

Original Questions:

1. Can flight paths of birds and bats be controlled? **See response below.**
2. Will migration patterns be studied for birds in the area of Lake Michigan, Bear Lake, Glovers Lake, Mud Lake, Arcadia Lake, Upper and Lower Herring Lakes? Will it be a local Forest Representative or someone from Duke Energy who wouldn't truly know the area? **See response below.**
3. Has the Duke project done a formal study of bird migration routes as related to the likely sites of the turbines? Are there design possibilities that would mitigate potential dangers to wildlife? Are flashing lights required at night? **See response below.**
4. There are migratory flyways from Platt Lake, to Crystal Lake, Betsie Bay to Upper and Lower Herring Lakes and on down to Bear and Glovers Lake. What should be the setbacks of wind turbines from these lakes with migratory flyways? **Project specific.**
5. Can we mandate that no turbines be placed in the areas of migratory bird paths? **See response below.**
6. Why do bats get the bends near wind turbines? **See response below.**
7. If bats are killed in large numbers and the industrial wind projects are within orchards, what will be the impact on the orchard from the loss of the bat population? **Beyond scope of project.**
8. Bats are extremely susceptible to wind turbines. Studies have shown they do not have to strike the wind turbine since the pressure drop caused by the blades causes the bat's lungs to rupture. What are the mitigation measures that can be used to protect the bat population? **See response below.**
9. Is there any real danger to wildlife? What about migrating birds? Do they know that birds have been and will be killed by the spinning blades? Protected species? **See response below.**
10. What will the action be if all the experts and all the planning indicate minimal effect on wildlife but it turns out otherwise? **Beyond scope of project.**
11. Other than Altamont, could you identify other sites where there has been excessive bird and bat kill? **See response below.**
12. What is the impact of wind turbine sound on wildlife living in the industrial wind project area? **See response below.**
13. Is there a definitive or exemplar study available regarding the health and wildlife impacts, both positive and negative? **See response below.**
14. What is the typical time period that environmental studies cover? One year to cover spring and fall migration—nesting and breeding periods? **See response below.**
15. Does environmental impact on wildlife, investigation, birds, etc. last for 1 year. Are there actual fixed studies done? **See responses to questions B13 and B14.**
16. The FWS recommends at least a 5-mile setback distance from any active bald eagle's nest. Will the developers apply for a permit to "take" a certain number of bald eagles so they will not be in violation of the Bald and Golden Eagle Protection Act? **See response to question B18.**
17. We only have a few bald eagles. What can be done to protect them? **See response below.**
18. Will the developers apply for a "take" permit for endangered species of birds and bats so they will not be in violation of the Migratory Bird Treaty Act and the Endangered Species Acts? **See response below.**
19. Would the bats and bald eagles in the area potentially be threatened by the wind turbines? **See response to question B9.**
20. How do ridge/valley sound and vibration affect fishery, birds, etc. in Blaine Township? **Beyond scope of project; could be answered in site specific proposal/assessments**

21. Are there Best Management Practices for avoiding and/or mitigating invasive species proliferation caused by the development? (For example, the development of dirt roads can often spread invasive species from one location to another). **Beyond scope of project; site specific.**
22. Are we allowed to enact ordinances that protect the wildlife habitats currently in our areas? **See response below.**
23. Can the township require or make it mandatory that the applicant follow all US fish and wildlife recommendations? **See response below.**
24. Can the township require the applicant to follow US fish and wildlife wind siting guidelines? **See response to question B23.**
25. Can the township require that the applicant study the impact of wind turbines on bees and their pollination ability, as well as bats? **See responses to questions B2 and B26.**
26. Has the impact of industrial wind farms on beekeeping ever been researched? And what is that impact? Do wind revolving tower blades create a vortex that disorients bees and/or tears their wings? **See response below.**
27. Will the towers be lit in a way that will not attract migrating birds? What other protections will be considered for birds? **See response below.**
28. How many birds die from windmills compared to airplane, automobiles, or window panes? **See response below.**
29. What guidelines are being followed regarding effects on wildlife, in particular avian? Is anyone consulting with the national Audubon organization? Reputable sources/best experts must be consulted when any siting decision is made. While the towers may be sited away from regular migration paths, there could be a problem with lights on those towers especially with many towers. **See response below.**
30. Are proponents and developers aware that the Lake Michigan coast from Benzie to Allegan counties is declared an important bird area by national Audubon? Rafts of 5,000 to 35,000 long-tailed ducks are seen offshore regularly. Wind tower siting in the lake must consider this. **Comment not question.**
31. What ramifications to our ecosystems would there be if many birds and bats are eliminated by large wind turbines? **Beyond scope of this project.**
32. What are the known impacts from turbines, roads, power lines and other associated infrastructure, including but not limited to displacement & avoidance behaviors and direct collision/mortality on the species listed in "Attachment 1?" **Needs further clarification.**

