PacifiCorp with 34 counts of unlawfully taking golden eagles, hawks, and ravens in violation of the Migratory Bird Treaty Act. PacifiCorp has killed 232 eagles in Wyoming from January 2007 to the present. The company, which pleaded guilty to all 34 counts, has been sentenced to pay a \$510,000 criminal fine and an additional \$900,000 in restitution and will spend the next five years on probation. During this period, PacifiCorps has been ordered to spend \$9.1 million to repair or replace its equipment to protect migratory birds from electrocution in Wyoming.

A U.S. Fish and Wildlife Service investigation, which began in 2007, linked excessive eagle mortalities to PacifiCorp's electrical distribution and transmission facilities in six Wyoming counties (Sweetwater, Washakie, Hot Springs, Park, Converse, and Natrona). The United States Attorney's Office for the District of Wyoming filed Federal charges against the company based on this probe. The Migratory Bird Treaty Act makes it illegal for anyone to kill a protected bird (including eagles and other raptors) by any means without first obtaining a permit.

Concern has also been raised about the eagle kills in the Altamont Pass in California, United States. It was estimated

that 80 golden eagles were killed by wind turbines annually (Hoffman, 2010). This was in spite of birds being protected by the Migratory Bird Treaty Act:

While the total number of birds killed in the US each year fluctuates, Michael Fry of the American Bird Conservancy estimates that US wind turbines kill between 75,000 and 275,000 birds per year. Yet the Justice Department is not bringing cases against wind companies. "Somebody has given the wind industry a get-out-of-jail-free card," Fry said, in an interview with the Wall Street Journal. "If there were even one prosecution," he added, the wind industry would be forced to take the issue seriously.

CanWEA (2006) acknowledges that

Lessons were learned from one of the first major wind farm projects in North America. Established in the 1970s, Altamont Pass was problematic for birds. As turbines at Altamont are replaced, newer, fewer and bigger models take their place, making air space around the wind turbines safer for birds.

A recent article by Sahagun (2011) reported regarding the Altamont Pass:

"It would take 167 pairs of local nesting golden eagles to produce enough young to compensate for their mortality rate related to wind energy production," said field biologist Doug Bell, manager of East Bay Regional Park District's wildlife program. "We only have 60 pairs."

It went on to say: "So far, no wind energy company has been prosecuted by federal wildlife authorities in connection with the death of birds protected by the Migratory Bird Act, the Bald and Golden Eagle Protection Act or the federal Endangered Species Act."

In 2009, the California Energy Commission stated,

Well over 10,000 raptors at the Altamont over 20 years, including 2,000 to 3,000 golden eagles.

All kinds of mitigation measures were implemented at the Altamont, including the poisoning of live prey (rabbits). None of them worked, and the poisoning backfired into more eagle deaths.

Meyburg and Meyburg (2009) state,

The number of victims at wind farms is undoubtedly higher than officially known. The plans to greatly increase the numbers of these installations in Brandenburg and elsewhere can only be viewed with

the greatest concern as far as the Lesser Spotted Eagle is concerned. Wind farms in the USA claim thousands of victims annually. As with the help of ST studies it is now known that the Lesser Spotted Eagles have a much greater home range than previously believed, the protective belt around known nest sites of 3 or 6 km only partly helps to solve the problem. Moreover, even these minimum stand-off distances are often not respected.

The legal settlement regarding the Altamont Pass emphasizes the serious risk to raptors regarding the proximity to industrial wind turbines.

Cuff (2010) reports,

. . . largest wind energy producer in the Altamont Pass area of eastern Alameda and Contra Costa counties has agreed to replace 2,400 wind turbines within four years and pay \$2.5 million in a legal settlement to reduce deaths of eagles, hawks and other raptors hacked by turbine blades. The settlement between NextEra Energy Resources, the state, and several environmental groups was announced Monday by the state Attorney General Jerry Brown . . . The settlement resolves a debate about whether the company was making sufficient progress toward a previous legal pledge to reduce bird kills by 50 percent from 2007 to 2010.

In spite of several Acts, which many expected would protect bird life, litigation was required. Raptor kill numbers are disturbing and the after-the-fact settlements are viewed by some as inadequate.

