SUBMISSION TO THE EBR:

Comments on MNR document "Birds and Bird Habitats: Guidelines for Wind Power Projects (2010)"

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The Friends of Arran Lake/ Central Bruce Grey Wind Concerns Ontario

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Please include this submission as part of the public record.

Contents

1.0 Requirement for consistency with existing legislation

It is the reasonable expectation of the citizens of Ontario that all environmental regulations policies and guidelines proposed by the Ministry of Natural Resources and the Ministry of the Environment should follow the guiding principles long established in Ontario’s environmental legislation. The proposed "Birds and Bird Habitats: Guidelines for Wind Power Projects (2010)” must be “consistent with” The Environmental Bill of Rights and its Statement of Environmental Values as well as the

Provincial Policy Statement and the Bergen Declaration of the precautionary principle.

1.1 The Ontario Environmental Bill of Rights (EBR)

The EBR includes, in its Preamble, the Statement of Environmental Values (SEV):

"The people of Ontario recognize the inherent value of the natural environment.

The people of Ontario have a right to a healthful environment.

"The people of Ontario have as a common goal the ***protection, conservation and restoration of the natural environment for the benefit of present and future generations.***

"2. (1) The purposes of the Act are:

(a) To protect, conserve and where reasonable, restore the integrity of the environment;

(b) To provide *sustainability* of the environment by the means provided in the Act; and

(c) To protect the right to a healthful environment by the means provided in the Act.

"(2) The purposes set out in subsection (1) include the following:

1. The *prevention*, reduction and *elimination* of the use, generation and release of pollutants [including noise] that are an unreasonable threat to the integrity of the environment.

2. ***The protection and conservation of biological, ecological and genetic diversity.***

The protection and conservation of natural resources, including plant life, animal life and ***ecological systems.***

3. The encouragement of the wise management of our natural resources, including plant life, animal life and *ecological systems*. . . .

5. ***The identification, protection and conservation of ecologically sensitive areas or processes.*** 1993, c. 28, s 2 (2).

"It is each Minister's responsibility to take every reasonable step to ensure that the SEV is considered whenever decisions that might significantly affect the environment are made in the Ministry".

The Act specifies that these principles must be applied to the development of regulations and policies:

"3. APPLICATION OF THE SEV

The Ministry of the Environment is committed to applying the purposes of the EBR when decisions that might significantly affect the environment are made in the Ministry. **As it develops Acts, regulations and policies, the Ministry will apply the following principles:**

"*The Ministry adopts an ecosystem approach to environmental protection and resource management.* This approach views the ecosystem as composed of air, land, water and living organisms, including humans, and the interactions among them.

"***The Ministry considers the cumulative effects on the environment;*** *the interdependence of air, land, water and living organisms;* and the relationships among the environment, the economy and society.

"***The Ministry uses a precautionary, science-based approach in its decision-making to protect human health and the environment".***

"6. The Ministry of the Environment will document how the SEV was considered each time a decision on an Act, regulation or policy is posted on the Environmental Registry. The Ministry will ensure that staff involved in decisions that might significantly affect the environment is aware of the Ministry's Environmental Bill of Rights obligations".

1.2 The Bergen Declaration

Canada signed The Bergen Declaration in 1990. It has become, over the past fifteen years, part of customary international law. "Scholars have documented the precautionary principle's inclusion in virtually every recently adopted treaty and policy document related to the protection and preservation of the environment". (Lucas)

It clearly states that

> "policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation".

1.3 The Provincial Policy Statement (2005) (PPS)

The PPS notes in Section 4.2 that a decision of a minister of the Crown and a ministry, board, commission or agency of the government, including the Municipal

Board, in respect of the exercise of any authority that affects a planning matter, "shall be consistent with" this Provincial Policy Statement".

It further specifies that

"2.1.1 Natural features and areas shall be protected for the long term.

2.1.2 The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground *water features*.

2.1.3 *Development* and *site alteration* shall not be permitted in: *significant* habitat of *endangered species* and *threatened species*;

2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions"*. . . .

4.2 In accordance with Section 3 of the Planning Act, as amended by the Strong Communities (Planning Amendment) Act, 2004, a decision of the council of a municipality, a local board, a planning board, a minister of the Crown and a ministry, board, commission or agency of the government, including the Municipal Board, in respect of the exercise of any authority that affects a planning matter, 'shall be consistent with' this Provincial Policy Statement.

Comments, submissions or advice that affect a planning matter that are provided by the council of a municipality, a local board, a planning board, a minister or ministry, board, commission or agency of the government 'shall be consistent with' this Provincial Policy Statement".

4.3 This Provincial Policy Statement shall be read in its entirety and all relevant policies are to be applied to each situation".

2.0 Legal compliance of proposed MNR Guidelines

Unfortunately the proposed MNR *Birds and Bird Habitats: Guidelines for Wind Power Projects* raises serious concerns as to its consistency with these principles. Moreover, it is difficult to comprehend how it will actually address the real concerns associated with bird SWH (significant wildlife habitat) and interactions between wind turbines and birds, as it purports to do.

The basic cause of this problem is three-fold.

2.1 The MNR guidelines fail to recognize the actual extent of damage to significant wildlife habitat that is already occurring.

For example, section 1.1 "Potential Effects of Wind Power Projects on Birds" states:

> "Post construction mortality surveys conducted at wind power projects in Ontario and recent studies undertaken around the world suggest very low numbers of bird fatalities occur at wind power projects. Reports from wind energy facilities in Ontario and the United States have shown that approximately two birds per year are killed by individual wind turbines, which is very low compared to other *existing sources of human-caused avian mortality*".

The comparison to "other existing sources of human-caused avian mortality" restates the industry position that two wrongs make a right. It also fails to take into account the **cumulative effect** of the destruction.

However, more importantly, the fatality rate of two birds per year per turbine is contradicted by one of the most recent studies in Ontario and by several European studies.

2.2 Ontario bird mortality study from Wolfe Island: 6.99 birds per turbine

For example, the post construction monitoring report by TransAlta which owns and operates the Wolfe Island industrial wind facility through its wholly owned subsidiary Canadian Hydro Developers, (REPORT NO. 2, JULY-DECEMBER 2009) published in May 2010, indicates quite another story. The estimated total bird mortality for the Reporting Period is 6.99 birds/turbine. Moreover, according to the report, "***this is consistent with the results in nearby New York and other studies summarized by Arnett et al. (2007)".***

The MOE approved the **Wolfe Island** project despite numerous warnings about the sensitivity of the area from nature groups and conservationists.
In fact, according to the TransAlta report:

The 86-turbine wind farm on Wolfe Island caused **more than 1800 bird and bat deaths in six months**. (This means 3600 in a year).
Seven *of the species have been identified as* ***species of conservation priority*** *by Ontario Partners in Flight (2006):*

2 American Kestrels, 1 Northern Flicker, 1 Black-billed Cuckoo, 2 Eastern Kingbirds 1 Bank Swallow, 1 Savannah Sparrow , 8 Bobolinks, 28 Tree Swallows , 1 Bank Swallow, 2 Barn Swallows 7 Purple Martins

Along with 12 raptors, 3 red tailed hawks and one merlin.

As Dr. Albert Manville has pointed out, collision mortality figures do not give us any indication of the effects on already dwindling species. **"In cases where the birds affected are already in decline, the turbines could push them closer to extinction,"** he notes. [1]

For example, an article in the Windsor Star recently reported the **slaughter of a Bald Eagle at a wind turbine site near Tillsonberg.** Another Bald Eagle fatality was also

[1] 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. Proceedings 3rd Internatl. Partners in Flight Conference. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191, Vol. 2: 1051-1064.

suspected. Eagles are a protected species. Their reproduction is very slow. *Unfortunately, no care has been taken to prevent wind turbines from being placed on ridges customarily used for hunting by raptors.* The now infamous results of placing wind turbines along ridges in the Altamont Pass, California and in Spain should have alerted decision makers long ago that extra care is needed to protect these species and their hunting territory. But in Ontario, companies such as Leader Resources have planned their turbines to be located precisely along the ridges of drumlins surrounding Arran Lake, a traditional hunting territory for raptors including eagles, kestrels, and threatened hawks.

2.3 Mortality research results from Europe

A key study on collision mortality comes from Europe. Joris Everaert and Eckhart Kuijken of the Belgian Research Institute for Nature and Forest have undertaken a long-term project to study the impact of land-based wind turbines on birds and to act as a consultancy for proposed wind farms in Flanders. In 2007 they published *Wind turbines and birds in Flanders (Belgium): Preliminary summary of the mortality research results*.

These researchers emphasize that proper site selection plays a very important role in limiting the impact of wind farms on nature. They also call attention to rates as high as 64 birds per turbine.

- "The average number of collision fatalities in different European wind farms on land varies between a few birds up to 64 birds per turbine per year".

- "Actual collision observation (thermal image intensifiers) was performed in The Netherlands (Winkelman 1992b). These results showed a remarkably high nocturnal collision probability of 1 on 40 passing birds (2.5%) at rotor height".