Questions and Responses:

These questions may have been recategorized and reorganized. Some may have been sent to another "theme" area (this will have been explained in red under the "Original Questions" section). In other cases two or more questions will be answered with one response.

B1. Can flight paths of birds and bats be controlled?

Response: It would be difficult to control the flight paths of birds and bats, but being aware of the spaces where the most migration occurs can help wind developers build in the least obtrusive spots. With more knowledge about flight patterns, wind facilities can be better placed to avoid collision with flying animals. Radar can be used to track the movement of avian wildlife in specific areas, as discussed in a study called "Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document," published by the *Journal of Wildlife Management*. This study can be accessed at http://www.nationalwind.org/assets/publications/Nocturnal_MM_Final-JWM.pdf

B2. Will migration patterns be studied for birds in the area of Lake Michigan, Bear Lake, Glovers Lake, Mud Lake, Arcadia Lake, Upper and Lower Herring Lakes? Will it be a local Forest Representative or someone from Duke Energy who wouldn't truly know the area?

Response: Although the research team cannot comment on whether or not any studies will be carried out for those specific areas, there has been some research done on the effects of wind energy on Great Lake

bird populations. This recent study, entitled “Wind Energy: Great Lakes Regional Guidelines,” comprehensively discusses potential risks to birds and recommends ways to avoid serious impact. This research is available online at <http://conserveonline.org/library/wind-energy-great-lakes-regional-guidelines/view.html>.

The US Fish and Wildlife Service has prepared guidelines on wind turbine siting. Those can be accessed at http://www.fws.gov/habitatconservation/windpower/wind_turbine_advisory_committee.html

- B3. Has the Duke project done a formal study of bird migration routes as related to the likely sites of the turbines? Are there design possibilities that would mitigate potential dangers to wildlife? Are flashing lights required at night?

Response: The research team is not able to respond to specific questions related to Duke Energy’s project. However, developing research has shown that there are ways to reduce collision rates by altering the design and coloration of turbines. For instance, newer turbine models which have less perching space lessen the number of nesting birds near turbines. Other research suggests that painting visible designs on turbine blades – like stripes or solid colors – have helped reduce the number of fatalities. The National Wind Coordinating Collaborative published a useful report which specifically outlines some of these studies. The “Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions” report specifically outlines this work. The report is available online at https://www.nationalwind.org/assets/publications/Birds_and_Bats_Fact_Sheet_.pdf. Meanwhile, their more detailed Mitigation Toolbox provides summaries of various mitigation studies, accessible online at: http://www.nationalwind.org/assets/publications/Mitigation_Toolbox.pdf.

Flashing lights are required on any structures higher than 199 feet, according to the Federal Aviation Administration, in order to avoid airplane collisions. For a wind turbine farm, it may be possible to use lights on the perimeter and not on every single turbine.

- B5. Can we mandate that no turbines be placed in the areas of migratory bird paths?

Response: Migratory birds are differentially impacted by wind turbines. See response below to question B9 for information about which birds are impacted, mitigation and protection measures.

- B6. Why do bats get the bends near wind turbines?

Response: When a wind turbine spins, a small area of air pressure around the tips of the blades drops slightly, causing a “lift”-like effect, similar to that of an airplane’s wings. Although it is unclear why bats are attracted to wind turbines, as they fly through the low air pressure their lungs expand and fill with liquid – a phenomenon comparable to the bends in divers. The National Geographic reported on this phenomenon in their 2008 article “Wind Turbines Give Bats the ‘Bends’ ”. That article is accessible at <http://news.nationalgeographic.com/news/2008/08/080825-bat-bends.html>

More information about bats and wind energy is available at the website of the Bats and Wind Energy Collaborative at <http://www.batsandwind.org/>. This organization was formed in 2003 by Bat Conservation International (BCI), the US Fish and Wildlife Service, the American Wind Energy Association (AWEA), and the National Renewable Energy Laboratory of the US Department of Energy (NREL).