What Are the Siting Distances?

Authoritative siting distances for regarding bird habitat have not been determined. However, some estimates have been suggested in order to protect eagles and other raptors from harm.

Spanish Birdlife (Sociedad Española de Ornitología-SEO/Birdlife) to warn that wind farms located less than 15 km from large raptors' nests may have detrimental effects on these birds (Dec. 2008). (http://savetheeaglesinternational.org/?page_id=588)

Duchamp quotes Dr. Bernd-Ulrich Meyburg, president of World Working Group on Birds of Prey: "It is now known that the birds (lesser-spotted eagles) have a much greater home range than previously believed, the protective belt around known nest sites of 3 or 6 km only partly helps to solve the problem." (M. Duchamp, personal communications, June, 2011).

It is evident research is urgently required to determine authoritative setbacks.

Endangered Species

Endangered species are at risk. In Ontario, the industrial wind turbine developer can apply for a permit to bypass the Environmental Protection Act.

To the shock of many people, the Ontario Ministry of Natural Resources (2011) requested public comment regarding an application made by a developer regarding road construction to

Permit under section 17 of the Endangered Species Act, 2007 (ESA) to allow Gilead Power Corporation to kill, harm and harass Blanding's Turtle and Whip-poor-will as well as damage and destroy the habitat of Whip-poor-will for the purpose of the development and operation of Ostrander Point Wind Energy Park in the Township of South Marysburgh, Prince Edward County.

The Sierra Club Canada (2011) has expressed its concern about the Blanding's Turtle, one of the endangered species for which the permit is being applied: "An increase in mortality by even 2-3% can cause long term declines in the Blanding's Turtle population."

However, Schliesmann (2011) reported with respect to the Sierra Club and wind energy:

The pro-wind power stance of the Sierra Club Canada environmental group caught its executive director in a political crosswind in Kingston this week.

People there wanted to know why the Sierra Club hadn't raised objections about the 86-turbine project on Wolfe Island.

Bennett said environmental arguments are the way to fend off turbines -- not claims about negative effects on human health.

I think basically they're NIMBYs," he said in a follow-up interview with the Whig-Standard, "but somebody's fanning the flames."

. . . at the Kingston meeting, Bennett did agree with his audience that turbines should not be located on bird migration routes or in environmentally sensitive areas.

Many expect that the Sierra Club would fight as hard for the Whip-poor-will as it does for the Blanding's Turtle. It is disturbing that a permit may be granted to "kill, harm, and harass" both endangered species for the purpose of the development and operation of Ostrander Point Wind Energy Park.

Nature Canada (2010) has identified other species endangered, threatened, or of special concern at the Ostrander Point Gilead project and asks the government of Ontario to reject the proposed roads:

. . . a number of Species of Conservation Concern have been identified on or near the proposed project

area including: Blanding's Turtle (Threatened), Common Musk Turtle (Threatened), Milksnake (Special Concern), Monarch Butterfly (Special Concern), Bobolink (Threatened), Whip-poor-will (Threatened), King Rail (Endangered), Least Bittern (Threatened), Black Tern¹ (Special Concern), Short-eared Owl (Special Concern), Golden Eagle² (Endangered), Bald Eagle³ (Special Concern), Peregrine Falcon (Special Concern), Red-headed Woodpecker (Threatened), Loggerhead Shrike (Endangered), Golden-winged Warbler (Threatened), Yellow-breasted Chat (Special Concern), and Rusty Blackbird (Special Concern)

For all the reasons outlined above, 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. In the MNR's proposed draft Bird and Bird Habitats; Guidelines for Wind Power Projects (EBR Registry Number: 011-0112) it states that 'appropriate selection of a project location is a key factor to preventing potential negative effects on birds', and 'applicants should collect and consider all available bird data and bird habitat-related information for the proposed project location'. Therefore, we ask that the proponent adhere to these guidelines, and seek an alternative site for the proposed project. This should be the case for all future wind farm projects proposed within areas of high natural value.

The application for such a permit indicates that the wind developer and Ontario government officials are aware that birds could be killed, harmed, and harassed by industrial wind turbines. Otherwise, why would the developer of the Ostrander Point Gilead Project require such a permit? And why would it be necessary for the government to issue one?

