Large Bird Study for the Garden Peninsula Phase I Wind Energy Site: Summary of Spring 2011 Field Season

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Executive summary

Many areas in Michigan possess winds adequate for the efficient generation of wind energy, especially areas near the shorelines of the Great Lakes. 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. In addition to collision risks, some grassland or open-land bird species are not adapted to using areas near any tall structure, including a wind turbine, and can be displaced. Due to the potential for avian collisions with wind turbines or turbine related avian displacement, we conducted surveys of large birds to better understand the densities of birds in the project areas, 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 collected data at 2 raptor and other large bird viewing stations in the Garden Peninsula Phase I Project Area. We conducted 3-hour surveys at the stations in the spring of 2011. 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 spring 2010 large bird survey data suggests that most species' flight behaviors do not put them at frequent risk of collisions, as the birds detected flew below the RSA. The Project Area had much lower passage rates for raptors than regional designated hawk migration observation sites. However, the Bald Eagle flight paths appear to cover the Project Area and do not appear to be limited to a particular area.

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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, and Michigan has far less than this goal. 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. Songbird collisions with turbines, as well as with other tall structures, are related to the lighting systems of the structure (Gehring et al. 2009). Songbirds can become attracted to non-blinking lights, especially during nocturnal migration; thereby, increasing their risk of collision with any structure

illuminated with these types of lights. Most turbines are lit with Federal Aviation Administration recommended blinking lights which decreases the likelihood of songbirds becoming attracted into the site. 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 at the turbine site.

In addition to collision risks, some grassland or open-land nesting bird species are not adapted to nesting or otherwise using habitat near any tall structure, including a wind turbine (Strickland 2004). These species can be displaced from traditional nesting and foraging areas upon construction of a nearby wind turbine (Leddy et al. 1999).

Due to the potential for avian collisions with wind turbines or turbine related avian displacement from areas previously used we conducted surveys of large birds to better understand the densities of birds in the 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 in which they might reduce those impacts.

Study Site and Methods

Study site and description

Research was conducted in the Garden Peninsula Phase I Project Area in Delta County, located in the upper peninsula of Michigan, USA (Appendix 1). The land use / land cover of the project area is a mixture of agricultural fields (e.g, corn, soybeans, winter wheat), pastures, hay fields, grasslands, and forests (Fig. 1). In the 1800s this area was predominantly vegetated with beech-sugar maple-hemlock forests (Albert 1995). The forest overstory currently includes those species as well as components of white pine (*Pinus strobes*), aspen (*Populus* spp.), and oak (*Quercus* spp.) species. The Project Area is approximately 0.3 - 1.5 miles from the Lake Michigan shoreline (Fig 2).

Figure 1. The Garden Peninsula Phase I Project Area in Delta County, MI includes mowed hayfields, row crops, forests and some grasslands.

Figure 2. The Garden Peninsula Phase I Project Area in Delta County, MI is 0.3 – 1.5 miles from the Lake Michigan shoreline.

Large bird surveys

In the spring of 2011 we collected large bird movement data at two viewing stations in the Project Area. These were the same viewing stations used in the spring and fall of 2010. These stations provided the best possible viewsheds of the proposed project sites (Figs. 3 and 4). Following methods similar to those used by Hawkwatch International, we conducted 3-hour surveys at the stations starting in May and completing in late June 2011. When conducting outdoor research, some flexibility in scheduling is needed and some surveys were missed due to dangerous conditions.

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 (Fig. 5). Technicians used landmarks as reference when measuring distance to birds and flight altitude. 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, gender and age class, distance from plot center when first observed, closest distance, height above ground, activity, and habitat(s) were recorded.