- B8. Bats are extremely susceptible to wind turbines. Studies have shown they do not have to strike the wind turbine since the pressure drop caused by the blades causes the bat’s lungs to rupture. What are the mitigation measures that can be used to protect the bat population?

Response: Although more studies need to be completed in order to more conclusively decide on the best mitigation practices, some past research has shown that wind facility operation hours can be adjusted to weather and other conditions to limit impacts on bats. For example, it is known that bats are most active during times of low wind periods, so wind farms could potentially operate less frequently during those times. However, more research must be done into the feasibility of this strategy. See the “Wind Turbine

Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions” at https://www.nationalwind.org/assets/publications/Birds_and_Bats_Fact_Sheet_.pdf for more detailed information. This report was prepared by the National Wind Coordinating Collaborative (NWCC). The mission of the NWCC Wildlife Workgroup is “to identify, define, discuss, and through collaboration address wind-wildlife and wind-habitat interaction issues by seeking broad stakeholder involvement on scientific and public policy questions”.

In addition, more information about bats and wind energy is available at the website of the Bats and Wind Energy Collaborative at <http://www.batsandwind.org/>. This organization was formed in 2003 by Bat Conservation International (BCI), the US Fish and Wildlife Service, the American Wind Energy Association (AWEA), and the National Renewable Energy Laboratory of the US Department of Energy (NREL).

Finally, the “Wind Energy: Great Lakes Regional Guidelines” report lists similar operational guidelines to limit wildlife risks on page 39, available online at <http://conserveonline.org/library/wind-energy-great-lakes-regional-guidelines/view.html>.

B9. Is there any real danger to wildlife? What about migrating birds? Do they know that birds have been and will be killed by the spinning blades? Protected species?

Response: It is widely understood that wind turbines do demonstrate some danger to flying birds and bats, but studies have shown that in relation to other anthropogenic activities, wind farms present a substantially lower risk. In the meantime, much scientific research is currently being done on the most appropriate ways to reduce and mitigate the harmful impacts that do exist. For a summary of the issue and a description of the research that is being undertaken, refer to the “Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions” report. This report is accessible from https://www.nationalwind.org/assets/publications/Birds_and_Bats_Fact_Sheet_.pdf, and was prepared by the National Wind Coordinating Collaborative (NWCC). The mission of the NWCC Wildlife Workgroup is “to identify, define, discuss, and through collaboration address wind-wildlife and wind-habitat interaction issues by seeking broad stakeholder involvement on scientific and public policy questions”.

In addition, the “Wind Energy: Great Lakes Regional Guidelines” study provides useful information about the effects of wind development on wildlife, specifically bird and bat populations. It categorizes danger as direct mortality (from flying into the turbine, for instance) and indirect through displacement, fragmentation, and habitat loss. The study acknowledges the potential dangers to wildlife, but it also recommends mitigation measures. This study is available online at <http://conserveonline.org/library/wind-energy-great-lakes-regional-guidelines/view.html>.

B11. Other than Altamont, could you identify other sites where there has been excessive bird and bat kill?

Response: The National Wind Coordinating Collaborative has published several graphs which depict the mortality rates of raptors, all birds, and bats on numerous wind farms across the country. Refer to page 3 of “Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions,” at: https://www.nationalwind.org/assets/publications/Birds_and_Bats_Fact_Sheet_.pdf. This report was prepared by the National Wind Coordinating Collaborative (NWCC). The mission of the NWCC Wildlife Workgroup is “to identify, define, discuss, and through collaboration address wind-wildlife and wind-habitat interaction issues by seeking broad stakeholder involvement on scientific and public policy questions”.

B12. What is the impact of wind turbine sound on wildlife living in the industrial wind project area?