Many are appalled by the ability to obtain a permit that bypasses the protection of endangered species.

Calls for a Moratorium

Some organizations have called for a moratorium until scientific research has been conducted to determine authoritative guidelines.

Ducks Unlimited Canada (2010) expresses its concern and proposes a moratorium:

There is a lack of science investigating both the indirect impacts (disturbance, habitat fragmentation, etc.) and the cumulative impacts of multiple wind farms on the waterfowl and their habitat. DUC is calling on the Province to establish a moratorium on all wind turbines and renewable energy projects in areas providing continentally significant staging habitat for waterfowl and migratory birds. DUC has significant concerns with the

means by which, and the rate at which, renewable energy projects are being implemented in and adjacent to critical, continentally significant staging habitat for waterfowl and migratory birds.

A resolution for a moratorium was passed by the Ontario Nature–Federation of Ontario Naturalists (2010):

Now Therefore Be it resolved that Ontario Nature–Federation of Ontario Naturalists:

1. calls upon the government of Ontario to place a moratorium on wind farm development within 5 km of known significance to migrating birds and National Parks, Provincial Parks, and Important Bird Areas, until thorough, multi-year radar studies of bird migration are conducted at proposed development sites; and
2. urges the government to protect these sites from wind farm development if studies determine that they have significant bird migration concentrations, for example, of over 100,000 birds in a season or are found to be situated within major migratory pathways.

Regarding another moratorium, Sherri Lange (Toronto Wind Action, 2011) stated

that Ontario is seen as a leader in wind turbine education. We have a very high number of moratoriums in this province. Councillor Paul Ainslie was very proactive and instrumental in attaining the Moratorium vote at the TRCA (Toronto and Region Conservation Authority), the largest Conservation Authority in Ontario. International groups are watching Ontario and are certainly feeling encouraged by the Province's announcement today, she said. Some municipalities share the concerns.

Discussion

Evidence is mounting that the impacts to birds and bird habitat is underestimated. The industrialization of sensitive bird areas and migratory bird paths and nesting grounds is resulting in negative effects. Raptors are being negatively affected and legal settlements have resulted.

The ability for industrial wind developers to obtain a permit to “kill, harm, or harass” an endangered species has outraged many Ontarians and global environmentalists.

Katz (2010) of the Fraser Institute noted that

outrage erupted worldwide in the spring of 2008 following the deaths of 1,606 ducks that alighted on a tailings pond in northern Alberta, leading to the criminal prosecution of Syncrude Canada Ltd., one of the

largest producers of crude oil from Canada’s oil sands (Syncrude, n.d.). Yet the fact that a great many more birds and bats are routinely mangled by wind turbine blades at wind farms draws very little attention. This double standard highlights the widespread misperception that so-called “renewable” energy sources do not demand environmental trade-offs” and that “Somebody has given the wind industry a get-out-of-jail-free card.

Buxton (2006) identifies:

The wind industry has hitherto been slowly reactive rather than speedily proactive to the plight of birds and bats in relation to the problems caused by their turbines. The attitude always appeared to be one of first instance denial and it was not until overwhelming evidence was produced showing the mortality rates, that attempts were made to ameliorate the situation.

Being unable to see or hear the blades represents a very real danger and probably explains the high mortality rate at wind farms sited in frequently used flight or migration paths. The down draught and turbulence caused by the wind passing through the blades also plays a part in disturbance, injury and death rates.

The Precautionary Principle

When there is scientific uncertainty, the precautionary principle should be invoked until the issues are resolved.

Everaert and Kuijken (2007) of the Belgium Research Institute support the precautionary principle:

When important factors remain unclear and an indication exists for an important negative impact, the precautionary principle must be applied.

In general, current knowledge indicates that there should be precautionary avoidance of locating wind farms in regional or internationally important bird or bat areas and/or migration routes. Locations with high bird or bat use are not suitable for wind farms.

In the United States, Eaken (2010) reported,

“We need to take a cautionary approach,” Evans continued. “We’re learning as we go with this technology. I think the important thing is that we go slowly until we know more about this technology. There is very little foresight into maintaining bird populations 20 years out. It’s very difficult to forecast that many years in advance.”