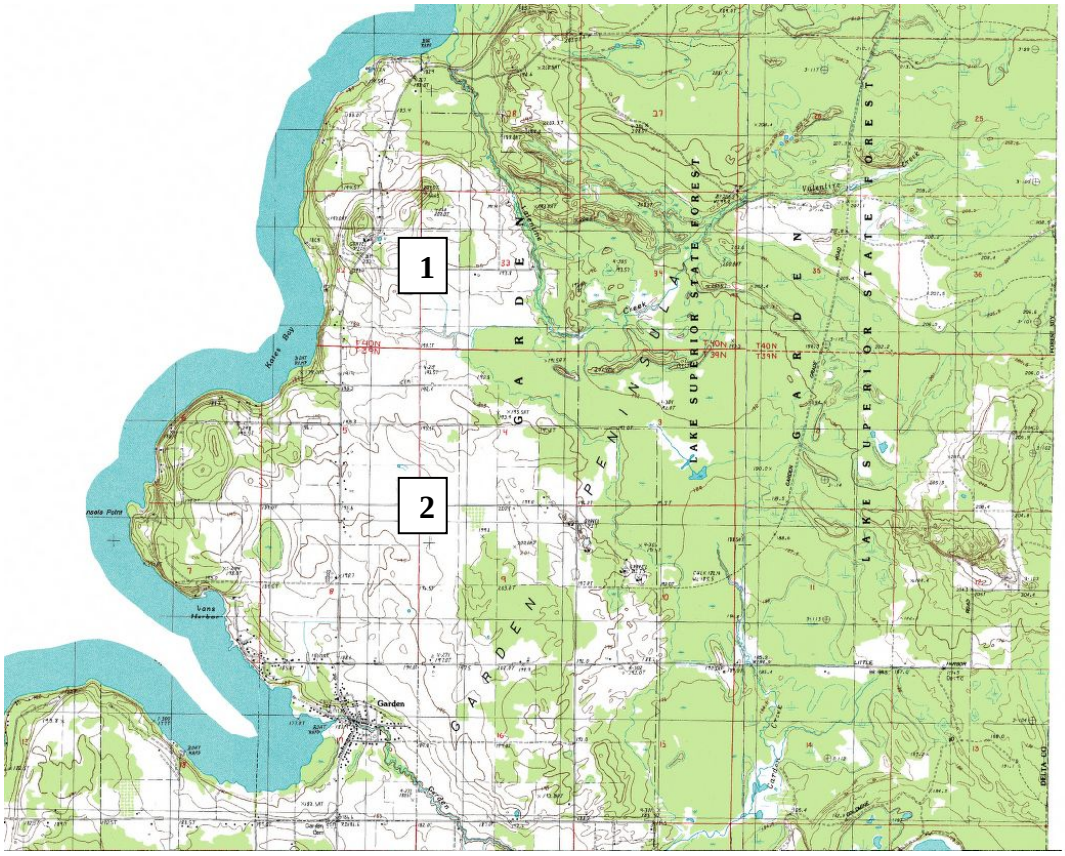

Figure 3. Large bird viewing stations (1 and 2) were established in Delta County, MI in the Garden Peninsula Phase I Project Area. Site 1 was located at 45 degrees 49' 00.36" N 86 degrees 32' 28.46" W and Site 2 was located at 45 degrees 47' 41.99" N 86 degrees 33' 03.08". Large bird surveys were conducted at the viewing stations in the spring of 2011.

Figure 4. Large bird viewing stations (1 and 2) were established in Delta County, MI in the Garden Peninsula Phase I Project Area. Large bird surveys were conducted at the viewing stations in the spring of 2010.

Figure 5. In the spring of 2010 observers surveyed the viewshed for large birds from the viewing stations in the Garden Peninsula Phase I Project Area, Delta County, MI.

Results and Summary

Large bird surveys

During the 15 large bird surveys, observers detected 890 large birds of 9 species. There was a mean of 59.3 birds detected per survey (19.8 birds / hour) (Table 1). The waterbird group (e.g., gulls, herons, cranes) was the most abundant of the bird groups surveyed (48.7 birds / survey, 1.1 birds / hour, Table 2); the waterfowl group (e.g., Canada Goose, ducks was the second most abundant of the bird groups surveyed with 4.7 birds / survey (1.6 birds / hour, Table 2), followed by the corvid group (e.g., American Crows and Common Ravens) with 5 birds / survey, 1.7 birds / hour (Table 2). The Ring-billed Gull was the most common waterbird species detected during the surveys (48.7 birds / survey, Table 3). This species are frequently found in high numbers in close proximity to large waterbodies such as Lake Michigan. Gulls can also be associated with farming practices (e.g., tilling, planting) that expose invertebrates and other food items.