- **"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."**

- "Large modern turbines of 1500 kW or more can have as many as, or even more collision fatalities than smaller turbines".

- "'Site selection' can play an important role in limiting the number of collision fatalities. [2]

Obviously, a wind turbine development in an area of high bird and bat use such as the Wolfe Island development near a significant IBA (Important Bird Area) or proposed developments near Point Pelee also on a migratory corridor or the proposed 46 turbine development which would provide a barrier to Arran Lake, a migratory bird staging area, is more likely to create a higher fatality rate than one in the middle of an arid Texas desert.

The proposed MNR document fails to restrict wind turbine development in areas that scientists have indicated are unsuitable because of proximity to migratory

[2] Web link: http://www.semantise.com/~lewiswindfarms/Download%... Download complete File(s): everaert_kuijken_2007_preliminary_b.pdf (119.38 kB) *FROM* HTTP://WWW.WINDACTION.ORG/DOCUMENTS/11725

corridors, migratory staging areas and Important Bird Areas. This is inconsistent with the requirement of the Environmental Bill of Rights which requires *"the identification, protection and conservation of ecologically sensitive areas or processes.* 1993, c. 28, s 2 (2)".

This problem can be solved most simply by following the recommendations and guidelines that have already been proposed by international biologists as outlined below.

2.4 Proposed remedy

Without reinventing the wheel, the MNR should adopt the existing international guidelines respecting sensitive habitat areas in order to fulfil its obligations to the EBR and the PPS by restricting the construction of industrial wind turbines near sites that are important to wildlife, migratory corridors and staging areas.

EXISTING INTERNATIONAL GUIDELINES FOR MIGRATORY CORRIDORS AND STAGING AEAS

Study by the **Belgian Research Institute** for Nature and Forest, 2007	**Avoid** locating wind farms in regional or internationally **important bird or bat areas** and/or **migration routes**
Dr. Mark Avery, **Royal Society for the Protection of Birds,**	Developers should **avoid sites that are important to wildlife**

U.K.	
Danish biologists	• **1 km setback from staging areas** • Wind turbines **must not be placed** on flight corridors **between staging and field feeding area** • Turbines **must not be placed on migratory corridors** • Turbines **must not be placed in agricultural fields** traditionally **used by** large flocks of **foraging waterfowl**.
Dr Scott Petrie, Bird Studies Canada	**2km setback from staging areas to ensure that there are sufficient field feeding opportunities between the staging/loafing areas and the IWT development (Based on our satellite tracking data of field feeding swans)**
U.S. Fish and Wildlife Service Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines 2003	**1.) Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the Federal Endangered Species Act.** **2). Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated. . . . Examples of high concentration areas for birds are wetlands, State or Federal refuges [sanctuaries], and staging areas. . . . Avoid known daily movement flyways (e.g., between roosting and feeding areas).**

	3.) Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas."

3.0 Unacceptable emphasis on mitigation

The emphasis on mitigation throughout the MNR *Guidelines* is suggestive of bias in favour of the wind energy industry and another failure of compliance with the requirements of the EBR, the PPS and the Bergen Declaration. Instead of recognizing "threats of serious or irreversible damage**,** and postponing measures to prevent environmental degradation", or "using a precautionary, science-based approach in its decision-making to protect human health and the environment", the MNR document seems to assume that any damage to the environment caused by wind turbines can be corrected after construction or "mitigated" through "operational mitigation techniques" which "may include periodic shut-down of select turbines and/ or blade feathering at specific times of the year when mortality risks to the affected bird species is particularly high (e.g. migration)".

The lack of consistency with the EBR and PPS as well as the absurdity of this approach suggests that the writers of the *Guidelines* are either out of touch with the reality of actual wind turbine construction, or victims of industry spin.

Consider the reality of a typical medium sized project and its negative effect on a sensitive environment from the very outset.

3.1 Example of construction disruption caused by a relatively small wind energy project

The example below outlines the foreseeable effect of the proposed 46 turbine Arran Wind Project proposed for the centre of a Natural Heritage System.

- Construction time: up to 1year
- Background noise will be increased from 25-30dB to 40-60+dB
- 40km of access roads will fragment the ecosystem and disrupt the functionality of the habitat
- 13,018 triaxel gravel trucks (46x 283 loads per road) will move into an area presently almost free of traffic to build access roads to the turbines. Traffic will be further increased by heavy component transports, cranes, excavation equipment and concrete mixers and vehicles of construction personnel.
- 93km of excavation trenches will be needed to bury collector cables
- 46,000+ tonnes concrete and steel rebar will be used in 6-30 foot deep tower platforms
- 90ft deep steel piles will be driven down to anchor platforms
- Miles of new transmission lines will be placed along roadsides with the loss of hundreds of CO2absorbing trees now used as wildlife refuge

3.2 Disturbance during construction: major and prolonged

The construction of a wind turbine complex takes place over a considerable period of time and often requires up to a year before construction crews have finally left

the area. *In most rural areas, this type and intensity of interruption to the local ecosystem is completely unprecedented.* In terms of noise disturbance alone, one has to imagine the continuing shock experienced by wildlife which has previously been accustomed to a background noise of 25-30 dBA or less.

Agricultural operations on a typical Bruce County family cattle operation, for example, may consist of a few days of annual haying, harvesting, ploughing and seeding on minor sections of the farm. The greater portion is left in pasture and a larger number of farms remain entirely pasture. Substantial tracts of woodland still remain on most farms and these provide corridors for the movement of wildlife. It should be emphasized that human activity in most rural areas is negligible. Country washboard roads attract minimal outside traffic. Scientists have long associated wildlife disturbance with reproductive problems.[3]

Compare (*Guidelines* Section 3.0, "Environmental Impact Study": "construction at 'less-sensitive' times of the year to avoid disturbing natural bird process es and habitat". The reality, however, is that in rural Ontario the activity of the construction industry must take place after melting of the snow before the first frost and the return of snow in the autumn. This period corresponds to the migratory seasons and the breeding season.

3.3 Access roads

The initial phase of construction is responsible for considerable immediate habitat abandonment. For example, the proposed siting of a 46, 2.5 turbine development at

3 For example, harassment of mule deer by all-terrain vehicles resulted in reduced reproduction the following year (Yarmaloy et al. 1988). Common loons experienced reduced productivity with increased human contacts (Titus and VanDruff 1981).

the centre of the Arran Lake Natural Heritage System would require the building of approximately 40 kilometres of access roads through undisturbed meadows and pastures that now supply foraging habitat and wildlife corridors for more than 22 endangered or threatened species. The proposed development would fragment a functional ecosystem linking two provincially significant wetland complexes, a provincially significant earth sciences ANSI, and five other regionally significant life and earth sciences ANSIs. It would form barriers to wildlife movement between them equivalent to urban truck routes. (Please see maps in the attached document on Arran Lake).

At least 283 triaxle loads of gravel will be required for each access road which (multiplied by the 46 turbines) will mean the **invasion of 13,018 heavy trucks** into areas that now see a single tractor two or three times a year. *Traffic noise has been shown to reduce bird breeding density*.[4]

3.4 Excavation for cable collection trenches

93 kilometres of trenches criss-crossing the site will have to be excavated to accommodate the collector cables. This will jeopardize the habitat of many sensitive reptile and amphibian species and interfere with the food supply of many birds and animals. (This particular project happens to coincide with at least a dozen registered archaeological sites dating back to the Middle Woodland Period (500 BC), mostly unexcavated and including sacred remains of the ancestors of the Saugeen Native

[4] Four Dutch ornithologists (Rien Reijnen, Ruud Foppen, Cajo ter Braak and Johan Thissen) took paired sites close to and distant from busy roads and analyzed the densities of 43 different species of breeding birds in woodland. Of these 26 species (60%) showed evidence of reduced density. The analysis clearly showed that it was the noise and not the sight of the traffic that was affecting the birds. Two other studies also published in the *Journal of Applied Ecology* - one of the scientific journals published by the British Ecological Society, (1994 31, 95-101; 31, 85-94 & 32, 187-202), confirm this finding.

People. Although the developer has proposed making superficial archaeological explorations within the immediate area of the turbine bases, cable excavation could be much more extensive and more damaging of this important Native cultural resource).[5]

3.5 Construction of the cement pad or base for the turbine tower

The installation of the turbine towers would require 46 major excavations each 30 feet deep with steel piles driven down around 90 feet. Local residents near the Enbridge development found the vibrations from pile driving extremely trying. Any wildlife that did not disappear during the building of access roads is not likely to remain once the pile driving has commenced.

All this takes place long before the actual operation of the wind turbines begins. Residents near existing wind turbine complexes have commonly observed that the frogs, deer, and less common birds are the first to disappear.

3.6 New transmission lines

Hundreds of kilometres of new transmission lines are needed along rural roads, to take the electricity to central switching and transformer stations before it is loaded onto the main transmission lines to the cities. Routinely all trees are eliminated from

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[5] *Provincial Policy Statement 2005:*

"2.6 Cultural Heritage and Archaeology

2.6.1 *Significant built heritage resources* and *significant cultural heritage landscapes* shall be *conserved*.