In Canada, migratory birds are protected under federal law. The Migratory Bird Convention Act (2011) states,

Canada seasonally hosts over 500 species of migratory birds, and it is the responsibility of Environment Canada to develop and implement policies and regulations to ensure the protection of migratory birds, their eggs and their nests.

Environment Canada (2010) affirms the precautionary principle if there is threat of serious or irreversible harm:

Canada's environmental policy is guided by the precautionary principle and is reflected in the FSDS as required by the Federal Sustainable Development Act which states that the Minister of Environment must develop a Federal Sustainable Development Strategy based on the precautionary principle.

The precautionary principle states that: Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation (United Nations, 1992).

In other words, the absence of complete scientific evidence to take precautions does not mean that precautions should not be taken—especially when there is a possibility of irreversible damage.

Conclusions

There is sufficient scientific evidence indicating a serious risk to birds and bird habitat in the environs of industrial wind turbines and the associated infrastructure including transformer stations and transmission lines.

Globally, scientists and nature and conservation groups are expressing their concerns.

Everaert and Kuijken (2007) support the need for research: "An exhaustive study before the selection of future locations is a key factor to avoid deleterious impacts of wind farms on birds and bats."

Authoritative and peer reviewed research by independent scientists must be undertaken before allowing industrial wind development near migratory bird corridors, wetlands, nesting grounds, or any area where birds are placed at risk. This must be accompanied by baseline analysis 3 to 5 years prior to establishing an industrial wind turbine facility.

Until the risks are rigorously assessed with long-term studies prior to installation, the precautionary principle must be invoked and industrial wind developments should not be permitted near migratory bird corridors, wetlands, nesting grounds, or any area where birds, including raptors, are placed at risk.

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References

- American Bird Conservancy. (2010). *Voluntary federal wind farm guidelines insufficient to prevent bird impacts says bird conservation group*. Retrieved from <http://www.abcbirds.org/newsandreports/releases/100607.html>
- Blackwell, R. (2010, June). Windfarm turbines deadly for birds, bats. *The Globe and Mail*. Retrieved from <http://www.theglobeandmail.com/subscribe.jsp?art=1598597>
- Buxton, I. (2006). *Low frequency noise and infrasound (Some possible causes and effects upon land-based animals and freshwater creatures): A literary comment*. Retrieved from <http://docs.wind-watch.org/buxton-infrasoundandlandbasedanimals.doc>
- California Energy Commission. (2009, October). *PIER Final project: Report range management practices to reduce wind turbine impacts on burrowing owls and other raptors in the Altamont pass wind resource area, California* (Report No. CEC-500-2008-080). Retrieved from <http://www.energy.ca.gov/2008publications/CEC-500-2008-080/CEC-500-2008-080.PDF>
- Canadian Wind Energy Association. (2006). *Birds, bats and wind energy*. Retrieved from http://www.canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/6_wildlife.pdf
- Canadian Wind Energy Association. (2011). *Making way for birds and bats. How birds and wind turbines interrelate*. Retrieved from http://www.canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/6_wildlife.pdf
- Cheskey, E., & Zedan, A. (2010). *What birders in Ontario think about wind energy in relation to birds, Ontario birds*. Retrieved from http://www.naturecanada.ca/pdf/Ontario%20Birds_birders_on_wind_energy.pdf
- Crable, A. D. (2011, May 18). Blowin' in the wind, outdoor trails. *Intelligencer Journal*. Retrieved from http://lancasteronline.com/article/local/390927_Blowin--in-the-wind.html#ixzz1Od9SX84J
- Cuff, D. (2010, December 6). Altamont wind energy company to pay \$2.5 million and replace turbines to reduce raptor deaths. *ContraCostaTimes*. Retrieved from http://www.contracostatimes.com/news/ci_16790686?nclick_check=1
- Ducks Unlimited Canada. (2010). *Impacts of wind turbines on waterfowl*. Retrieved from <http://windconcernsontario.wordpress.com/2010/12/06/ducks-unlimited-demands-moratorium-on-all-wind-turbines-near-staging-habitats/>
- Eaken J. P. (2010, December 2). Birders seek moratorium on lakeshore turbines. *The Press*. Retrieved from <http://www.presspublications.com/from-the-press/5789-birders-seek-moratorium-on-lakeshore-turbines>
- English Nature, RSPB, WWF-UK, & British Wind Energy Association. (2001). *Windfarm development and nature conservation: A guidance document for nature conservation organisations and developers when consulting over wind farm proposals in England*. Retrieved from <http://www.bwea.com/pdf/wfd.pdf>