Assuming the wind turbine rotor-swept area (RSA) would be 54 – 146 m above the ground (AGL), 100% of all birds used areas below the RSA, 0% within the RSA, and 0% flew above the RSA (Figure 6). The mean flight altitude of the most common bird species, the Ring-billed Gull, was 3.5 m AGL with 100% flying below the RSA.

Table 1. Large bird abundance and richness in Delta County, MI in the Garden Peninsula Phase I Project Area proposed for the development of wind energy by Heritage Sustainable Energy. Data were collected in the spring of 2011 at large bird survey sites.

	Large Bird Survey Total
No. Species	9
Mean No. Species / Survey	0.6
Mean No. Species / Hour	0.2
Mean No. Birds / Survey	59.3
Mean No. Birds / Hour	19.8

Table 2. Mean bird abundance in Delta County, MI in the Garden Peninsula Phase I Project Area proposed for the development of wind energy by Heritage Sustainable Energy. Data were collected in the spring of 2010 at large bird survey sites.

Group	Mean Abundance [a] Total
Waterfowl	4.7
Waterbirds	48.7
Raptors	0.9
Corvids	5.0

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

Table 3. Species composition in Delta County, MI in the Garden Peninsula Phase I Project Area proposed for the development of wind energy by Heritage Sustainable Energy. Data were collected in the spring of 2010 at 2 large bird survey sites. SC is Special Concern (MNFI 2007)

Species	Total	No. Birds Status
American Crow AMCR	36	
Canada Goose CAGO	70	
Common Raven CORA	39	
Northern Harrier NOHA	3	SC
Northern Goshawk NOGO	1	
Ring-billed Gull RBGU	730	
Turkey Vulture TUVU	9	
Sharp-shinned Hawk SSHA	1	
Wild Turkey WITU	1	
Total	890	

Table 4. Species flight height (upon first observation) distribution in Delta County, MI in the Garden Peninsula Phase I Project Area proposed for the development of wind energy by Heritage Sustainable Energy. Data were collected in the fall of 2010 at 2 large bird survey sites. The estimated Rotor Swept Area (RSA) was 54 m – 146 m above ground level.

Species	Proportion		
	Below RSA	Within RSA	Above RSA
American Crow AMCR	100	0	0
Canada Goose CAGO	100	0	0
Common Raven CORA	100	0	0
Northern Harrier NOHA	100	0	0
Northern Goshawk NOGO	100	0	0
Ring-billed Gull RBGU	100	0	0
Turkey Vulture TUVU	100	0	0
Sharp-shinned Hawk SSHA	100	0	0
Wild Turkey WITU	100	0	0