2.6.2 *Development* and *site alteration* shall only be permitted on lands containing *archaeological resources* or *areas of archaeological potential* if the *significant archaeological resources* have been conserved by removal and documentation, or by preservation on site. **Where *significant archaeological resources* must be preserved on site, only *development* and *site alteration* which maintain the heritage integrity of the site may be permitted.**

these roads before installing thousands of wooden poles (more trees). As trees are removed, their CO_2 absorption is terminated. Acres of wildlife habitat for species that roost in the trees are also lost. However the much greater number and much higher capacity wires represents a new danger for collision mortality among migrating and foraging birds because they form new barriers and are significantly lethal during adverse weather conditions.

The Canadian Wildlife Service document *Wind Turbines and Birds* [6] notes that there are tens of thousands of fatalities each year, (Manville 2000) and that Koops (1987) estimated approximately 174 million birds could be killed annually by transmission wires in the U.S. This means there are important implications for substantially increasing transmission lines around wetlands and other waterfowl habitat:

> "Several groups of birds appear to be the most susceptible to collision with wires, most notably waterfowl, shorebirds and raptors (Stout and Cornwell 1976, Curtis 1977, Anderson 1978, Enderson and Kirven 1979, NUS Corporation 1979, Olsen and Olsen 1980, Moorehead and Epstein 1985, Faanes 1987). Raptors are frequent victims of wire collisions (Enderson and Kirven 1979, Olsen and Olsen 1980). For example, overhead wires are believed to be one of the main causes of injury and death to merlins[7] *(Falco columbarius)* in Great Britain (Olsen and Olsen 1980)."

> "Waterfowl and shorebirds may show avoidance behaviour to turbines, but significant numbers have been known to collide with associated power lines, especially when located near wetlands (Anderson 1978, NUS Corporation 1979, Moorehead and Epstein 1985)."

The Arran Lake site, for example, is a favourite foraging area for waterfowl, shorebirds and raptors.

[6] Kingsley and Whittam. *Wind Turbines and Birds*. Canadian Wildlife Service 2005

[7] Merlins are known to migrate through the Arran Lake site.

3.7 Storage and cement mixing areas; transformer (switching) stations

Concrete may be mixed on site or brought in from considerable distances causing, in either case, more industrial disruption to the countryside. Typically the greater part of one farm in the project is set aside for the storage of components. This requires more soil and traffic disturbance with grading and access roads. Fields of steel tower sections, blades, other electrical equipment and waste disposal bins now further fragment the habitat. In addition to this, a transformer or switching station will be built and in the case of a large development such as the Enbridge site, for example, this can sprawl over many acres with its own network of access roads, even greater intensity of transmission lines and widespread soil disturbance.

3.8 How can the MNR Guidelines seriously consider "mitigation" of all this?

After taking the above into account, compare the absurdity of the MNR *Guidelines: Section 3.0:*

"General approaches to minimizing potential negative effects to birds or bird SWH include:

- mitigation measures for any negative environmental effects to bird SWH; and how the construction plan report and the environmental effects monitoring plan address any negative environmental effects to bird SWH.
- restoration of habitat disturbed during construction".

It is quite impossible that restoration of a sensitive habitat could ever take place after such disturbance. Most commonly, these increasingly rare refuges of threatened wildlife are simply abandoned, much to the peril of many species of concern.

4.0 Failure to protect ecosystem functionality, natural heritage systems

The most serious oversight is the Guidelines' failure to think in the broader terms of functional ecosystems, natural heritage systems and the cumulative effects on the environment as well as the interdependence of ecological features as required by the PPS.

Clearly, a 120 metre setback fails to be consistent with the requirement that interrelated drumlins and adjacent wetlands, valleylands and their surrounding uplands and the mesh of interconnecting wildlife corridors that are crucial to the survival of all species within a natural heritage system be preserved.

This section from the *Guidelines* assumes that 120 metre setbacks are protective.

"2.4 Evaluation of Significance

As per Section 27 of the Renewable Energy Approval regulation, an applicant who proposes a project location within 120 metres of a candidate or confirmed bird SWH is required to conduct an evaluation of significance. MNR encourages applicants to consider applying setbacks as the first option, prior to moving forward with an evaluation of significance and possibly an EIS. If a candidate bird SWH is evaluated and confirmed within the project location, *applicants may setback 120m* or conduct an Environmental Impact Study (Section 3.0) as part of the Natural Heritage Assessment process to determine whether potential negative environmental effects can be avoided or effectively mitigated".

Now compare the Provincial Policy Statement

"2.1.1 Natural features and areas shall be protected for the long term".

"2.1.2 The diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, should be maintained, restored or, where possible, improved, recognizing linkages between and among *natural heritage features* and *areas*, *surface water features* and *ground water features"*.

"2.1.3 *Development* and *site alteration* shall not be permitted in: *significant* habitat of *endangered species* and *threatened species"*;

2.1.6 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions"*.

Where is the requirement of the developer to demonstrate that the project will have "no negative impacts on the natural features or on their *ecological functions"?* This omission renders the Guidelines inconsistent with the PPS. Self regulation has already proven inadequate. Lack of government oversight is a serious problem.

5.0 Habitat degradation: decline of endangered species and loss of biodiversity

Ontario has already lost between 70 and 80% of its wetlands. Habitat loss and degradation is the main cause of population decline among threatened and endangered species. Sensitive species have, over many years, sought out the few remaining undisturbed habitats necessary for their survival. For the first time in our history, industrialization in the form of industrial wind turbine developments is being rushed into these out-of-the-way places which *will lose their fragile biodiversity* if disrupted.

*The tragedy is all the more pitiful because of the failure of the Ontario government to lay down effective **regulations** which could easily spare such areas from destruction*.

Much has been made of the industry's claim that it follows best practices by avoiding sensitive habitats from the outset. On 23 November, 2010, Mr. Sean Whittaker, VP of the Canadian Wind Energy Authority (CanWEA) told the Senate Committee on Energy, the Environment and Natural Resources that 20 years ago they used to put turbines on migratory routes. "We've learned since then." Some hope! The Wolfe Island wind farm, brought online in 2009, is on an important migratory pathway. Wolfe Island is designated an Important Bird Area (IBA). The Windstream wind farm, recently approved as the first off-shore project for Ontario, is on the same pathway. Algonquin Power is proposing to build on Amherst Island, another IBA. Prince Edward County has several projects in the planning process or already approved. There is an even stronger situation for the migratory pathways across Lake Erie. **Not one wind farm in Ontario has been subject to a full Environmental Review.** The Arran Wind Energy Project proposed by Leader Resources is another example of complete disregard for locating an industrial wind turbine project in the midst of a Natural Heritage System, forming barriers to an

international migratory corridor and staging area and disrupting a diurnal flight path between the roosting area on Chantry Island IBA and foraging areas surrounding a provincially significant wetland despite 3 years of protests from local conservationists and residents.

In other words, despite its contention to the contrary, the industry has shown no inclination to self regulation and respect for Ontario's natural heritage. The bottom line for the industrial wind turbine developer appears to be the $890,000 annual net profit from each wind turbine installed.

6.0 Special provisions are needed to protect staging areas and migratory corridors

Dr Albert Manville, Senior Wildlife Biologist with the Division of Migratory Bird Management (DMBM) of the U.S. Fish and Wildlife Service is one of the best known authorities on the topic. In a briefing dated April 4, 2008, he outlined his main concerns about wind turbines. In this document titled Current Avian Issues and Land-Based Wind Turbine Developments, he expressed concern for migratory birds and collision mortality caused by

1. "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; (land-based turbines now > 425-ft. above ground level); (rotor sweep currently at 3 ac but projected to approach 4 ac by 2010 [B. Ram pers. comm.]) and

2. “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”.

CANWEA’s website displays the Kingsley and Whittam background review: *Wind Turbines and Birds* published by the Canadian Wildlife Service in 2005:

“Staging areas

When birds migrating over land or water encounter a coastline, they often turn along that coastline and form a concentrated stream of migration along the coast. Some types of migrants (e.g. shorebirds and waterfowl) concentrate in restricted areas of suitable habitat while resting and feeding between migratory flights. These are often interior lakes or marshes, coastal estuaries, mud flats, or other areas that can provide food and/or shelter for large numbers of birds (Richardson 2000).

At staging areas, flights of large numbers of migrants are often concentrated into corridors when the birds are either taking off or approaching to land (Richardson 2000**). The flight height of these migrants is often at the height of wind turbines and the distance from the stopover area within which flight altitudes will be low enough to be at risk of collisions with turbines will depend on the type of bird and other factors. Some birds, like swans, typically climb only very gradually, and may remain low for a considerable distance after takeoff from the stopover area.** Other birds climb (or descend) more rapidly (Richardson 2000).”[8]

But the wind turbines themselves would not be the only hazard for migrating birds. According to the Kingsley and Whittam background review,

[8] (http://www.canwea.ca/images/uploads/File/Resources/Wind_Turbines_and_Birds_a_Background_Review.pdf)

"*disturbance* can be a factor for migrants if wind turbines are located near important staging areas, where large numbers of birds concentrate to rest or feed . . .(e.g., stage during fall migration). Additionally, the alteration or destruction of habitat used by birds on migration can also contribute to adverse environmental effects (see Milko 1998a).

