Tools for the Mitigation of Habitat-Based Impacts

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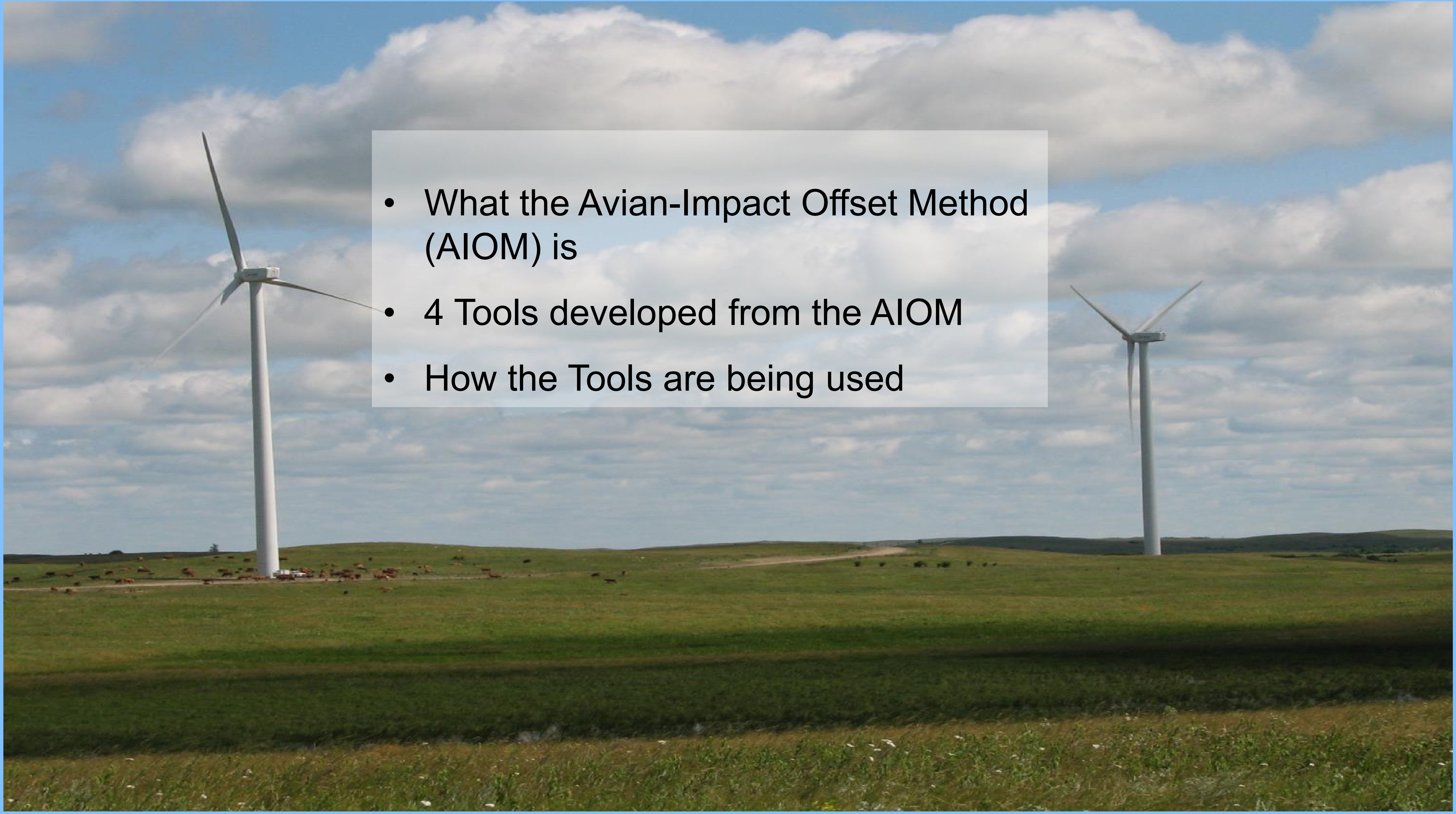
• What the Avian-Impact Offset Method (AIOM) is
• 4 Tools developed from the AIOM
• How the Tools are being used