- Environment Canada. (2010). *Planning for a sustainable future: A federal sustainable development strategy for Canada*. Retrieved from http://www.ec.gc.ca/dd-sd/F93CD795-0035-4DAF-86D1-53099BD303F9/FSDS_v4_EN.pdf
- Everaert, J., & Kuijken, E. (2007). *Wind turbines and birds in Flanders (Belgium): Preliminary summary of the mortality research results*. Retrieved from <http://www.windaction.org/documents/11725>
- Gallant, P. (2011, March 3). Time to deep-six the green energy act. *Financial Post*. Retrieved from <http://opinion.financialpost.com/2011/03/03/parker-gallant-time-to-deep-six-the-green-energy-act/>
- Harris, C. (2008, February 20). *Red zone warning to wind farm firms* [News release]. Retrieved from <http://www.rspb.org.uk/media/releases/183648-red-zone-warning-to-wind-farm-firms>
- Hoffman, D. (2010, March 4). *Windpower: Green and deadly*. Retrieved from <http://www.climaterealists.com/index.php?id=5656>
- Jais, M. (2011, March 10). *Interview with Alv Ottar Folkestad about the white-tailed eagle in Norway*. Retrieved from http://www.europeanraptors.org/interviews/interview_white_tailed_eagle_norway_alv_ottar_folkestad.html
- Katz, D. (2010). *Birds, bats, and the trade-offs of wind power*. Retrieved from <http://www.fraserinstitute.org/uploadedFiles/fraser-ca/Content/research-news/research/articles/birds-bats-and-the-trade-offs-wind-power.pdf>
- Lynas, M. (2011, June 10). *Bats, birds and blades: Wind turbines and biodiversity*. Retrieved from <http://www.marklynas.org/2011/06/bats-birds-and-blades-wind-turbines-and-biodiversity/>
- Lucey, A. (2011, April 4). Rare sea eagle killed by wind turbine, White-tailed sea eagles were released in Kerry three years ago. *The Irish Times*. Retrieved from <http://www.irishtimes.com/newspaper/ireland/2011/0404/1224293734180.html>
- Manville, A. M., II. (2005). Bird strikes and electrocutions at power lines, communication towers, and wind turbines: State of the art and state of the science—next steps toward mitigation. In C. J. Ralph & Rich, T. D. (Eds.), *Bird conservation implementation and integration in the Americas: Proceedings of the 3rd International Partners in Flight Conference* (pp. 1051-1064). Albany, CA: U.S. Dept. of Agriculture, Forest Service, Pacific Southwest Research Station. Retrieved from <http://www.treesearch.fs.fed.us/pubs/32105>
- Meyburg, B.-U., & Meyburg, C. (2009). *High mortality rate in juvenile and adult birds: Causes of death in lesser spotted eagles*. Retrieved from http://www.raptor-research.de/pdfs/a_sp100p/a_sp143_Mortality%20A.%20pomarinay.pdf
- Migratory Bird Convention Act and Regulations. (2011). Retrieved from <http://www.ec.gc.ca/nature/default.asp?lang=En&n=7CEBB77D-1>
- Ministry of Natural Resources. (2011, May 10). *Permit under section 17 of the Endangered Species Act, 2007 (ESA) to allow Gilead Power Corporation to kill, harm and harass Blanding's Turtle and Whip-poor-will as well as damage and destroy the habitat of Whip-poor-will for the purpose of the development and operation of Ostrander Point Wind Energy Park in the Township of South Marysburgh, Prince Edward County (EBR Registry No. 011-3181)*. Retrieved from <http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTEyODc0&statusId=MTY5Mjg1&language=en>
- Natural Resources Committee. (2007, May 1). *Testimony of Mike Daulton, Director of Conservation Policy, National Audubon Society, before the Committee on Natural Resources Subcommittee on Fisheries, Wildlife and Oceans: Impacts of wind turbines on birds and bats*. Retrieved from <http://naturalresources.house.gov/uploadedfiles/daultontestimony05.01.07.pdf>
