Bird Collision Study for the White Pines Wind Farm:
Summary of 2005, 2006, 2007, and 2008 Field Seasons

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Introduction

Avian fatalities have been documented at towers for over 50 years (Aronoff 1949; Bernard 1966; Shire at al. 2000). Past research suggests that birds, primarily night-migrating neotropical songbirds, become disoriented when night skies are overcast or cloud/fog enshrouded and are then attracted to the lights of tall structures, such as communication towers (Larkin 2000). Bird collisions with unlit towers appear to be less frequent; however, little experimental research exists on this topic.

This study investigated the collision mortality of birds at a guyed meteorological tower at the proposed White Pines Wind Farm Project, in Mason County Michigan. Results of 4 years of searches for carcasses are summarized in this report.

Study Site and Methods

Tower Site and Description

Research was conducted at meteorological tower located in Mason County, in western Michigan. As part of the proposed wind-energy facility a meteorological monitoring tower was constructed approximately three-quarters of a mile (1.2 kilometers) from the eastern shore of Lake Michigan. The tower is less than 200 ft (<61 m) above ground level (AGL), unlit, and supported by guy wires. Birds occasionally collide with tall structures during migration and daily movements, with taller (>984 ft; 300 m AGL) lit towers, supported by guy wires are involved in significantly more bird fatalities than shorter, unlit, guyless towers (Gehring and Kerlinger 2007). Most collisions with taller structures are thought to occur during migration,

The area is primarily forested with interspersed fallow fields. Vegetation in this area is generally described as dry northern forest. The forest overstory typically includes components of jack pine (*Pinus banksiana*) and oak species (*Quercus* spp.), with an understory of bracken fern (*Pteridium aquilinum*). The topography is relatively flat.

Carcass searches

Carcass searches were conducted during spring and fall migration in 2005 and 2006, and during spring migration in 2007 and 2008. The spring 2005 field season was May 7 (after meteorological tower erected) to May 31, and in the fall data collection took place August 15 to October 15. In 2005, during the peaks of spring and fall migrations, observers sampled for 29 and 59 consecutive days, respectively. In 2006, searches were conducted approximately every three days during the season peaks of spring (April 1 - May 31) and fall (July 1 - October 15) migrations. In 2007 and 2008, searches were conducted approximately every three days during peak spring migration (April 1 - May 31).

Observers arrived at the tower in the mornings in an effort to prevent diurnal and crepuscular scavengers from removing carcasses. Using flagged, straight-line transects, technicians walked at a rate of 148-197 ft (45-60 m) per minute and searched for carcasses within 16.4 ft (5 m) on either side of each transects (Gehring 2004; Erickson et al. 2003). Transects covered a circular area under each tower with a radius equal to 90% of the height of the tower. Bird carcasses were placed in plastic bags, and the following information was recorded: tower identification number, date, closest transect, distance from tower, azimuth to the tower, estimated number of days since death, and observer's name. Once bagged and labeled, carcasses were frozen for later identification and verification of species. The appropriate US Fish and Wildlife Services (USFWS) and Michigan Department of Natural Resources (MDNR) permits were maintained, and Institutional Animal Care and Use Committee protocol approval (#07-03) via Central Michigan University (CMU) was secured for the collection, transport, and storage of the carcasses.

Observer detection and carcass removal trials

It is inevitable that observers did not observe all bird carcasses under the meteorological monitoring tower due to dense vegetation, observer fatigue, human error, and scavenging by predators. Failure to find bird carcasses could underestimate the documented bird mortality at towers. Therefore, it was necessary to quantify each technician's observer detection rate and the rate of carcass removal (Erickson et al. 2003). Observer detection trials were conducted with technicians at the tower once during each field season. By arriving at the site before observers and placing a known number of bird carcasses within each observers' search area, the proportion of bird carcasses found or observed by field technicians was quantified (Erickson et al. 2003). During each trial, 10 bird carcasses were placed randomly within the tower search area. For observer detection trials, bird carcasses representing a range in size and colors, but predominantly brown-headed cowbirds (*Molothrus ater*) painted to simulate the plumage of migrating songbirds, were used. Bird carcasses used for observer detection trials were also painted with an "invisible" paint that glowed fluorescent colors when viewed under a black light. When analyzing the study data, the "invisible" paint prevented any confusion between birds that had collided with the towers and birds placed in the plots for observer detection trials.