Manville also reminds us that there are miles of transmission lines associated with wind turbine developments.

"In addition, birds can collide with towers, nacelles, meteorological tower guy wires, power lines, their associated structures, and "bird-unfriendly" wiring can electrocute them.…The Service has special concerns about project development on avifauna". [9]

Manville and many other researchers specifically mention their apprehension over the safety of raptors nesting and hunting in close proximity to wind energy facilities. Appendix 7 of the USFWS *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* lists the "Known and suspected impacts of wind turbines on wildlife". It is particularly concerned about the safety of raptors, waterbirds, passerines and bats:

"However, even with a bright future for growth, and with low speed tubular-constructed wind turbine technology now being stressed, larger and slower moving turbines still kill raptors, passerines, water birds, other avian species, and bats. Low wind speed turbine technology requires much larger rotors, blade tips often extending more than 420 ft. above ground, and blade tips can reach speeds in excess of 200 mph under windy conditions (J. Cadogan, U.S. Department of Energy, 2002, pers. comm.). When birds approach spinning turbine blades,

[9] Manville, *op. cit*.

"motion smear" – the inability of the bird's retina to process high speed motion stimulation – occurs primarily at the tips of the blades, making the blades deceptively transparent at high velocities. This increases the likelihood that a bird will fly through this arc, be struck by a blade, and be killed (Hodos *et al.* 2001).

"What cumulative impact these larger turbines will have on birds and bats has yet to be determined. Johnson *et al.* 2002b raised some concerns about the impacts of newer, larger turbines on birds.

"Their data indicated that higher levels of mortality might be associated with the newer and larger turbines, and they indicated that wind power related avian mortality would likely contribute to the cumulative impacts on birds.

"Howell and Noone (1992) estimated U.S. avian mortality at 0.0 to 0.117 birds/turbine/yr., while in Europe, Winkelman (1992) estimated mortality at 0.1 to 37 birds/turbine/yr. Erickson et al. (2001) reassessed U.S. turbine impact, based on more than 15,000 turbines (some 11,500 in California), and estimated mortality in the range of 10,000 to 40,000 (mean = 33,000), with an average of 2.19 avian fatalities/turbine/yr. and 0.033 raptor fatalities/turbine/yr. This may be a considerable underestimate. As with other structural impacts, only a systematic turbine review will provide a more reliable estimate of mortality. **While some have argued that turbine impacts are small (Berg 1996), especially when compared to those from communication towers and power lines, turbines can pose some unique problems, especially for birds of prey.** Mortalities must be reduced, especially as turbine numbers increase. . . . **Wind farms can affect local populations of Eagles and other raptors whose breeding and recruitment rates are naturally slow and whose populations tend to have smaller numbers of breeding adults (Davis 1995). Large raptors are also revered by Native Americans as well as by many others within the public. They are symbolic mega fauna, and provide greater emotional appeal to many than do smaller avian species. Raptors also have a lower tolerance for additive mortality (Anderson et al.**

1997). As with all other human caused mortality, we have a responsibility to reverse mortality trends." [10]

Consider once again the example of Arran Lake. Because of the Arran Lake site's importance to raptors it must be considered of "very high sensitivity". Deliberately jeopardizing the raptor population within this natural heritage system would severely upset its balanced ecological functions (including rodent control). Raptors would be at risk of being pushed into the blades by strong winds coming off Lake Huron. The slow breeding rates and lower tolerance for additive mortality of raptors and the fact that the wind turbines would be placed in the middle of their hunting territory would be an unacceptable formula for disaster for this group of birds. Failing to protect the Bald Eagle from such harm would also be an offence under the Fish and Wildlife Conservation Act.

Since the late 1800s, high-tension lines have been noted as a cause of avian mortality in North America. The U.S. Fish and Wildlife Service (Manville 2000) estimates that there are tens of thousands of bird fatalities a year due to collision with overhead wires. However, this estimate may be too low if a study by Koops (1987) in the Netherlands is applicable to the North American situation. Based on estimates of Koops (1987), approximately 174 million birds could be killed annually by transmission wires in the U.S.

"Several groups of birds appear to be the most susceptible to collision with wires, most notably waterfowl, shorebirds and raptors (Stout and Cornwell 1976, Curtis 1977, Anderson 1978, Enderson and Kirven 1979, NUS Corporation 1979, Olsen and Olsen 1980, Moorehead and Epstein 1985, Faanes 1987). Raptors are

[10] USFWS Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines p. 50.

frequent victims of wire collisions (Enderson and Kirven 1979, Olsen and Olsen 1980). For example, overhead wires are believed to be one of the main causes of injury and death to Merlins19 (Falco columbarius) in Great Britain (Olsen and Olsen 1980). Waterfowl and shorebirds may show avoidance behaviour to turbines, but significant numbers have been known to collide with associated power lines, especially when located near wetlands (Anderson 1978, NUS Corporation 1979, Moorehead and Epstein 1985). At a power plant in Illinois, an estimated 400 birds each autumn (0.4% of the peak number present) were killed by colliding with overhead power lines; most of the known victims were Bluewinged Teal (Anas discors; Anderson 1978). Powerline strikes are the cause of up to 64% of collision fatalities for certain waterfowl species, but wires also take a toll on shorebirds. At Trinidad, California, more than 150 Red-necked Phalaropes (*Phalaropus lobatus*) were killed on 6 May 1969 by striking electric wires along the coast (Gerstenberg 1972)"20.

At Arran Lake, the raptors that spend much of their time soaring over the drumlin ridges would be susceptible to entanglement in transmission lines as well as rotor blades. Raptors fail to perceive such hazards during concentrated hunting and the wind turbines and interconnecting wires would be spread throughout their customary hunting territory.

Clearly, migratory birds using a wetland or lake as a stopover or staging area will not be protected unless an adequate corridor of at least five miles is kept open for their approach and departure around Arran Lake.

7.0 Significant threshold: Out of touch with reality or another concession to the industry?

Consider, from page 10 of the *Guidelines:*

- "Bird and raptor mortality is considered by this Guideline to be significant when a threshold of annual bird mortality exceeds:
  - 18 birds/ turbine/year at individual turbines or turbine groups".

Calculate this "acceptable" mortality rate of 18 birds per turbine :

Example 1: In the highly sensitive proposed Arran Wind Energy Project area, this would mean a potential loss of 46 (number of turbines) x 18 = 828 birds per year within a small area of approximately 5 square miles. Because of the presence of so many endangered and threatened species (approx 20) the consequences for groups that should be protected would be proportionately greater. Now multiply by the 20 year life expectancy of the turbines and the figure becomes 16560 fatalities. How could such a figure even be contemplated by anyone who was serious about their duty to protect and conserve ecologically sensitive areas and protect and conserve biological, ecological and genetic diversity?

Example 2: Now consider the calculation for all of Ontario. According to the Ontario Power Authority web site, 10,609 megawatts of wind energy are planned for the province. This represents more than 5000 wind turbines. 5000 x 18 = 90,000 birds per year. Over the 20 year life of the turbines this would be 1,800,000 fatalities. Once again, the effect on threatened, endangered and specifically vulnerable species such as raptors, waterfowl and passerines would be proportionately higher and likely to push some groups into extinction. This is especially the case for those that are not prolific at reproduction. Given the critical declines in many species over the last twenty years, the question of the seriousness of this proposal arises. Surely this is a misprint.

8.0 Habitat degradation

Many biologists are of the opinion that avian mortality from collision with the turbine blades is a relatively minor aspect of the hugely adverse effect of wind turbine developments on all wildlife including birds, mammals, reptiles and amphibians.

Habitat degradation, barrier formation, leading to long term and permanent abandonment have been amply catalogued in the literature. Also observed are reproductive declines, and interference with hunting, self defence and mating mechanisms associated with the low frequency noise emissions of nearby wind turbines.

8.1 Disturbance and displacement resulting in habitat unsuitability

"As taller and larger wind turbines are installed on land nationwide, the potential for growing numbers of deaths and large-scale habitat fragmentation increases. As the industry grows, **these indirect effects will also become cumulative**. Both direct and indirect effects could become additive to normally compensatory mortality – a scenario we wish to avoid. More than 20,000 commercial turbines presently operate in the U.S., and within 10 years that number is projected to increase to > 155,000 (M. Tuttle pers. comm., AWEA data, National Renewable Energy Laboratory estimate). **This explosive growth without the availability of "tools" to address it – specifically to avoid or minimize impacts to bird, bats, and their habitats – is troubling."**[11]

[11] Dr Albert Manville. Current Avian Issues and Land-Based Wind Turbine Developments. U.S. Fish and Wildlife Service briefing dated April 4, 2008.