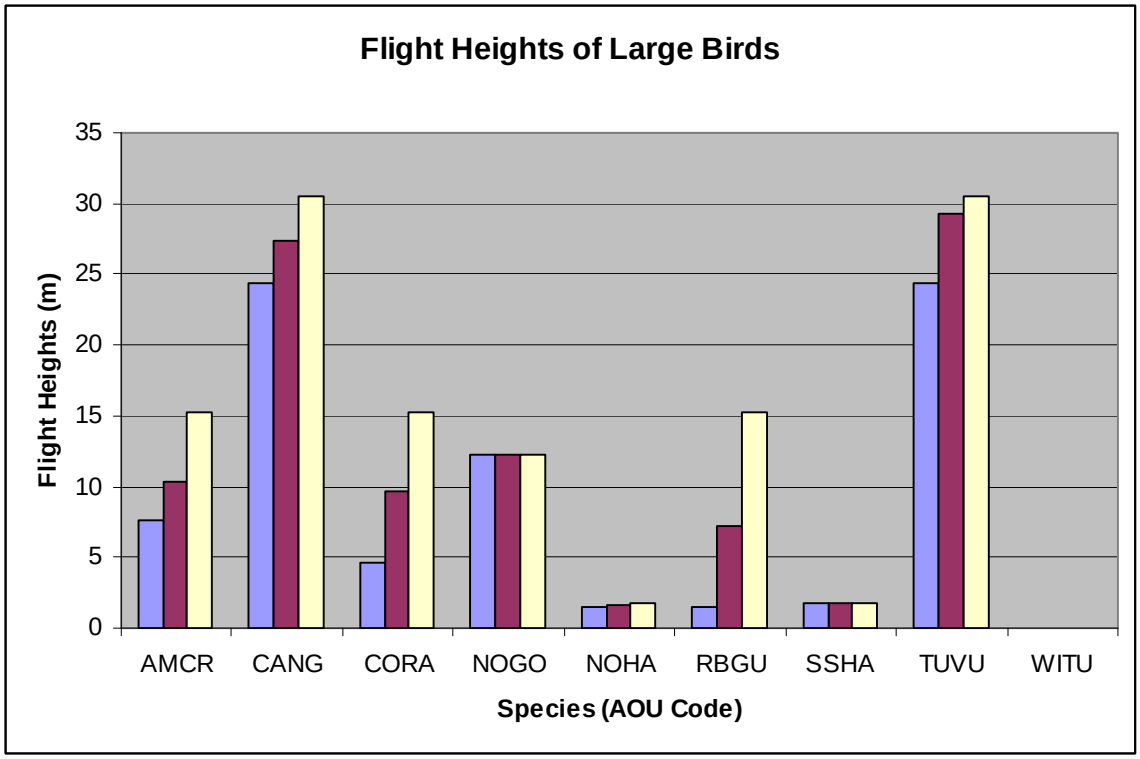

Figure 6. In the spring of 2011 large bird surveys were conducted at two viewing stations in the Garden Peninsula Project Area, Michigan. The AOU species codes are detailed in Table 3, the top of the blue bars represent the minimum height of flight, the top of the dark red bar represents the mean height of flight, and the top of the cream bar represents the maximum flight height of each species.

Summary of large bird flight behavior in the project area

When compared to regional hawk watch sites the numbers of raptors per hour at the Garden Peninsula Project Area (0.3 raptors / hour) is much lower than designated hawk watch sites. Brockway Mountain in the Keweenaw Peninsula of Michigan collected hawk migration data in the spring of 2011 and found that 24.0 raptors / hour flew over the site. In Whitefish Point, MI 65.0 raptors / hour were observed in the spring of 2011.

The spring 2011 large bird survey data demonstrated that the majority of birds (100% of birds observed) flew below the RSA. The prevalence of Ring-billed Gull and Canada Goose observations are related to the proximity to the lakeshore and the birds loafing and foraging in agricultural fields within the Project Area. While our collective understanding of avian collision issues is always increasing, currently waterfowl are not believed to collide with wind turbines as frequently as some other avian groups such as raptors. Some waterfowl species have actually been documented to avoid turbines in

their flight paths (Desholm and Kahlert 2006). The high densities of gulls in the Project Area could lead to an increased risk of collisions, however; all observed gull flights were at a lower altitude than the RSA of the turbines.

The flight altitudes of large birds in the Project Area were generally lower than many other sites studied in Michigan. This could be due to the predominance of high winds which prevents birds from flying at higher altitudes due to the "blowing out" of thermal lift from the ground and/or the birds utilizing mechanical lift created by winds striking and directed up from surfaces on the ground.

Figure 7 delineates the flight paths of 3 species with "special concern" conservation status in Michigan: the Bald Eagle is designated in blue lines, the Northern Harrier flight paths are black, and the Northern Goshawk is in red. These data were collected during all seasons of large bird research in the Garden Peninsula Project Area. The Northern Goshawk activity is concentrated near the forested areas of the Project Area, while the Northern Harrier appears to be near the grassland and open field areas. The Bald Eagle flights are scattered throughout the Project Area and the vegetative cover types. While micrositing of wind turbines has included attempts to avoid grassland habitats and the shoreline, it does not appear that such micrositing would prevent interactions between turbines and Bald Eagle flight paths.

This research provides a better understanding of the species composition and densities of large birds moving through the Project Area as well as the relative level of risk these species may experience if turbines are constructed.

