Assessing Direct Impacts to Avifauna at Wind Energy Facilities in the Dakotas

Bianna J. Graff, Troy W. Grovenburg, Kent C. Jensen, and Jonathan A. Jenks

INTRODUCTION
- The Northern Great Plains (NGP) contains most of the remaining temperate grasslands, an ecosystem that is the most converted and least protected in the world.
- NGP holds strong wind energy potential but the effects of wind energy on resident and migratory avifauna are poorly studied.
- South Dakota (SD) and North Dakota (ND) rank 5th and 6th, respectively, in wind energy resource potential, and each state is capable of producing over 200 times its current energy usage (American Wind Energy Association 2014).
- Within the NGP, the Prairie Pothole Region (PPR) is the main breeding area for a majority of the waterfowl and grassland songbirds in the USA.

OBJECTIVES
1. Evaluate influence of landscape composition on potential wind turbine-related direct mortality to migratory and resident birds in the south-central Missouri Coteau during migration and nesting period prior to June 1. We will concentrate only on spring migration and nesting period because of its importance to production of young.
2. Evaluate the influence of nesting density on wind turbine-related direct mortality of raptors in the northern Great Plains.
3. Identify migratory and resident bird species most at-risk in the Missouri Coteau to mortality from wind-turbine strikes.

STUDY AREA
Edgeley-Kulm Wind Farm (EKWF)
- NextEra Energy Resources
- Commissioned in 2003
- LaMoure County, ND
- 41 1.5-MW turbines
- Over 90% of turbines located in agriculture
- Actiona Wind Company
- Commissioned in 2008
- Dickey County, ND and McPherson County, SD
- Largest wind facility in ND and SD
- 120 1.5-MW turbines
- Over 90% of turbines located in grassland

RESULTS
- We completed 3,398 turbine searches with 144 avifauna mortalities found. Of these, 92 were included in the analysis, representing 33 species. The remaining 52 carcasses were considered non-turbine strike or non-spring mortality events.
- Carcasses were found between 4 m and 72 m from the turbine and included waterfowl (62%), passerines (21%), waterbirds (5%), shorebirds (4%), and bats (2%).
- For both farms over both years, the average large bird (>38cm) detection rate was 67% (0.06 SE) while the average small bird (<38cm) detection rate was 24% (0.05 SE).
- After adjusting for detection rates, we estimated spring avifauna mortality at TAWF to be 303 birds in 2013 and 171 birds in 2014. Adjusted estimates for the EKWF were 62 birds in 2013 and 52 birds in 2014.
- Mortality rates (fatalities/MW/year) between the farms did not differ in 2013 (t1,2 = 0.46, P = 0.33) or 2014 (t1,2 = 0.85, P = 0.20), even though TAWF is predominantly grassland and EKWF is row-crop agriculture. The number of species killed at TAWF (n = 30) was greater (412, 11.31, P < 0.001) than at EKWF (n = 9).
- We averaged the number of carcasses found in the last 10 weeks of field season both years and then extrapolated that number for the summer and fall migration period (31 weeks total; 1 Apr to 31 Oct) to estimate partial-year mortalities.
- We estimated partial-year mortality to be 2.92 (SE = 0.36) fatalities/MW/year at TAWF and 3.62 (SE = 0.78) fatalities/MW/year at EKWF.

DISCUSSION
- Although mortality rates for most species were low, many migratory bird populations are declining (North American Bird Conservation Initiative 2014), and any wind energy mortality may be cause for additional concern.
- Our mortality estimates were higher than the Great Plains overall estimate of 1.81 fatalities/MW/year (Loss et al. 2013) and estimates at the Altamont Pass in California (1.51–2.82 fatalities/MW/year; Johnson et al. 2002), but within range of estimates at Buffalo Ridge in Minnesota (2.86–5.93 fatalities/MW/year; Johnson et al. 2002).
- We did not find any state or federal threatened or endangered species, however, we did find 14 Species of Concern that are listed as being in management or conservation concern in ND, SD, or federally.
- Over 800 turbines are proposed for this four county area, meaning an estimated additional 3600 fatalities/year. Proper siting and management is necessary to mitigate impacts to sensitive species and populations.

LITERATURE CITED

MANAGEMENT IMPLICATIONS
- Our fatality counts and mortality estimates indicate that wind energy operations on the NGP and in the PPR have the capacity to directly affect many avian species.
- Future siting of wind facilities should focus on pre-existing disturbed land, such as cropland, outside of major migration pathways to mitigate impacts to avifauna species, especially those of conservation and management concern.

MANAGEMENT IMPLICATIONS
- Our fatality counts and mortality estimates indicate that wind energy operations on the NGP and in the PPR have the capacity to directly affect many avian species.
- Future siting of wind facilities should focus on pre-existing disturbed land, such as cropland, outside of major migration pathways to mitigate impacts to avifauna species, especially those of conservation and management concern.

ACKNOWLEDGMENTS
Funding for this research was provided by the United States Fish and Wildlife Service Mountain-Prairie Region through the United States Geological Survey South Dakota Cooperative Fish and Wildlife Research Unit at South Dakota State University. We thank the Department of Natural Resource Management at SDSU for their support and C. Swanson, M. Erickson, R. Klaver, A. Halvorson, R. Schmoke, and A. Kunkel for assistance in the field, as well as the many landowners that allowed access to their land.