Estimating offsets for avian displacement effects of **anthropogenic** impacts

Wind

Oil / Gas

Solar

Roads

USGS

4 Tools developed from Shaffer et al. 2019

- The Avian – Impact Offset Method formula

  available in Shaffer et al. 2019

- Tutorial (series of 4 PowerPoints)

  available from jshaffer@usgs.gov

- Worksheets that serve as templates for different mitigation scenarios

  available in Shaffer et al. 2019

- Decision Support Tools to guide the location for mitigation

  available from chuck_loesch@fws.gov

Avian - Impact Offset Method

- A formula
- that determines the displacement impact of anthropogenic disturbances on grassland bird and waterfowl pairs
- by calculating the number of hectares of grasslands and wetlands that would be necessary to support the displaced pairs

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ECOLOGICAL APPLICATIONS
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Shaffer, J. A., C. R. Loesch, and D. A. Buhl. 2019. Estimating offsets for avian displacement effects of anthropogenic impacts. Ecological Applications 29(8):e01983. 10.1002/eap.1983

Tool 1: the AIOM

4 Impact Metrics

Impact Distance	Linear distance for which energy infrastructure influences bird behavior
Impact Area	Buffer zone; i.e., the spatial extent of habitat affected
Pre-Impact Density	Number of birds per hectare; measured prior to impact
Percent Displacement	Percent of birds displaced due to energy infrastructure

