Avian Studies for the Crosswinds Proposed Wind Energy Site: Summary of Fall 2010 Field Season

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Executive summary

The development of wind energy has the potential to significantly reduce the emissions of harmful air pollutants, greenhouse gases, and our reliance on fossil fuels. The majority of the areas with high potential for wind energy generation are near the shorelines of the Great Lake's. These shorelines have also been documented to provide important habitat for wildlife, including migratory songbirds and raptors. Avian collisions with wind turbines have been documented, but the frequency of those collisions is site and situation specific. Informed siting of wind turbines can minimize impacts to birds. Due to the potential for avian collisions with wind turbines we conducted surveys of large birds to better understand the densities of large birds in the Project Area, as well as the species composition, habitat use and flight behaviors. These data will help wind energy developers and resource managers to make appropriate decisions regarding the potential impacts to birds and the methods by which they might reduce those impacts.

We established seven raptor and other large bird viewing station in the Project Area. We conducted 1-hour surveys at the stations in October through mid December 2010. During surveys, each raptor, large bird, and sensitive status species was recorded in addition to the bird's flight path, flight direction, approximate flight altitude, and the distance to each bird from the observer. Technicians also recorded the behavior and habitat use of each bird, and weather characteristics. Examination of the fall 2010 large bird survey data suggests that most species' flight behavior does not put them at frequent risk of collision. The species with the highest frequency of flight at altitudes of risk include American Black Duck, Bald Eagle, and Wood Duck. Waterfowl has demonstrated the ability to avoid turbine areas thereby reducing their risk of collision but increasing the likelihood of displacement from foraging and loafing areas. Bald Eagles were detected, within the rotor-swept area (RSA) of turbines fortunately this species rarely collide with wind turbines, especially when compared to Golden Eagles. Further research should be conducted in the Project Area to ensure that these flight behavior patterns are consistent among years and seasons.

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Introduction

The development of wind energy has the potential to significantly reduce the emissions of harmful air pollutants, greenhouse gases, and our reliance on fossil fuels. The U.S. Department of Energy has a goal of 10 GW of wind energy deployment in Michigan by the year 2030. The majority of the areas with high potential for wind energy generation are near the shorelines of the Great Lakes. These shorelines have also been documented to provide important habitat for wildlife, including migratory songbirds and raptors. Shoreline areas have been suggested to be important as stopover sites for Neotropical migratory birds (Ewert 2006, Diehl et al. 2003) and as concentration or funneling areas for migrating raptors which avoid crossing large areas of water (Kerlinger 1989). Waterfowl (e.g., Common Loon) and waterbirds (e.g., gulls, herons, cranes) also use shoreline areas especially during the breeding and migration seasons. Research across North America has demonstrated a relationship between the densities of birds in an area and the numbers of avian collisions. Avian collisions with wind turbines have been documented but the frequency of those collisions is site and situation specific. Birds that use the airspace within the rotor swept area of a turbine are at risk of a collision and therefore the frequency of avian collisions at turbine sites can be directly correlated to the density of birds in the local area. These data will help wind energy developers and resource managers to make appropriate decisions regarding the potential impacts to birds and the methods in which they might reduce those impacts.

Study Site and Methods

Study site and description

Research was conducted in the Project Area within Tuscola County, located in east-central Michigan, USA (Fig. 1). The land use / land cover of the Project Area consists mainly of agricultural fields (e.g, corn, soybeans, and sugar beets), with some pastures, forested areas, fencerows, and some small wetlands. The natural vegetation in this area is generally described as mesic forests, and wet forests. The forest overstory typically includes components of maple (*Acer* spp.), oak (*Quercus* spp.), ash (*Fraxinus* spp.) and beech (*Fagus grandifolia*). Historically, the eastern inland portion of the Project Area was vegetated with beech-sugar maple forest mixed with black ash swamps. The western portion was predominantly mixed hardwood swamp and areas of mixed conifers with hemlock-white pine. The majority of these areas are now drained for agricultural use (Comer et al. 1995). The western edge of the Project Area is approximately 0.6 – 1.2 miles from the Lake Huron lakeshore (i.e., Saginaw Bay), which is considered by some to be a concentration area for migratory birds. Our Study Area includes the shoreline areas thereby providing a thorough survey effort.