In his Senate testimony Mike Daulton of National Audubon also stressed the problem of loss or degradation of habitat, disturbance and displacement as well as disruption of ecological links:

"Development of wind power facilities results in destruction of habitat from support roads, storage and maintenance yards, turbine towers, and associated infrastructure. It may involve blasting and excavation to bury power lines. Such activity **may cause contiguous blocks of habitat to become fragmented,** leading to increased abundance of predators, parasites, and invasive species. . . . It can have substantial impacts if the wind energy facilities are sited in areas of pristine or rare native habitats.

"**Disturbance and subsequent displacement from habitat:**

"The impacts of wind energy facilities extend well beyond the footprint of the roads, power lines, and other structures. 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".**

"In cases where the birds affected are already in decline, the turbines could push them closer to extinction".

"Disruption of ecological links:

"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."

8.2 Habitat abandonment / reduction of abundance

Abandonment of habitat is also a finding of one of the most recent research projects at the Centre for Evidence Based Conservation, School of Biosciences, University of Birmingham in the United Kingdom. In their *SYSTEMATIC REVIEW NO. 4: Effects of wind turbines on bird abundance Review Report*, Stewart, Pullin, & Coles concluded:

- "Available evidence suggests that windfarms reduce the abundance of many bird species at the windfarm site.

- "There is some evidence that Anseriformes (ducks) experience greater declines in abundance than other bird groups suggesting that a precautionary approach should be adopted to windfarm developments near aggregations of Anseriformes and to a lesser extent Charadriformes (Gulls and Terns). [12]

- "There is also some evidence that impact of windfarms on bird abundance becomes more pronounced with time, suggesting that short term bird abundance studies do not provide robust indicators of the potentially deleterious impacts of wind farms on bird abundance".[13]

One solution put forward by the Royal Society for the protection of Birds in the United Kingdom is the publishing maps of some of England's most sensitive sites--areas that should be avoided by wind farm development. Dr. Mark Avery, the RSPB's Conservation Director, says: "We have been appealing to the government for many years to publish maps like these, primarily to help developers avoid sites that are

[12] *Impacts of Wind Turbines on Birds and Bats*. Testimony of Mike Daulton Director of Conservation Policy National Audubon Society before the U.S. Senate Committee on Natural Resources Subcommittee on Fisheries, Wildlife and Oceans May 1, 2007.
[13] Stewart, Pullin, & Coles. SYSTEMATIC REVIEW NO. 4: Effects of wind turbines on bird abundance Review Report. University of Birmingham: 2006.

important to wildlife". . . . Dr. Avery told BBC News more care needed to be taken when choosing a site for wind farms. He said: "The problem is if wind farms are put in stupid places where there are lots of vulnerable birds and lots of vulnerable rare birds.'"[14]

9.0 Low frequency noise and vibrations

Vibrations from wind turbines have been measured up to 10 miles away. A 2005 Keele University study (Styles, Stimpson, Toon & Wright "Microseismic and Infrasound Monitoring of Low Frequency Noise and Vibrations from Windfarms: Recommendations on the Siting of Windfarms in the Vicinity of Eskdalemuir, Scotland") noted that "at present there are no current, routinely implemented vibration mitigation technological solutions which can reduce the vibration from wind turbines". It added that "this analysis allows us to define an exclusion zone of 10 km within which **NO** windfarm/turbine development is acceptable".

A literary report by Ivan Buxton[15] has combined a variety of study findings and concludes "there is a case to answer when land based animals and freshwater creatures are exposed to noise at low Hz levels. Because of the limitations of our hearing it would be easy to suppose that noises beyond our receiving range do not exist and should therefore be of no concern to us. Yet both very high and extremely low inaudible sounds may be harmful to us and other animals with similar but not identical ranges of hearing".

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14 http://news.bbc.co.uk/2/hi/5108666.stm>

15 Low Frequency Noise and Infrasound (Some possible causes and effects upon land-based animals and freshwater creatures): A literary comment. Ivan Buxton. 2006.

“Other creatures have lower acceptance levels, as their survival is more reliant upon instinct and interpretation of unusual sounds as a source of danger.

“Wind turbine generators were raised as a noise concern some years ago. Yet only recently have reports been released by the wind industry with results of desktop studies and none seem to have been conducted on wild animals at wind farms. A few seconds is all it takes at very low Hz and high dB levels before severe problems arise. Even at a level of dB normally found comfortable for listening to music for example, if the Hz level is low then a significant adverse reaction has been reported.

“There is reason to suppose that similar effects would also occur with wild animals if exposed to the sounds for long enough periods. The presumption must be that as soon as they felt uncomfortable they would move away from the zone of discomfort. A term more properly described as, disturbance and displacement, which in the case of protected species would be contrary to appropriate legislation.

“Laboratory studies upon animals have been reviewed with quite chilling results, as it clear that deformities, damage and impairment occur to the subjects with regularity. Admittedly the animals were contained and subjected to exposure times of several hours per day at moderate to high intensity levels of LFN and infrasound. Yet fish and aquatic creatures contained in ponds and lakes would certainly be unable to escape whatever the level of sound intensity or duration of exposure. Aircraft noise and sonic booms have been blamed for reduction in egg laying by domestic poultry. The use of military aircraft at supersonic speeds resulted in some successful claims for damages following alleged injury or loss involving livestock.

Goats have been adversely affected by exposure to jet noise resulting in reduced milk yields. Pigs suffered excessive hormonal secretion as well as water and sodium retention after being subjected to continuous noise over several days.

“Wild mice captured from a field at the end of an airport runway were compared with mice from a rural field not exposed to high levels of aircraft sounds and noise was concluded to be the dominant stressful factor causing adrenal weight differences. Recorded noise from a miscellany of sources including machinery, military hardware, electrical and diesel engines, roller coasters and many others have been used in experiments upon sheep and lambs and the results have shown increased heart rates, respiratory changes and reduction in feeding.

“Anthropological sources of LFN and infrasound are increasing and will continue so to do. There is clearly a cause for concern because of the likely effects upon wildlife and current protective measures seem inadequate.

“Thus it is recommended that better environmental assessments be made to accompany all planning applications involving erection or construction of plant, machinery, buildings, infrastructure or other potential sources of low frequency noise and infrasound, irrespective of project size.

“The measurement methods should be reviewed to embrace ‘C’ Weighting and ‘G’ Weighting as well as the usual ‘A’ Weighting so that a proper appreciation of the extent of LFN and infrasound is achieved before, during and after the noise source is installed. Yet a wealth of other creatures relies on their sense of hearing and indubitably is exposed to and experience low frequency noises. In the case of those living in the wild, good hearing is quite simply a survival aid.

“Even some invertebrates without conventional auditory receptors register vibrations and use them for either communication or as warnings. The acoustical energy that many invertebrates can sense allows them to survive.

“Creatures have evolved senses including those of hearing for reasons of assisting in procreation, communication and protection. The latter includes defence from the danger of predation or to enable them to find food.

“Wind turbines are also situated on land where the effects upon the flora and fauna are easier to monitor but are nonetheless disturbing. Many instances of bird

and bat deaths have been recorded. The wind industry has belatedly shown a degree of concern and there are recorded instances where chosen sites have been abandoned in deference to the potential impact upon wild life.

"Accordingly it might be supposed, that if wind turbines were shown to have a substantial deleterious effect upon large sections of marine or land-based fauna, proposed sites where the exposure and danger to those creatures was most likely, would not be developed.

"Unfortunately this is not always the case and besides, such a policy does nothing to reduce the risk where lesser immediate creature damage is concerned. Furthermore only limited steps have been taken to try and avoid mistakes from the past placement of turbines.

"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.

For furthr information on low frequency sound and its effect on wildlife please see Appendix 1.

10.0 Problems with proponent-commissioned studies:

In Ontario the problem is already critical. Dr. Scott Petrie, a biologist with Bird Studies Canada notes that —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.[16]

Dr. Petrie, who is a Canadian waterfowl expert and Executive Director of Long Point Waterfowl, believes that:

"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; hence the proposals and possibility that wind farms will be placed on the shorelines of Lake St. Clair and Long Point, two of the most significant wetland complexes in North America.

In Ontario, citizens have assumed that protection of important natural heritage sites is being carried out by the Ministry of Natural Resources, or the Ministry of the Environment. But under the present system, proponents of wind power developments are being allowed to conduct their own environmental screenings by commissioning their own studies. According to Dr. Petrie, "most of the studies that I have seen pertaining to bird activity are simply based on casual observations done over an insufficient number of days/seasons/weather conditions. For example, one contractor concluded that a proposed wind farm would not impact tundra swans; however, his assessment amounted to a few days of observations prior to the fall arrival of tundra swans (early Oct) and a few days of spring observations after tundra swans had departed (mid-April). In many cases there has been an inadequate use of local expert knowledge during

[16] From an email from Dr. Scott Petrie sent March 15, 2008 to Harry Verhey of the Chatham Kent Wind Action Group for presentation at the Kent Council meeting of March 25 2008. Dr. Petrie himself addressed the council on February 11, 2008.

the planning process. Instead of local experts, consultants are hired from the city".