Response: Although the effect of turbine sound on wildlife is not yet fully understood, existing knowledge of animal hearing suggests that some wildlife may be affected by the sound frequencies generated by the turbines. Some studies show that from far distances, birds are unable to hear the “swooshing” of the

turbine, increasing the likelihood of collision. Others link noisy habitats to problems with bird mating, communication, or nesting, but there have been no direct, conclusive studies of the impacts of wind facility noise on wildlife. For a brief analysis of some of these studies, refer to the U.S. Fish and Wildlife Service's report called "The Effects of Noise on Wildlife". This report can be accessed at <http://www.fws.gov/windenergy/docs/Noise.pdf>

B13. Is there a definitive or exemplar study available regarding the health and wildlife impacts, both positive and negative?

Response: The *Journal of Wildlife Management* published a study called "Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document", which assesses the potential impacts of wind farms on bird and bat populations, looks at fatality rates of these species, determines the causes of these deaths, and recommends methods to reduce future mortality. This study can be accessed at http://www.nationalwind.org/assets/publications/Nocturnal_MM_Final-JWM.pdf.

Also see responses to questions B2, B3 and B12.

B14. What is the typical time period that environmental studies cover? One year to cover spring and fall migration—nesting and breeding periods?

Response: The time period covered by environmental studies and environmental impact assessments varies from place to place, and depends on what is being researched and the amount of time and space under study. According to the authors of "Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document", construction surveys, which are conducted by developers to assess the impact of their wind farms, are often carried out in less than a full or active season. However, depending on the given species being studied, one season or one year of data may not provide enough information or observations about potential impacts. This document is available at http://www.nationalwind.org/assets/publications/Nocturnal_MM_Final-JWM.pdf.

B17. We only have a few bald eagles. What can be done to protect them?

Response: There have been numerous recommendations proposed for ways to reduce raptor collision rates with wind turbines, many of which are being employed on new and developing wind farms. Pre-construction evaluation of proposed wind farms can help predict and avoid much of the potential for harm; considerations like location, structure, and design can all have a significant affect. For instance, it appears that siting turbines out of raptor habitats, building wind farms in areas of low prey density, painting the blades of the turbine with a distinct pattern, or using newer and larger models can all reduce the danger to raptors. For more information on potential mitigation strategies, see the "Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions" report. This report is accessible at [https://www.nationalwind.org/assets/publications/Birds and Bats Fact Sheet .pdf](https://www.nationalwind.org/assets/publications/Birds_and_Bats_Fact_Sheet_.pdf), and was prepared by the National Wind Coordinating Collaborative (NWCC). The mission of the NWCC Wildlife Workgroup is "to identify, define, discuss, and through collaboration address wind-wildlife and wind-habitat interaction issues by seeking broad stakeholder involvement on scientific and public policy questions".

Additionally, the US Fish and Wildlife Service has a "Draft Eagle Conservation Plan Guidance" currently available for public comment. The report has developed a method to calculate compensatory mitigation for the loss of golden eagles caused by wind power. See section F of the report, which is available at http://www.fws.gov/windenergy/docs/ECP_draft_guidance_2_10_final_clean_omb.pdf.

B18. Will the developers apply for a "take" permit for endangered species of birds and bats so they will not be in violation of the Migratory Bird Treaty Act and the Endangered Species Acts?

Response: While the decision to apply for a "take" permit is ultimately up to the wind energy developers, the U.S. Fish and Wildlife Service (USFWS) does allow for non-federal activities which have the potential to

impact endangered species to apply for such a permit. This allows those groups to carry out their projects without technically violating the terms of the Endangered Species Act. The USFWS published the “Habitat Conservation Plan” under Section 10 (a)(1)(B) of the Endangered Species Act, where more information is available about such permits and the circumstances under which one may be granted. That document is available at http://library.fws.gov/Pubs9/hcp_section10.pdf.

B22. Are we allowed to enact ordinances that protect the wildlife habitats currently in our areas?

Response: Yes, subject to the limitations discussed generally in response to Question D1. For an example, see the model wind energy zoning ordinance discussed in D4, which requires that wind turbines be designed to mitigate the impacts on avian and wildlife. In particular, with regard to wildlife, Townships should take care to avoid regulating in areas pre-empted by state or federal law.