Similarly, technicians placed 10-15 brown-headed cowbird carcasses near the tower's search area and monitored the removal (e.g., scavenging) of carcasses daily during the study period. Using these data a scavenging or removal rate was calculated (Erickson et

al. 2003). Brown-headed cowbirds used in the removal trials were not painted, as this foreign scent might have prevented scavengers from removing carcasses. Both observer detection trial birds and removal trial birds were placed in a range of habitats characteristic of the individual tower search area.

Results

2005

Over 101 days observers found two birds determined to be killed during the study period (Table 1). The white-throated sparrow (*Zonotrichia albicollis*) was found during the spring season and the Lincoln's sparrow (*Melospiza lincolnii*) during the fall. The observer detection rates were 0.5 and 0.3 birds located per survey for the spring and fall, respectively. Carcasses remained on the ground for a mean of 12.14 days (multiplier = 1.10).

2006

During the spring and fall carcass searches at the meteorological monitoring tower observers found two birds determined to be killed during the study period (Table 1): Baltimore oriole (*Icterus galbula*) and an unidentified warbler. Both species were found during searches in the spring of 2006.

2007

During the carcass searches conducted during the spring migration season at the meteorological monitoring, observers found three birds determined to be killed during the study period (Table 1): eastern wood-pewee (*Contopus virens*), eastern meadowlark (*Sturnella magna*), and yellow-rumped warbler (*Dendroica coronata*). The observer detection trails quantified that observers found 70% of the carcasses at the site.

2008

The meteorological monitoring tower was searched for carcasses during the spring migration season of 2008. Five bird carcasses were detected at the site (Table 1): bufflehead (*Bucephala albeola*), Northern waterthrush (*Seiurus noveboracensis*), yellow-rumped warbler, savannah sparrow (*Passerculus sandwichensis*), and an unidentified passerine (scavenged and unrecognizable). The observer detection rate at the site was 0.6 birds located per search and carcass removal trials determined that carcasses remained on the site for 6.5 days.

Table 1. Bird mortalities at a meteorological monitoring tower in Mason County, Michigan, during the spring and fall of 2005 and 2006, and the spring of 2007 and 2008.

Bird Species[a]	Numbers of carcasses found
2005	
white-throated sparrow (*Zonotrichia albicollis*)	1
Lincoln's sparrow (*Melospiza lincolnii*)	1
2005 Subtotal	**2**
2006	
Baltimore oriole (*Icterus galbula*)	1
unidentified warbler	1
2006 Subtotal	**2**
2007	
Eastern wood-pewee (*Contopus virens*)	1
Eastern meadowlark (*Sturnella magna*)	1
yellow-rumped warbler (*Dendroica coronata*)	1
2007 subtotal	**3**
2008	
bufflehead (*Bucephala albeola*)	1
Northern waterthrush (*Seiurus noveboracensis*)	1
yellow-rumped warbler (*Dendroica coronata*)	1
savannah sparrow (*Passerculus sandwichensis*)	1
unidentified warbler	1
2008 subtotal	**5**

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

Discussion/Conclusions

It is important to note that the number of bird fatalities at this unlit structure will not necessarily be indicative of the numbers of fatalities at turbine structures. Turbines are frequently a source of fatality for bats in addition to birds (Johnson and Arnett 2004); however, bats are rarely found under communication towers or meteorological towers. To accurately estimate bird and bat fatalities at turbines, post-construction carcass searches will need to be conducted.

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