Dr. Petrie's concerns with wind turbines can be grouped in three areas: mortality, impact on migration and impact on foraging. "With so many turbines planned, Petrie is concerned it will be like a wall. With waterfowl and most bird species migrating at night, he fears there will be collisions with turbines.

He is also concerned in some locations the turbines will go up between resting areas and feeding areas".

Petrie would like to see guidelines developed to protect migrating waterfowl and coastal wetlands. He wants guidelines on setbacks from wetlands for both onshore and off shore turbines and requirements for monitoring. Petrie believes Ontario has an obligation under the North American Bird Treaty to protect waterfowl habitat. It could have an impact on traditional movement patterns and access to prime habitat and food. **Petrie also believes the present approval process could contravene the Species at Risk Act.**

"'You couldn't get approval to build an office tower beside a coastal wetland, why would you put an industrial wind turbine beside one', he said. 'Especially since we have lost 85% of our coastal wetlands, it's critical we protect what's left from human-induced impacts.'"[17]

[17] Ibid.

11.0 Maintaining of a "confidential" bird and bat monitoring data base is unacceptable

In the MNR *Guidelines,* "Appendix A: Best Management Practices" states:

"The Canadian Wind Energy Association, Canadian Wildlife Service, Bird Studies Canada and MNR have established a database for bird and bat data associated with wind power projects. Applicants are encouraged to submit pre and post-construction data to the Wind Energy Bird and Bat Monitoring Database to facilitate an improved understanding of the effects of wind turbines on birds, allow for greater consistency in assessment of wind power effects and lead to future improvements in approval processes. The database allows individual industry applicants and/or their consultants to enter bird survey data in a confidential environment. The data can then be analyzed to determine trends, inform guidance, develop best management practices and effective mitigation options as well as provide provincial data summaries for the public".

Why is this information being kept confidential? Is the MNR colluding with the industry to keep secret the actual environmental impact of wind turbines? The agreement of confidentiality with the Canadian Wind Energy Association is not consistent with the Statement of Environmental Values which insists:

"The Ministry of the Environment believes that public consultation is vital to sound environmental decision-making. The Ministry will provide opportunities for an open and consultative process when making decisions that might significantly affect the

environment". It is not in the interests of scientific investigation, public scrutiny or transparency.

12.0 What about the bats?

While the *Guide* pays lip service to the predicament of bats faced with huge fatality rates, it seems to have forgotten about the need to protect this species.

The huge negative effect of wind turbines on bats has economic repercussions.

Bats are one of the most important species in maintaining the balance of nature. Their economic value as a biological control agent for insects is estimated at multi billions of dollars annually in the US alone. Wind power kills bats in very large numbers. Seven species of bats are found at Arran Lake. Some of these are migratory species and therefore more vulnerable to wind turbines. The siting of wind turbines in this area would decimate this important species.

One of the first studies on bats was carried out at Pincher Creek in Alberta. **The astonishing numbers of bat fatalities there alerted biologists and the general public to the devastating effect the turbines are already having on this animal.**

Dr. Michael Gannon, Professor of Biology at Pennsylvania State University and a representative of the Pennsylvania Biological Survey on the Pennsylvania Wind and Wildlife Consortium,[18] is an acknowledged expert on bats, bat ecology, and bat population biology. He has spoken out about the adverse effect wind turbines are already having on bats. Citing the Government Accountability Office Report

[18] A committee formed by Governor Rendell to advise on wind development and wildlife issues in Pennsylvania.

commissioned by congress in 2005: *Wind Power, Impacts on Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife*,[19] he emphasizes that **"wind power kills bats in large numbers. That is a fact, not in dispute. Estimates I have seen, have gone from the conservative of 5000 bats per wind site per year, to the very liberal of about 60,000 bats per site per year."**[20]

According to the congressional report:

"Recent studies conducted in the eastern United States in the Appalachian Mountains have found large numbers of bats killed by wind power turbines. A 2004 study conducted in West Virginia estimated that slightly over 2,000 bats were killed during a 7-month study at a location with 44 turbines. More recently, **a 2005 report that examined wind resource areas both in West Virginia and Pennsylvania estimated that about 2,000 bats were killed during a much shorter 6-week study period at 64 turbines. Lastly, a study conducted of a small 3-turbine wind facility in Tennessee estimated that bat mortality was about 21 bats per turbine, per year, raising concerns about the potential impact on bats .** . . . Various species of bats have been killed at these wind power facilities and experts are concerned about impacts to bat populations if large numbers of deaths continue. For example, **one expert noted that 'it is alarming to see the number of bats currently being killed coupled with the proposed number of wind power developments' in these areas".**

These recently discovered statistics are acknowledged as true by the wind industry. But wind energy proponents have rather flippantly dismissed them by saying "there *is* a problem with bats, but, fortunately, bats do not have a very charismatic image with the public". But Dr. Gannon emphasizes the often forgotten

[19] GAO-05-906. Washington D. C. 64 pp. http://www.windaction.org/documents/134
[20] Letter to Mayor Kilmartin by Dr. Michael Gannon, biology professor at Penn State Altoona (*November 4, 2007) by Dr. Michael Gannon* http://www.windaction.org/documents/12514

economic importance of bats: **"The economic value of bats has been documented many times. Bats are the major predators of all our nocturnal insects. They consume large numbers of insect pests including many of our most troublesome crop pests".**

> "Relatively small numbers of bat fatalities were reported at wind energy facilities in the US before 2001 (Johnson 2005), largely because most monitoring studies were designed to assess bird fatalities (Anderson *et al*. 1999). Thus, it is quite likely that bat fatalities were underestimated in previous research. Recent monitoring studies indicate that some utility-scale wind energy facilities have killed large numbers of bats (Kerns and Kerlinger 2004; Arnett 2005; Johnson 2005)".[21]

The *Gidelines* commit a serious omission in failing to protect this important species. For more information on bats and wind turbines please see Appendix 2.

13.0 What about the SARA and migratory bird regulations?

Although international treaties are referred to in the *Guidelines*, the MNR and the MOE have additional responsibilities to actively protect migratory birds. It has already been pointed out that no provision has been made to protect migratory corridors or staging areas. This omission is a further failure to accept responsibility under the SARA and the Migratory Birds Convention Act:

[21] Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. Thomas H Kunz et. al.

> "The SARA also requires that every person required by federal law to ensure that an EA is conducted must (1) notify the competent minister(s) in the likelihood that a project will affect a listed wildlife species or its critical habitat; (2) identify the adverse effects of the project on the listed wildlife species and its critical habitat".

The Migratory Birds Convention of 1916 between the USA and Canada is an international treaty implemented in Canada by the federal *Migratory Birds Convention Act, 1994* (MBCA) and accompanying regulations.

The *Migratory Birds Regulations* (MBR), in Section 6, prohibit the disturbance, destruction, and taking of a nest or egg of a migratory bird; or the possession of a live migratory bird, or its carcass, skin, nest or egg, except under authority of a permit. It is important to note that under the current MBR, no permits can be issued for the incidental take of migratory birds caused by development projects or other economic activities".

14.0 Emissions reductions

The MNR document assumes that wind turbines actually contribute to the reduction of CO_2 and other fossil fuel emissions. This has been the spin of the wind turbine industry. But international electricity generation experts point out the necessity of running fossil fuel burning electricity generating plants on inefficient standby mode in order to stabilize the grid in the face of the intermittency and unpredictability of wind energy. They also indicate that wind will never be able to replace coal because it cannot provide base load electricity. The Ontario Power Authority has indicated that new gas plants will be needed to backup wind in Ontario. However, according to the David Suzuki Foundation, "Possibly more troubling are the emissions of fine particulates from gas-fired power plants. Though particulate emissions are about

one-tenth what they are for coal power, the U.S. Environmental Protection Agency estimates that 77% of particulates from natural gas plant are dangerously small. These fine particulates have the greatest impact on human health because they by-pass our bodies' natural respiratory filters and end up deep in the lungs. In fact, many studies have found no safe limit for exposure to these substances."[22]

Electricity generation experts have indicated that there are negligible CO2 emission savings from such an arrangement.

- **"Wind power. . . can not make a significant contribution to reducing greenhouse gas emissions".**--Peter Lang, energy production engineer, 2009
- **"As the level of wind capacity increases, the CO_2 emissions actually increase as a direct result of having to cope with the variation of wind-power output".** Irish Electricity Supply Board (ESB) National Grid Study, 2004

- **"Wind turbines . . . have produced no environmental benefit in Germany in terms of lowering of CO_2 emissions". Rhein-Westfalia (Germany) Institute for Economic Research study, 2009**

- **"Despite huge investments, wind-generated electricity 'has had minimal, if any, impact on carbon dioxide' emissions" in Colorado and Texas.** Robert Bryce, energy researcher, *Wall Street Journal* August 24, 2010

- **"Thermal power plants in the compensation of fluctuating production of windmills eliminate the major part of the expected positive effect of wind energy. . ."** Tallinn Technical University, Estonia study 2003

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22 http://www.davidsuzuki.org/Climate_Change/Energy/Fossilfuels/naturalgas.asp

Since a single wind turbine can produce a net corporate profit of over $840,000 per year for the company[23], the stakes are high for making sure that the public believes such an enterprise is beneficial for the environment, especially when consumers are only now beginning to discover that they are paying 13.5 cents kWh for wind produced electricity which is already available on the open market for 4 cents.