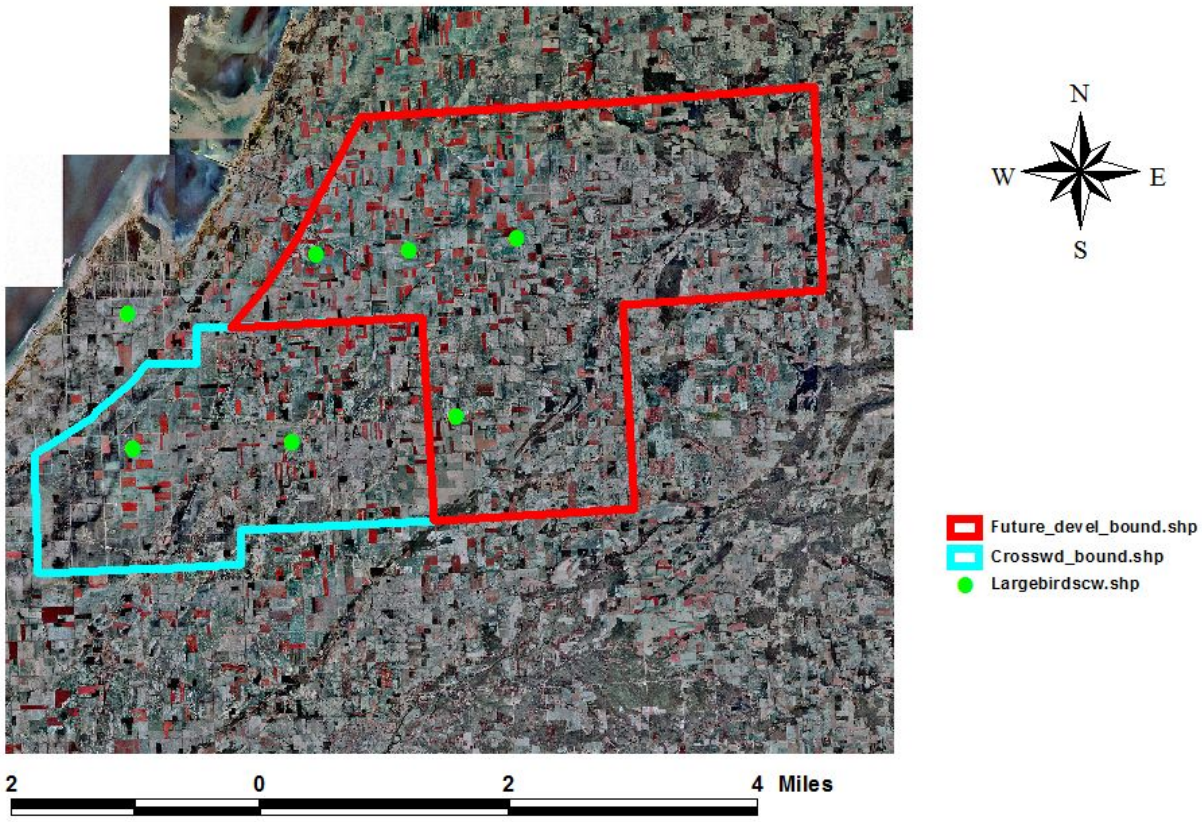

Figure 1. Large bird viewing stations (green dots) were established Tuscola County, MI in and around the Project Area proposed for wind energy development. Large bird surveys were conducted at the viewing stations in the fall of 2010. The Project Area is predominantly agricultural lands with some interspersed forested areas.

Large bird surveys

We established seven raptor and other large bird viewing stations in the Project Area. These stations provided the best possible viewsheds of the proposed project sites (Fig. 1). Following methods similar to those used by Hawkwatch International, we conducted 1-hour surveys at the stations in September – mid December 2010. When conducting outdoor research, some flexibility in scheduling is needed and some surveys were missed due to inclement weather.