B23. Can the township require or make it mandatory that the applicant follow all US fish and wildlife recommendations?

Response: The guidelines published by the USFWS are voluntary, and more specific requirements and regulations are mandated at a local level on a state-by-state basis. These recommendations are “intended to assist Service staff in providing technical assistance to the wind energy industry to avoid or minimize impacts to wildlife and their habitats” (as described in the introductory Memorandum of the “Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines” – available at <http://www.fws.gov/habitatconservation/wind.pdf>). Townships can enact ordinances to protect wildlife. See response to question B22.

B 26. Has the impact of industrial wind farms on beekeeping ever been researched? And what is that impact? Do wind revolving tower blades create a vortex that disorients bees and/or tears their wings?

Response: We have not located any scientific studies on the topic. While we have excluded discussion threads in all other responses, given the general lack of information on this topic, in this case we suggest visiting this discussion thread by amateur beekeepers which discusses the location of hives and how high bees fly. See <http://www.beesource.com/forums/showthread.php?217516-Wind-Farms-Turbines-and-Bees>

B27. Will the towers be lit in a way that will not attract migrating birds? What other protections will be considered for birds?

Response: Studies have shown that tower lights do not increase bird mortality rates. The lights are required by the Federal Aviation Administration for structures above 199 feet to avoid airplane collision with tall structures. The red strobe-like flashing poses no apparent danger to birds or bats. The “Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions” report cites several studies which look further into this phenomenon. This report is accessible at https://www.nationalwind.org/assets/publications/Birds_and_Bats_Fact_Sheet_.pdf, and was prepared by the National Wind Coordinating Collaborative (NWCC). The mission of the NWCC Wildlife Workgroup is “to identify, define, discuss, and through collaboration address wind-wildlife and wind-habitat interaction issues by seeking broad stakeholder involvement on scientific and public policy questions”.

To read more about other mitigation strategies, see the response to question B3.

B28. How many birds die from windmills compared to airplane, automobiles, or window panes?

Response: Although data about how many birds die from human activities is limited, the estimates show that bird deaths from wind farms are significantly lower than deaths from other anthropogenic sources. A study on collision mortality rates in birds puts the actual danger of wind turbines in context by comparing them to other causes of death. Their results are shown in the table below; for the full report, see “A

Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions,” at http://www.fs.fed.us/psw/publications/documents/psw_gtr191/Asilomar/pdfs/1029-1042.pdf. These findings were written by wildlife experts and published in a US Forest Service technical report. It is important to note that turbines do require power lines so those totals are not mutually exclusive.

Summary of predicted annual avian mortality.

Mortality source	Annual mortality estimate	Percent composition
Buildings	550 million	58.2 percent
Power lines	130 million	13.7 percent
Cats	100 million	10.6 percent
Automobiles	80 million	8.5 percent
Pesticides	67 million	7.1 percent
Communications towers	4.5 million	0.5 percent
Wind turbines	28.5 thousand	<0.01 percent
Airplanes	25 thousand	<0.01 percent
Other sources (oil spills, oil seeps, fishing by-catch, etc.)	not calculated	not calculated

B29. What guidelines are being followed regarding effects on wildlife, in particular avian? Is anyone consulting with the national Audubon organization? Reputable sources/best experts must be consulted when any siting decision is made. While the towers may be sited away from regular migration paths, there could be a problem with lights on those towers especially with many towers.

Response: The U.S. Fish and Wildlife Service has a list of recommended guidelines for wind developers in its “Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines” (online at <http://www.fws.gov/habitatconservation/wind.pdf>) and has published a useful draft of its “Land-Based Wind Energy Guidelines” (online at http://www.fws.gov/windenergy/docs/WEG_July_12_%202011.pdf).

While compliance to these guidelines is not required, many states and individual developers choose to follow them in order to lessen the impact on wildlife. Furthermore, a variety of local and national organizations – like the Audubon Society – have suggested ways to reduce the wildlife impact of wind farms (see: “The Michigan Audubon Society Resolution 2008-02: Wind Turbine Generated Electricity,” accessible at <http://www.michiganaudubon.org/file.../9e566586-29a0-4eec-9005-bddade0a9052>). The decision to follow such suggested guidelines is ultimately that of wind developer.