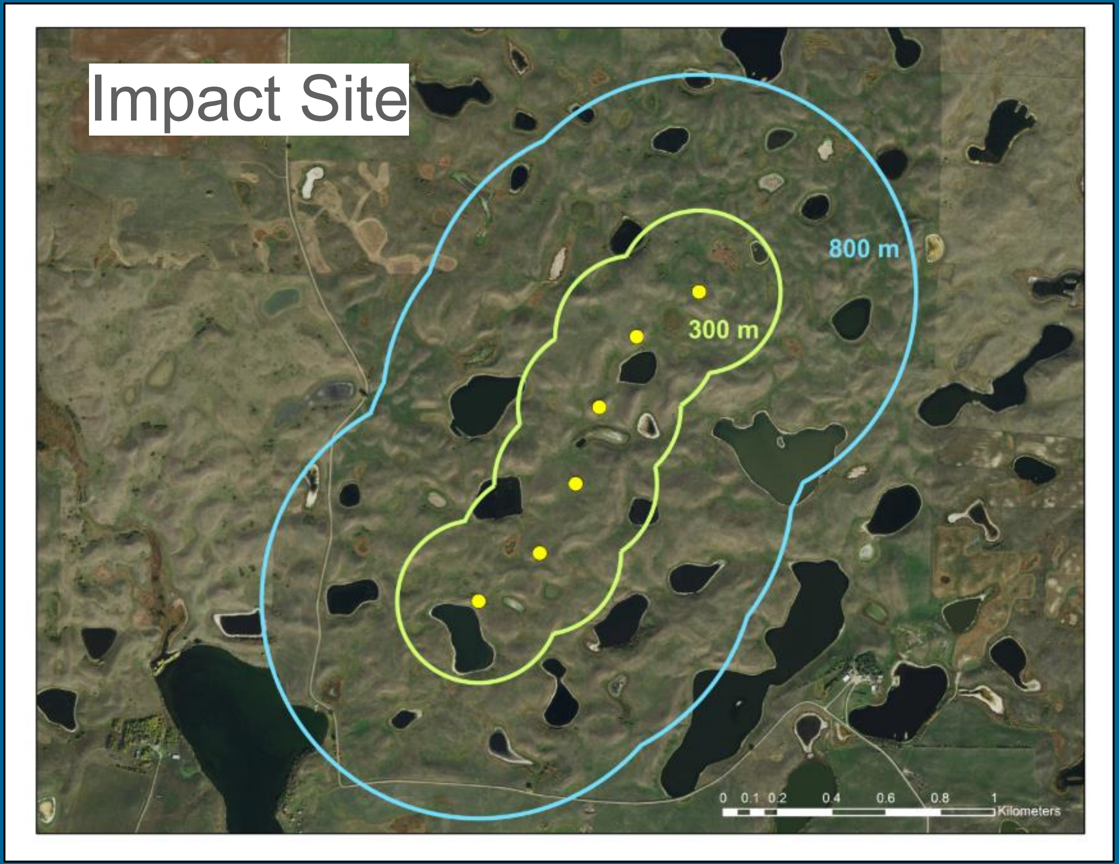
1 Offset Metric

Offset Density	Number of birds per hectare on offset habitat

USGS

Computation of area needed to support displaced pairs of waterfowl

Example of a 6-turbine wind farm in the Prairie Pothole Region



Impact Distance = 800 m

Impact Area (a)

= # of wetlands

109 wetland basins

Pre-Impact Density (d_1)

= # pairs / wetland

1.82 duck pairs

Percent Displacement (r)

= 18%

Grassland Bird Displacement

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Conservation Biology

Contributed Paper

Effects of wind-energy facilities on breeding grassland bird distributions

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Abstract: *The contribution of renewable energy to meet worldwide demand continues to grow. Wind energy is one of the fastest growing renewable sectors, but new wind facilities are often placed in prime wildlife habitat. Long-term studies that incorporate a rigorous statistical design to evaluate the effects of wind facilities on wildlife are rare. We conducted a before-after-control-impact (BACI) assessment to determine if wind facilities placed in native mixed-grass prairies displaced breeding grassland birds. During 2003–2012, we monitored changes in bird density in 3 study areas in North Dakota and South Dakota (U.S.A.). We examined whether displacement or attraction occurred 1 year after construction (immediate effect) and the average displacement or attraction 2–5 years after construction (delayed effect). We tested for these effects overall and within distance bands of 100, 200, 300, and >300 m from turbines. We observed displacement for 7 of 9 species. One species was unaffected by wind facilities and one species exhibited attraction. Displacement and attraction generally occurred within 100 m and often extended up to 300 m. In a few instances, displacement extended beyond 300 m. Displacement and attraction occurred 1 year after construction and persisted at least 5 years. Our research provides a framework for applying a BACI design to displacement studies and highlights the erroneous conclusions that can be made without the benefit of adopting such a design. More broadly, species-specific behaviors can be used to inform management decisions about turbine placement and the potential impact to individual species. Additionally, the avoidance distance metrics we estimated can facilitate future development of models evaluating impacts of wind facilities under differing land-use scenarios.*

Keywords: avoidance, before-after-control-impact design, climate change, displacement, renewable energy, upland birds, wind turbine

Efectos de las Instalaciones de Energía Eólica sobre la Distribución de las Aves de Pastizales en Época Reproductiva

Resumen: *La contribución de la energía renovable para cumplir con las demandas mundiales sigue creciendo. La energía eólica es uno de los sectores renovables con mayor crecimiento, pero continuamente se colocan nuevas instalaciones eólicas en los principales hábitats de fauna silvestre. Los estudios a largo plazo que incorporan un diseño estadístico riguroso para evaluar los efectos de estas instalaciones sobre la fauna son escasos. Realizamos una evaluación de control de impacto de antes y después (CIAD) para determinar si las instalaciones eólicas colocadas en praderas de pastos mixtos nativos desplazaron a las aves de pastizales en época reproductiva. Durante el periodo 2003-2012, monitoreamos los cambios en la densidad de aves en tres áreas de estudio en Dakota del Norte y del Sur (E.U.A). Examinamos si había ocurrido desplazamiento o atracción un año después de la construcción (efecto inmediato) y también el promedio de desplazamiento o atracción 2-5 años después de la construcción (efecto retardado). Analizamos estos efectos en general y dentro de franjas de distancia de 100, 200, 300 y >300 m de las turbinas. Observamos desplazamiento en siete de las nueve especies. Una especie no fue afectada por las instalaciones eólicas y una especie mostró atracción. El desplazamiento y la atracción ocurrieron generalmente dentro de los 100 m y frecuentemente se extendieron hasta los 300 m. En algunos casos, el desplazamiento se extendió más allá de los 300 m. El desplazamiento y la atracción ocurrieron un año después de la construcción y continuaron durante por lo*