During surveys each raptor, large bird, and sensitive status species was recorded in addition to the bird's flight path, flight direction, approximate flight altitude (lowest and highest flight altitude), whether it flew within the proposed project area, and the distance to each bird from the observer. Technicians used landmarks as reference when measuring distance to birds and flight altitude (Fig. 2). Technicians also recorded the behavior and habitat use of each bird. Behavior categories were as follows: perched (PE), soaring (SO), flapping (FL), flushed (FH), circle soaring (CS), hunting (HU), gliding (GL), and other (OT, noted in comments). Any comments or unusual observations were also noted. Weather data were collected in concert with large bird surveys; specifically, temperature, wind speed, wind direction, and cloud cover. The date, start, and end time of observation period, species or best possible identification, number of individuals, sex and age class, distance from plot center when first observed, closest distance, height above ground, activity, and habitat(s) were recorded.

Figure 2. In the fall of 2010 observers surveyed the viewshed for large birds from the viewing stations in the Crosswinds Project Area.

Results and Summary

Large bird surveys – Fall 2010

During the large bird surveys observers detected 23,937 large birds of 20 species. There was a mean of 435.2 birds detected per survey (435.2 birds / hour) (Table 1). The waterfowl group (e.g., Canada Goose, Tundra Swans, ducks) was the most abundant of the bird groups per survey (429.5 birds / survey, 429.5 birds / hour; Tables 2 and 3), followed by the corvids (e.g., American Crow; 4.0 birds / survey, 4.0 birds / hour; Table 2). The raptor group (e.g., hawks, eagles, vultures; 1.4 birds / survey, 1.4 birds / hour, Tables 2 and 3) was the next most common taxonomic group. Mallards and unidentified were the most common waterfowl detected during the surveys (18,337 birds total, 333.4 birds / survey, 333.4 birds / hour, Table 3).

Assuming the potential wind turbine rotor-swept area (RSA) would be 50 – 150 m above the ground, 22% of all birds flew below the RSA, 21% within the RSA, and 57% flew above the RSA. The mean flight altitude of the most common species group, ducks (i.e., mallards, unidentified ducks, Wood Ducks, and American Black Ducks), was 286.3 m with 17% flying below the RSA, 16% within the RSA, and 68% above the RSA. Waterfowl are currently not believed to collide with wind turbines as frequently as some other avian groups, such as raptors. Some waterfowl species have been documented to actually avoid turbines via their flight behavior (Desholm and Kahlert 2006).

Table 1. Large bird abundance and richness in Tuscola County, MI in and around the Project Area proposed for the development of wind energy by Consumer's Energy. Data were collected in the fall of 2010 at a large bird survey site.

	Large Bird Survey
No. Species	20
Mean No. Species / Survey	0.4
Mean No. Species / Hour	0.4
Mean No. Birds / Survey	435.2
Mean No. Birds / Hour	435.2

Table 2. Mean bird abundance in Tuscola County, MI in and around the Project Area proposed for the development of wind energy by Consumer's Energy. Data were collected in the fall of 2010 at a large bird survey site.

Group	Mean Abundance [a]
Waterfowl	429.51
Corvids	4.00
Raptors	1.38
Gulls	0.04
Pheasants	0.13
Wild Turkey	0.16

[a] Mean Abundance = mean number of individuals observed per survey

Table 3. Avian abundance and richness in Tuscola County, MI in and around the Project Area proposed for the development of wind energy by Consumer's Energy. Data were collected in the fall of 2010 at a large bird survey site.

Species	No. Bird	Status
American Black Duck	8	
American Crow	220	
American Kestrel	14	
Bald Eagle	4	State Special Concern
Canada Goose	2234	
Cooper's Hawk	7	
Mallard	8148	
Merlin	6	State Threatened
Northern Harrier	2	State Special Concern
Herring Gull	1	
Ring-billed Gull	1	
Ring-necked Pheasant	7	
Red-tailed Hawk	24	
Rough-legged Hawk	13	
Short-eared Owl	6	State Endangered
Tundra Swan	1049	
Unknown ducks	12019	
Wild Turkey	9	
Wood Duck	16	

Summary of large bird flight behavior in the Project Area

Upon examination of the fall 2010 large bird survey data, it appears that most species' flight behavior did not put them at frequent risk of collisions (Fig. 3). The overlap of flight altitudes and the estimated RSA in the data suggests that Bald Eagles, American Black Ducks, and Wood Ducks were at the highest risk for collision. However, in several locations waterfowl have demonstrated the ability to avoid wind farms (Desholm and Kahlert 2006), making the concern turbine caused displacement of waterfowl from feeding and loafing sites. The majority of the ducks moving through the Project Area were observed flying at higher altitudes than the RSA. Bald Eagles were observed flying within the height of the RSA; however, Bald Eagles rarely collide with wind turbines. Additional data should be collected to ensure that these data are representative of migration in other seasons and years.

