Sandhill Crane (*Grus canadensis*) Collisions with Wind Turbines in the Southern High Plains of Texas

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ABSTRACT

During a study designed to evaluate behavioral effects of wind farms in the Texas High Plains(2009-2011), two crane collisions with wind turbines were observed. Wind farms are ideally situated along wind corridors in rural agricultural area which often puts them in direct conflict with migrating and wintering birds. Cranes are susceptible to collision due to high wing loading, large body size and the tendency to fly in large flock size. This susceptibility is exacerbated when wind farms are placed in placed in areas where wintering cranes are flying daily between roosting and foraging sites. As wind farms increase along migration corridors, cranes and other migrating birds will have to navigate through ever increasing densities of wind turbines.

INTRODUCTION

The High Plains of the United States are slated for a large increase in wind energy generation sites over the next 20 years, as part of the Obama-Biden New Energy for America Plan goal of 30% of Americas electricity coming from renewable sources by 2030 (American Wind Energy Association 2008). This area also coincides with the central North American Flyway used by a number of species of birds, some with large bodies and high wing loading like Sandhill Cranes (*Grus canandensis*), Whooping Cranes (*Grus americana*) and various species of waterfowl. Species such as these tend to be more vulnerable to mortality from wind turbine strikes than birds with a lower wing loading (Bevenger 1998).

Texas accounts for one-third of the United States' wind power generation (American Wind Energy Association 2008) and this is expected to increase. Eighty percent of the midcontinent Sandhill Crane population migrates to north-western Texas every winter (Iverson et al. 1985) and 100% of the only North American Whooping Crane wild self-sustaining population migrates through northern Texas to winter along the coast of the Gulf of Mexico (Stehn 2010), putting both populations at risk for turbine collisions.

Whooping cranes are a critically endangered species. Previous research shows that Sandhill Cranes and Whooping cranes use their migratory habitat in a similar manner (Kauffeld 1981, Armbruster 1990); hence, Sandhill Cranes should be an appropriate surrogate to study for the potential impacts of wind energy on whooping cranes, at least through migration, but possibly also for their use of winter habitat. As the number of wind turbines and associated structures like power lines expands across the landscape, cranes will increasingly come into contact with this infrastructure. Cranes are susceptible to mortality from running into power lines and other large obstacles (Windingstad. 1988, Brown and Drewien 1995, Bevanger 1998). Hence, mitigation and planning for wind energy development may need to be done to protect those cranes from further mortality. This mortality, especially for the whooping crane, which is critically endangered, could have serious population level consequences.

We document Sandhill Crane mortality from cranes flying into wind turbines in the southern high plains of Texas. We recorded weather conditions and time of day. This information can be used as a basis for further study of crane risk to wind energy infrastructure.

METHODS

We recorded Sandhill crane presence and behavior in the Texas High Plains, in Carson, Floyd, Crosby and Dickens counties, over the winters (October – February) of 2009-2010 and 2010-2011. This area is extremely flat and scattered with playa wetlands (elevation range 1000 to 1500 m) and is a large agricultural region producing corn, milo (sorghum), cotton, and winter wheat. Cranes use this area during migration and part of winter, foraging in the agricultural areas and roosting at night in the playas.

We surveyed the area using 174 km of road transects. The Texas panhandle is extremely flat with few visual obstructions, so crane flocks could often be spotted more than a kilometer away. This project was part of a study evaluating crane behavior in response to wind turbines, so the transect surveys were designed for detection of crane flocks and scan sampling of behavior. We recorded time and weather conditions including air temperature, wind speed, relative humidity (Kestrel 3000, Champlain, NY), cloud cover and precipitation.

RESULTS

We documented a Sandhill Crane strike at the Llano Estacado wind farm (approximate location 14 S 297542 3924893) on 23 November 2009 at 10:00 (daylight savings time, Central time zone). It was 12.8 C (55 F), relative humidity 80%, and foggy with 90% cloud cover. Visibility was limited. Winds averaged 8.2mph, gusting to 12.4 mph.

The second strike occurred at the Pantex Wind Farm (approximate location 14S 268556 3919797) on 24 November, 2010 at 09:30 (daylight savings time, Central time zone). The impact occurred approximately 800 m away from a consistently used roosting playa for cranes and geese (October and November 2010). It was 9.4 C (49 F) relative humidity 64%, with 40% cloud cover. Visibility was limited. Winds averaged 6.8 mph, gusting to 13.4 mph.

DISCUSSION

These impacts occurred in the foraging and roosting areas of the Sandhill Crane's migration and wintering habitat. During fall, Sandhill Cranes migrate south into north western Texas, moving between playas and stopping to feed at an unhurried pace (Iverson et al. 1985). They remain at the playas until they are dry or frozen, at which time most move to the saline lakes in the Texas High Plains (David Haukos, USFWS, Personal communication).

There are a number of factors besides basic physiology (Bevanger 1998) that may increase crane susceptibility to mortality from wind turbine strike. Good turbine locations and migratory corridors tend to occur in the same areas because of the favorable wind conditions (Sugimoto and Matsuda 2011). Wind farms that are placed in areas that are used regularly by large number of species for feeding and roosting on migratory routes, or local flight routes between foraging and roosting areas present a greater risk to the species that occupy the area (Drewitt and Langston 2008, Everaert and Stienen 2006,). As the number of wind farms increase in the central U.S., cranes and other birds will be forced to navigate though increasing densities of wind turbines. Specific species also have a higher susceptibility to collision than others. Gregarious species, such as the Sandhill Crane, seem to be more prone to collisions, due to greater concentrations of birds and lower levels of attention shown when following a lead bird (Pattersson 2005). Birds which make local movements between roosting and foraging sites tend to fly at a lower altitude than migrating birds which also increases the susceptibility of collisions (Drewitt & Langston 2008).

Visibility likely played a large role in the crane strikes we witnessed. Birds which habitually fly at dawn and dusk between foraging and roosting sites, such as the sandhill crane, are less likely to detect the wind turbines (Larsen & Clausen 2002). Others suggest that crane flight speed is so slow that they may be able to detect and avoid turbines (Cooper 2006, McCarthy 2009). Our observations suggest that this may not be the case during poor weather conditions. Inclement weather patterns that reduce visibility may increase the frequency of turbine strikes (Drewitt and Langstron 2008, Martin 2011). Furthermore, many birds do not have a high resolution directly in front of them (Martin 2011), likely further exacerbating the problem.

Time of year may have been a factor in the mortalities we recorded as well (Bevanger 1998). Others have documented larger numbers of bird strikes during fall migration as compared to other times of the year (Faanes 1987, Crawford and Engstrom 2001). This is a time of year when migratory birds may be more unfamiliar with their environment, increasing the risk of mortality from obstacles (Drewitt and Langstron 2008).

These are observations that occurred during sampling for other objectives. Intensive sampling for mortalities was not conducted, so we cannot calculate the mortality on a per-turbine or per-wind farm approach. This work suggests that turbine mortality surveys for cranes in the migratory and wintering habitat should be conducted, likely for both Sandhill Cranes and Whooping cranes, which use habitat during migration in a similar manner (Kauffeld 1981, Armbruster 1990).

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