This information puts an entirely different interpretation on the "green" credentials of the wind turbines, their so-called benign environmental footprint, and their ability to save the planet.

15.0 Absence of consequences for non compliance to guidelines

Without teeth, regulations are ignored. In order to be effective, the MNR Guidelines will have to be made into regulations that are binding corporations and their project applications. Only then would they actually require wind turbine developers to respect the vulnerability of sensitive habitats and avoid them from the earliest stages of planning.

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[23] The following calculation is provided by Professional Engineer William K. Palmer: A 2.5 MW turbine, might produce at 28% capacity factor, so produces 2.5 MW x 8760 hr x 0.28 = 6132 MWh per year. For this if onshore, they are paid $135 per MWh + $10 per MWh Eco-Action Fee (although that fund might run out soon unless CANWEA convinces the federal finance minister to add more money to that pot) Say 6132 MWh x $145 / MWh = $889,140 per year. The turbine is assessed at $40,000 per MW = $100,000 so pays less than $4000 municipal and county taxes per year. There might be 10 staff for a 100 turbine array, Lets assume each makes $75,000 per year, so the staffing cost is maybe $750 per turbine (Heck call it $1500) Throw in a slush fund for maintenance parts etc for $22,500 per year. The lease holder used to get between $5000 and $8000 per year. Now they might be getting $20,000 per year. The company probably pays no income taxes, as they can write off the asset at 30% a year to cover all income. Once depreciated, the company "flips" to new owners (sometimes just a new division in the same company) and restarts the depreciation clock again. Bottom line, the Company can expect to make $889,140 - ($4000 + $1500 + 20,000 + 22,500) = slightly over $840,000 per year per turbine. A building fee of maybe $15 per $1000 a value of the concrete base and tower of $500,000 (it does not apply to the turbine itself) comes to $7500 per turbine. Less than 1% of the first year's income.

These companies are allowed to make whatever claims they want. There is no government oversight of their claims. They have effectively emasculated local observers. The studies made by the wind turbine companies are always going to be in their favour (example Wolfe Island). Can this be considered a genuine effort to protect migratory birds, especially since there are no long term base line studies and no constraints on the wind turbine companies? The public perceives that the function of the environmental assessment consultants is to circumvent existing regulations on behalf of their corporate clients.

There is also no provision for the protection of vulnerable people who are experiencing very real negative health impact from wind turbines. I.e., there is no complaint process, no inspectors and no fines.

> "The people of Ontario have as a common goal the protection, conservation and restoration of the natural environment for the benefit of present and future generations.
>
> While the government has the primary responsibility for achieving this goal, the people should have means to ensure that it is achieved in an effective, timely, open and fair manner".

We look forward to a revision of the MNR "Guidelines" that will clearly demonstrate consistency with the goals of the Provincial Policy Statement, the Environmental Bill of Rights and Statement of Environmental Values and the Bergen Declaration.

16.0 Appendix 1. Low frequency noise and wildlife.

"Some similarities appear to be developing with regard to low frequency noise emitted by wind turbines. Although it must be accepted that no known creature deaths have yet been recorded as the result of exposure to such noise the industry reaction seems to have been one of denial before investigation.

"Infrasound effects upon humans from wind turbine generators were raised as a concern some years ago. Yet only recently have reports been released by the wind industry with results of desktop studies and none seem to have been conducted on wild animals at wind farms.

- "Amphibians such as frogs and toads also rely heavily upon sound for communication and this plays a substantial role in their reproductive behaviour. Most amphibians have complex ears that are dependent upon sound frequency and directionality.
- "In birds of prey, nesting failures (Boeker and Ray 1971), lowered nesting success (Wiley 1975, White and Thurow 1985), displacement (Andersen et al. 1986), and changes in wintering distribution and behaviour (Stalmaster and Newman 1978) were documented in response to human disturbance.

"The physiological impact of stress on animals has been the subject of many studies, which have somewhat conflicting results. Selye (1950) suggested that an exhaustion of the adrenal cortex occurs during prolonged stress exposure while others concluded that prolonged exposure to acute stress results in a decline in adrenal sensitivity (McNutty and Thurley 1973, Ader 1975).

"Alternatively, Sapolsky (1983) suggested that chronic stress might cause a decline in cortisol production as a result of impairment of pituitary ACTH production, while others (Friend et al. 1977, 1979, Paul et al. 1971, Barrett and Stockham 1963)

provide data, which demonstrates that stress tends to increase adrenal sensitivity to an acute stressor.

“If chronic exposure to stressors causes sustained elevated glucocorticosteroid levels, impairment of immuno-defensive mechanisms in affected animals may occur making the animals more susceptible to disease (Jensen and Rasmussen 1970, Paape et al. 1973, Hartman et al. 1976, Stein et al. 1976).

“Some animal studies have concentrated on the results of deliberate exposure to disturbance. Harlow et al. (1987) using domestic farm sheep determined that mild, medium, and severe stress events resulted in heart rate and plasma cortisol changes. Heart rate during mild stress events returned to resting values by 10 minutes post-stress event, while medium and severe stress events resulted in elevated heart rates for 20 and 60 minutes post stress event, respectively.

“Plasma cortisol levels were significantly elevated above resting values within minutes post-stress, with cortisol levels returning to pre-stress levels 30 minutes after removal of the mild stressor; as compared to continuously elevated cortisol levels from 90 to 180 minutes for both the medium and severe stressors.

“During chronic stress events, cortisol levels in the sheep were significantly elevated from day 5 through day 24 at which time the random noise generator used to create the stress event failed. Once the generator was repaired and restarted, cortisol levels increased to previous chronic stress values.

“The results of Harlow et al. (1987) do not support the concept of adrenal exhaustion or hypersensitization nor suggest that habituation to stressors occurred, perhaps because of the irregular, unpredictable interval of the noise stimuli.

“As indicated by Harlow et al. (1987), chronically elevated blood cortisol may adversely impact the efficiency of animal production by reducing weight gain and otherwise affecting animals in captivity (Van Mourik and Stelmasiak 1984, Van Mourik et al. 1985) and decreasing antibody production, thereby inhibiting or suppressing the body's ability to resist disease (Roth 1984, Jensen and Rasmussen

1970, Huber and Douglas 1971, Revillard 1971, Paape et al.1973, Hartman et al. 1976, Stein et al. 1976).

- **"These impacts, particularly if chronic, can result in: increased sickness, disease, and death; a decrease in animal productivity (Knight and Cole 1991, Anderson and Keith 1980); and ultimately result in population declines (Anderson and Keith 1980).**
- "What is almost invariably forgotten during such eventualities is that the resident population includes the natural inhabitants as well as humans. Whereas the human population tends to endure the noise, albeit under sufferance the wildlife (creatures in still freshwater excepted) is far more likely to be driven away.

"Rural areas are usually much quieter than urban conurbations and the sudden introduction of greater noise levels by building a new arterial road; airport or even a wind farm is bound to have an immediate effect upon the residents of sparsely populated regions.

"What is almost invariably forgotten during such eventualities is that the resident population includes the natural inhabitants as well as humans. Whereas the human population tends to endure the noise, albeit under sufferance the wildlife (creatures in still freshwater excepted) is far more likely to be driven away.

"Behavioural studies of the effects of low frequency noise and infrasound upon wildlife are few and far between. Those that have been conducted seem conclusive in their findings in that all confirm harm is possible to living creatures when exposed to prolonged high intensity noise levels.

"Mostly it appears noise is just as stressful to wildlife as to humans whether of low or high frequency but is species dependent with regard to the extent of the effects. Generally, creature response is one of appearing startled if the noise is sudden with increased stress if prolonged. In essence, as might be expected, the effects are similar to human behaviour.

“Whilst this suggests occasional disturbance is seemingly harmless or relatively innocuous it does depend upon the duration between events as well as other factors. Regular pulses of sound that occur between long intervals without disturbance can sometimes lead to habituation, but on other occasions create just as much of a startle factor as the ‘one off’ event.

“Thus at times the startle factor seems to be of little consequence although there are exceptions such as abandonment of habitat or in the case of nesting birds, desertion of eggs or young. More prolonged and intense exposure however, has a worsening effect and in the case of species contained within an enclosed environment, such as pond dwelling creatures the results could be significantly harmful.

“Despite an undoubted increase in general noise levels and the growth of manmade inventions producing differing levels of sound, very little progress seems to have been made in terms of actual research into the effects upon wildlife over the past 30 years.

“Environmental impact assessments rarely consider noise effects on wildlife. According to Bender in 1977 a complete and accurate assessment of a given impact should include an assessment of how animals will react (both physically and behaviourally) to various noise levels of varying frequencies produced by the impact.

“In 1980 Fletcher stated that further research is needed to answer critical questions about the effects of noise on animals, including long and short term noise effects and the effect of noise on declining animal population regardless of the cause of the population decline.