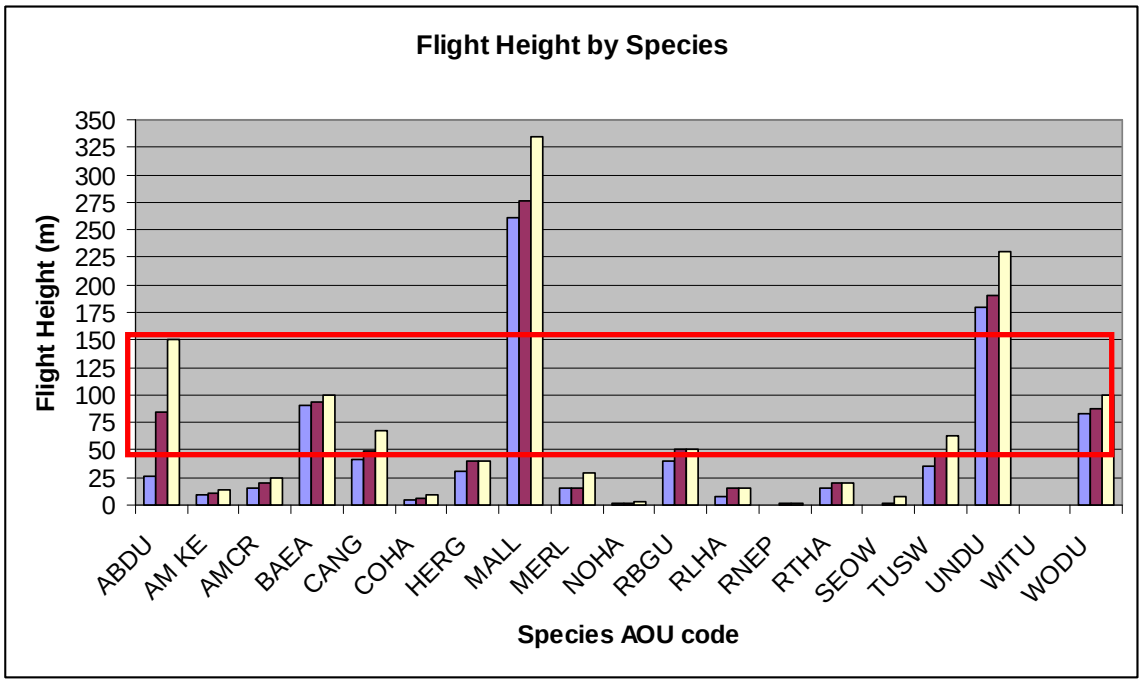

Figure 3. In the fall of 2010 large bird surveys were conducted in Tuscola County, Michigan, in and around the Project Area proposed for the development of wind energy by Consumer's Energy. The AOU species codes are detailed in Appendix A, the top of the blue bars represent the minimum height of flight, the top of the dark red bar represents the mean height of flight, and the top of the cream bar represents the maximum flight height of each species. The horizontal red bar is approximately the rotor swept area of a wind turbine.

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Appendix A. List of bird species observed during bird surveys conducted in Tuscola County, Michigan, in and around the Project Area proposed for wind energy development. These sites were surveyed in 2010 for bird use.

Species[a]	AOU code
Canada Goose	CANG
Mallard	MALL
Wood Duck	WODO
American Black Duck	ABDU
Tundra Swan	TUSW
Wild Turkey	WITU
Ring-necked Pheasant	RNEP
Turkey Vulture	TUVU
Cooper's Hawk	COHA
Red-tailed Hawk	RTHA
Rough-legged Hawk	RLHA
Northern Harrier	NOHA
Bald Eagle	BAEA
American Kestrel	MAKE
Merlin	MERL
Short-eared Owl	SEOW
Herring Gull	HEGU
Ring-billed Gull	RBGU
American Crow	AMCR
Unidentified Duck	UNDU

[a] names of birds follow the AOU Check-list of North American Birds