- Nature Canada (November 11, 2010). Correspondence from E. Cheskey to Gilead Power Corporation, Application for a Work Permit to Construct 5.4 km of Access Roads for the Proposed Ostrander Point Wind Energy Park NC/10-0103-500.
- Nature Canada. (2011a). *Birders want wind energy, but not in IBAs*. Retrieved from <http://www.naturecanadablog.blogspot.com/2011/02/birders-want-wind-energy-but-not-in.html>
- Nature Canada. (2011b). *Get wind power right in Canada!* [Read the Petition Letter]. Retrieved from <http://www.naturecanada.ca/advocate/wind.html>
- NextEra. (2010a). *Conestogo wind farm: Draft construction plan report* (Genivar Project No. MA 09-213-00-MA). Retrieved from http://www.canadianwindproposals.com/pdf/Conestogo/Draft_Construction_Plan_Report.pdf
- NextEra. (2010b). *Conestogo wind farm: Post construction follow-up plan* (Project No. 1083). Retrieved from http://www.canadianwindproposals.com/pdf/Conestogo/Bird%20and%20Bat%20Monitoring/NR_SI_1083_Revised_Conestogo_WF_Post_Construction_Follow-up_P.pdf
- Ontario Nature. (2010). *Priority resolution on: Protecting bird migration areas* [Resolution accepted by members at the Annual General Meeting of Ontario Nature]. Retrieved from: <http://windconcernsonario.wordpress.com/2010/06/01/ontario-nature-to-lobby-for-5-km-buffer-from-important-bird-areas/>
- Radwanski, A. (2010, September 13). An ill wind on Lake Erie. *The Globe and Mail*. Retrieved from <http://www.theglobeandmail.com/news/politics/adam-radwanski/an-ill-wind-on-lake-erie/article1697544/>
- Sahagun, L. (2011, June 6). Wind power turbines in Altamont Pass threaten protected birds. *Los Angeles Times*. Retrieved from <http://www.latimes.com/news/local/la-me-adv-wind-eagles-20110606,0,4078175.story>
- Schliesmann, P. (2011, March 6). Foul winds blow at workshop. *The Whig-Standard*. Retrieved from <http://www.thewhig.com/ArticleDisplay.aspx?e=3014038>
- SierraClubCanada. (2011). *Save the Blanding's Turtle*. Retrieved from <http://www.sierraclub.ca/en/endangered-species/save-blandings-turtle>
- Stelling, K. (2008). *Arran Lake Wetlands Complex: A study of a sensitive wildlife habitat under threat*. Retrieved from <http://www.torontoindaction.com/pdf/Arran%20Lake%20study%20of%20a%20sensitive%20wildlife%20habitat%20under%20threat%5B1%5D.pdf>
- Thompson, K.-M., & Köster, H. (2004). *Position statement on wind farms and birds*. Retrieved from http://www.birdlife.at/downloads/BirdLife_Windfarm_position.pdf

- Toronto Wind Action. (2011, February 13). *Media release: Toronto wind action, Great Lakes wind truth, Canada.* Retrieved from http://www.torontowindaction.com/media_release_feb13_2011.html
- Transalta Corporation. (2010). *Post-construction monitoring report.* Retrieved from <http://www.transalta.com/facilities/plants-operation/wolfe-island/post-construction-monitoring>
- U.S. Department of the Interior, Fish and Wildlife Service. (2003). *Service interim guidelines on avoiding and minimizing wildlife impacts from wind turbines* [Letter to Regional Directors, Regions 1-7]. Retrieved from <http://www.fws.gov/habitatconservation/wind.pdf>
- U. S. Fish and Wildlife Service. (2009). *Utility giant to pay millions for eagle protection.* Retrieved from <http://www.fws.gov/mountain-prairie/pressrel/09-47.html>
- World Wildlife Fund. (2004). *WWF position on wind power.* Retrieved from <http://assets.panda.org/downloads/wwfposition-onwindpowerfinaloct04.pdf>

Bios

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