“Quite clearly further research is required in an endeavour to resolve critical aspects concerning the effects of noise on land based animals and fresh water creatures. These should embrace studies of affected species both as individual creatures and in accumulated groups (e.g., shoals) to examine the acoustic frequency, intensity and

temporal patterns of significant sound sources upon mating, habitat, alarm response and nurturing.

- **“Permitting construction of vast numbers of large-scale renewable energy projects that produce virtually continuous emissions of infrasound could have wide-spread, marked adverse consequences for the creatures they are intended to help protect.**

“More factories will be built to provide the equipment used to harness wind, water and solar power as well as additional nuclear power stations. Old power stations will be rebuilt or demolished. All will give rise to some levels of low frequency noise during the construction process and more large transport vehicles will be required to move equipment and spoil from excavations.

- **“An independent environmental assessment is essential to include infrasound and low frequency noise tests at source with prediction models showing the anticipated noise levels at progressive distances and showing the predicted spread.**
- **“The assessment must also make a complete study of all wildlife in and immediately beyond the projected vicinity with a proper chronicle of species over a realistic period commencing with an intensive base line study of one year of full and representative observation before a planning application is submitted.**

“Thereafter regular, periodic seasonal monitoring should be enforced as part of the planning acceptance, conditional upon immediate cessation of noise emission if found detrimental to any affected species.

- **“Unless the problem is recognised as real and acute the potential for further chronic and significant harm to land based animals and fresh water creatures will multiply and almost certainly contribute to the progressive decline in species and habitat”.**

17.0 Appendix 2. Bats

"It has been demonstrated that this species is capable of detecting relatively low-frequency sound, such as that produced by groups of insects, over a maximum distance of 600 m. Such long distance acoustic cues could help the bat locate concentrations of flying insects and thus supplement the shorter range high frequency echolocation."[24] It is likely that this subtle natural hunting adaptation becomes confusing or dysfunctional as a result of interference from the low frequency noise projected from industrial wind turbines.

"Of the 45 species of bats found in North America, 11 have been identified in ground searches at wind energy facilities. Of these, nearly **75% were foliage-roosting, eastern red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), and tree cavity-dwelling silver-haired bats (*Lasionycteris noctivagans*), each of which migrate long distances.** Other bat species killed by wind turbines in the US include . . . the little brown bat (*Myotis lucifugus*), . . . northern long-eared myotis (*Myotis septentrionalis*), [and] big brown bat (*Eptesicus fuscus*). **A consistent theme in most of the monitoring studies conducted to date has been the predominance of migratory, tree-roosting species among the fatalities".[25]**

The *Maple Ridge Wind Power Avian and Bat Fatality Study Year One Report (Final Report)* dated June 25, 2007 by Aaftab Jain *et al*, Curry and Kerlinger, LLC[26] also confirms that all these species are especially susceptible to wind turbine mortality. **The study also indicates that fatalities are greater when the turbines are closer to wetlands.**

"Remains of 326 bats were found by searchers during standardized surveys, representing five species (Hoary Bat, Silver-haired Bat, Eastern Red Bat, Little Brown Bat, and Big Brown Bat). **The**

[24] C.G.van Zyll de Jong, *op.cit.,* p.164.
[25] *Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses* Thomas H Kunz, Edward B Arnett, Wallace P Erickson, Alexander R Hoar, Gregory D Johnson, Ronald P Larkin, M Dale Strickland, Robert W Thresher, and Merlin D Tuttle.
[26] http://www.windaction.org/documents/8533

greatest number of bat incidents occurred during the fall migration period, with 228 (69.9%) bat carcasses found between July 1, 2006 and August 31, 2006.

Wind turbines are also known to produce complex electromagnetic fields in the vicinity of nacelles. Given that some bats have receptors that are sensitive to magnetic fields (Buchler and Wasilewski 1985; Holland *et al*. 2006), interference with perception in these receptors may increase the risk of being killed by rotating turbine blades. Bats flying in the vicinity of turbines may also become trapped in blade-tip vortices (Figure 4) and experience rapid decompression due to changes in atmospheric pressure as the turbine blades rotate downward. Some bats killed at wind turbines have shown no sign of external injury, but evidence of internal tissue damage is consistent with decompression (Dürr and Bach 2004; Hensen 2004). Additionally, some flying insects are reportedly attracted to the heat produced by nacelles (Ahlén 2003; Hensen 2004). Preliminary evidence suggests that bats are not attracted to the lighting attached to wind turbines (Arnett 2005; Kerlinger *et al*. 2006; Horn *et al*. in press). Bats foraging in the vicinity of wind turbines may miscalculate rotor velocity or fail to detect the large, rapidly moving turbine blades (Ahlén 2003; Bach and Rachmel 2004; Dürr and Bach 2004). Given the speed at which the tips of turbine blades rotate, even in relatively low-wind conditions, some bats may not be able to detect blades soon enough to avoid being struck as they navigate."

Bat carcasses appeared to fall closer to turbine tower bases than bird carcasses**. Bat fatalities appeared to be slightly greater at turbines close to wetland areas** than at turbines located farther from wetlands".

Scientists do not yet understand why bats are particularly vulnerable to wind turbines. But anyone who has heard the invasive noise emitted by wind turbines (equivalent to constant jet roar or freight train rumbling) will have no difficulty in understanding that an animal species

capable of homing in on the subtlest of frequencies emitted by flying insects is bound to be disorientated by this thundering industrial disturbance.[27]

Two very recent research papers suggest that the impact of wind turbines on this agriculturally important keystone species is more devastating than first understood.

In Current Biology, Volume 18, Issue 16, 26 August 2008, pages R695-R696, Erin F. Baerwald, Genevieve H. D'Amours, Brandon J. Klug, and Robert M.R. Barclay of the University of Calgary report the first evidence that barotrauma is the cause of death in a high proportion of bats found at wind energy facilities. They found that 90% of bat fatalities involved internal haemorrhaging consistent with barotrauma, and that direct contact with turbine blades only accounted for about half of the fatalities. Air pressure change at turbine blades is an undetectable hazard and helps explain high bat fatality rates. They suggest that one reason why there are fewer bird than bat fatalities is that the unique respiratory anatomy of birds is less susceptible to barotrauma than that of mammals.

Another report published in the Journal of Wildlife Management 72(1):61–78; 2008 warns of the severity of impact of wind turbines on bats:

Based on estimates of installed capacity and the limitations and assumptions with respect to fatality rates, projected annual fatalities of bats in the Mid-Atlantic Highlands in the eastern United States could range from 33,017 to 61,935 (2,158-MW installed capacity) or from 58,997 to 110,667 (3,856-MW installed capacity) bats per year by 2020 in just this one region (National Research Council 2007). These projections, although hypothetical, should be of particular concern for species of migratory tree bats that experience the highest fatalities at wind energy facilities in North America.

[27] In Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. Thomas H Kunz et. al.speculate that:
"bats may become acoustically disoriented upon encountering these structures during migration or feeding. Bats may also be attracted to the ultrasonic noise produced by turbines
(Schmidt and Jermann 1986). Observations using thermal infrared imaging of flight activity of bats at wind energy facilities suggest that they do fly (and feed) in close proximity to wind turbines (Ahlén 2003; Horn et al. 2007; Figure 3). What other factors might contribute to bat fatalities?

North American bats consume half their weight in flying insects each night. All bats in Ontario feed on insects. (At one time health risks were associated with bats but histoplasmosis has never been found in Canadian bat colonies. Bats do occasionally get rabies, but less frequently than foxes or skunks). Today, with the introduction of the West Nile Virus carried by mosquitoes, they may have an even more important role to play in the protection of human health.

Dr. Gannon continues:

"The economic value of bats as a biological control agent for insects is estimated to be in the multi billions of dollars annually in the US alone.

"As such, they are considered to be ecological keystone species**. . . .** The keystone is the stone that bears the majority of the weight in an archway. If it is disturbed or removed, the archway collapses**. Bats are keystone species in our ecosystem. They play a vital role in maintaining it, and if disturbed or reduced, the ecosystem as we know it will collapse. However, bat populations are declining worldwide, mostly due to the actions of man.**

"As bats have a very low reproduction rate, where each female produces only one offspring or pup per year, any event that causes a population decline can take many years to recover from. Any event that repeatedly kills bats, year after year, in large numbers, can be devastating to a population. **The proliferation of numerous wind sites in this part of the country, most of which have or are being documented to have such an effect on bats, could be the most serious threat to our bat populations, our biological insect control, that science has seen.** The chances that a wind facility in this area will have a negative impact on our bat populations appears to be extremely high. Government Officials, with a responsibility of protecting our valuable natural resources, have a responsibility that before they allow construction of such a facility, they insure that the sites have been evaluated for their potential impact on bats and other wildlife. Just as the power companies evaluate it for wind, and place these facilities only in areas where there is sufficient wind blowing, **they need also to be evaluated for their**

environmental impact and sites that have a high potential to negatively impact wildlife should be avoided".[28]

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