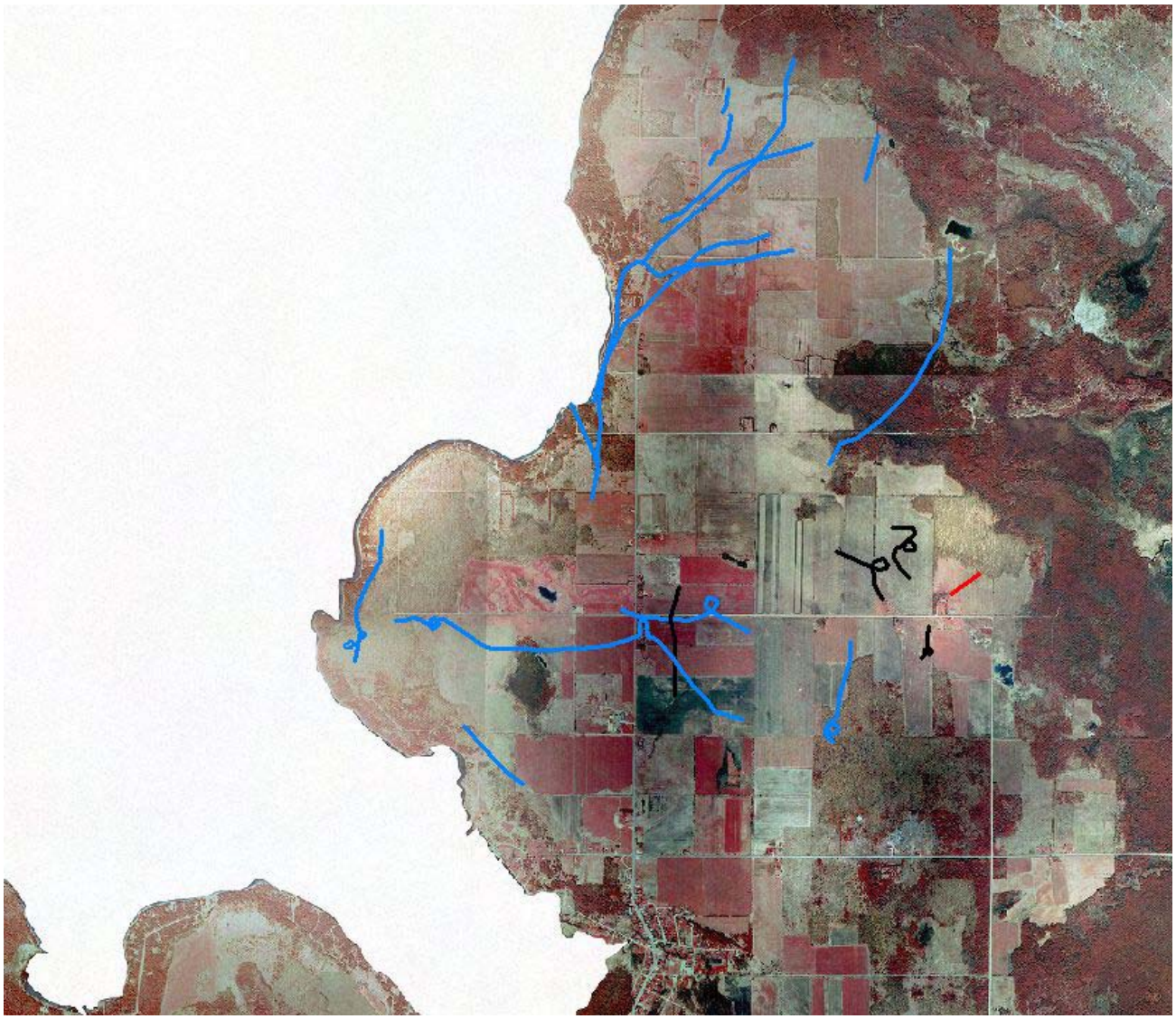

Figure 7. In the 2010 and 2011 large bird surveys were conducted at two viewing stations in the Garden Peninsula Project Area, Michigan. Blue lines represent Bald Eagle flight paths, black lines represent Northern Harrier flight paths, and the red line is a Northern Goshawk flight path.

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Appendix 1. The Delta County, MI, Garden Peninsula Phase I Project Area, is predominantly agricultural lands and hay fields with some interspersed grassland and forested areas.

Layout version 4

Generator lead / Garden Sub to ATC sub

21 22 29 28 27 20th Ln alt 1 2 32 19.5 Ln 33 34 3 4 alt N 25 18.5 Ln

6 5 00 25 Rd 5 4 6 14 3 7 18th Rd 8 alt 9 10 11 15 7 17.5 Rd 8 12 13 9 10 Oo Ln 17th Rd Winter St 18 17 16 Rp Rd 15

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