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USGS

Waterfowl Displacement

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Management and Conservation

Effect of Wind Energy Development on Breeding Duck Densities in the Prairie Pothole Region

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ABSTRACT Industrial wind energy production is a relatively new phenomenon in the Prairie Pothole Region and given the predicted future development, it has the potential to affect large land areas. The effects of wind energy development on breeding duck pair use of wetlands in proximity to wind turbines were unknown. During springs 2008–2010, we conducted surveys of breeding duck pairs for 5 species of dabbling ducks in 2 wind energy production sites (wind) and 2 paired reference sites (reference) without wind energy development located in the Missouri Coteau of North Dakota and South Dakota, USA. We conducted 10,338 wetland visits and observed 15,760 breeding duck pairs. Estimated densities of duck pairs on wetlands in wind sites were lower for 26 of 30 site, species, and year combinations and of these 16 had 95% credible intervals that did not overlap zero and resulted in a 4–56% reduction in breeding pairs. The negative median displacement observed in this study (21%) may influence the prioritization of grassland and wetland resources for conservation when existing decision support tools based on breeding-pair density are used. However, for the 2 wind study sites, priority was not reduced. We were unable to directly assess the potential for cumulative impacts and recommend long-term, large-scale waterfowl studies to reduce the uncertainty related to effects of broad-scale wind energy development on both abundance and demographic rates of breeding duck populations. In addition, continued dialogue between waterfowl conservation groups and wind energy developers is necessary to develop conservation strategies to mitigate potential negative effects of wind energy development on duck populations. © Published 2012. This article is a U.S. Government work and is in the public domain in the USA.

KEY WORDS *Anas discors, A. platyrhynchos*, blue-winged teal, breeding population, mallard, Prairie Pothole Region, wind energy development, wind turbines.

Millions of glaciated wetlands and expansive grasslands make the Prairie Pothole Region (PPR) the primary breeding area for North America's upland nesting ducks (Batt et al. 1989). Wetland and grassland loss in the PPR due to settlement and agriculture has been extensive (Dahl 1990, Mac et al. 1998), and conversion to agriculture continues to reduce available habitat for breeding waterfowl and other wetland- and grassland-dependent birds (Oslund et al. 2010, Claassen et al. 2011). During recent years, anthropogenic impacts in the PPR have expanded to include energy development (e.g., wind, oil, natural gas; see Copeland et al. 2011: table 2.1). From 2002 to 2011, industrial wind energy production has increased 1,158% (i.e., 769–9,670 MW), 205% during the past 5 years (United States Department of Energy [USDOE] 2011). Impacts from wind energy development including direct mortality from strikes and avoidance of wind towers and associated infrastructure have been widely documented for many avian species, including raptors, passerines, upland gamebirds, shorebirds, and waterfowl, as well as bats (Drewitt and Langston 2006; Arnett et al. 2007, 2008; Kuvlesky et al. 2007).

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Conclusions from Displacement Research

Average 53% displacement of breeding pairs (5-yr. post)

Average 18% displacement of breeding pairs

Chestnut-collared Longspur
Calcarius ornatus

Clay-colored Sparrow
Spizella pallida

Upland Sandpiper
Bartramia longicauda

Bobolink
Dolichonyx oryzivorus

Grasshopper Sparrow
Ammodramus savannarum

Savannah Sparrow
Passerculus sandwichensis

USGS