Environmental
& Statistical
Consultants

Prairie Grouse and Wind Energy Development

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04.23.2014

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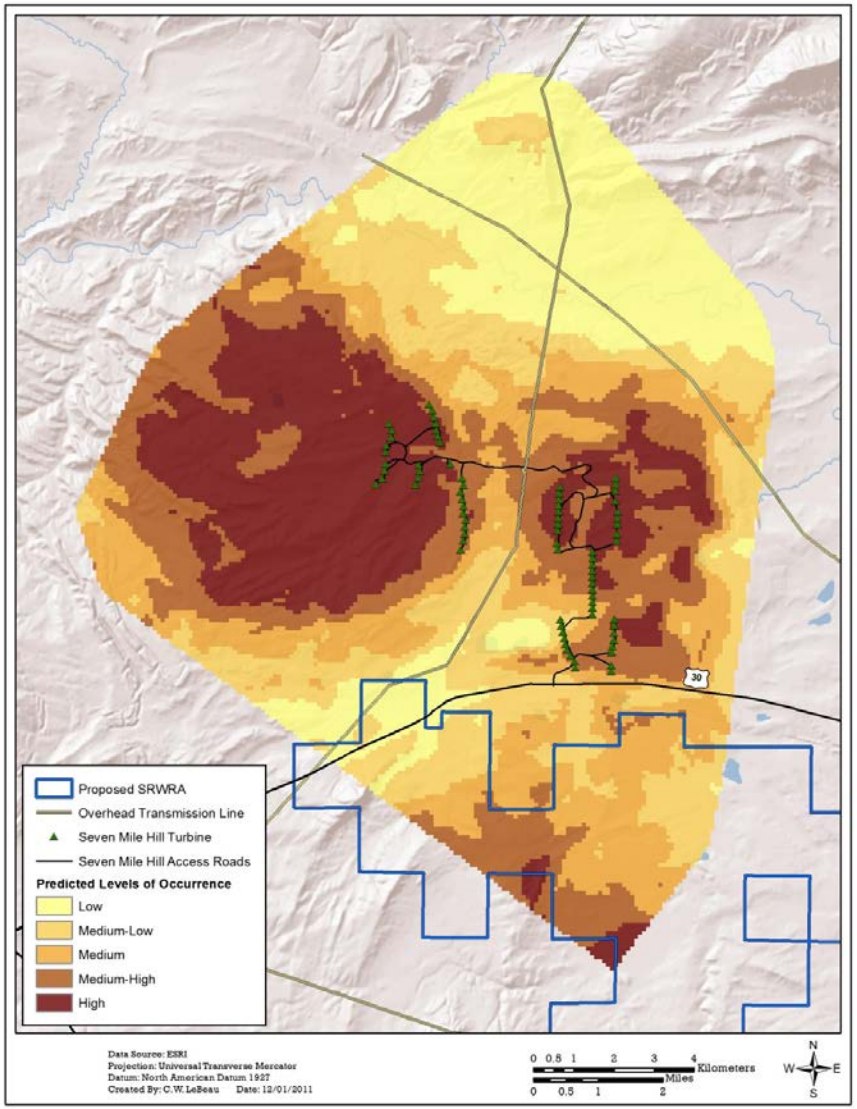
Background

- Wind energy development is a new form of anthropogenic disturbance to prairie grouse
- Few peer-reviewed studies exist documenting potential impacts to greater sage-grouse, prairie chickens, and sharp-tailed grouse

General Summary

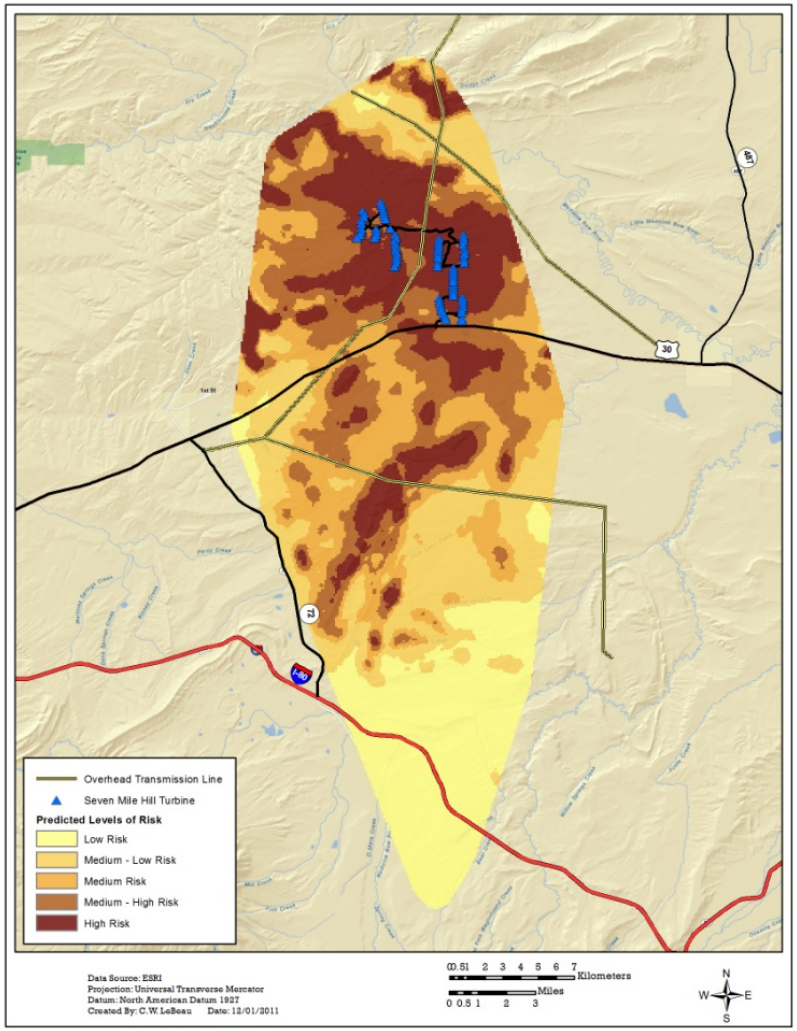
- Greater Sage-Grouse
  - Female greater sage-grouse habitat selection was not influenced by the presence of wind turbines; however, nest and brood survival decreased in close proximity to wind turbines (LeBeau 2012, LeBeau et al. 2014).
- Greater Prairie-Chicken
  - Female greater prairie-chicken nest selection and nest survival was not influenced by wind turbines (McNew et al. 2014).
  - The development of a wind energy facility had no negative effect on survival of female greater prairie-chickens (Winder et al. 2014b).
  - Female greater prairie-chicken avoided wind turbines during the breeding season (Winder et al. 2014a).

Greater Sage-Grouse

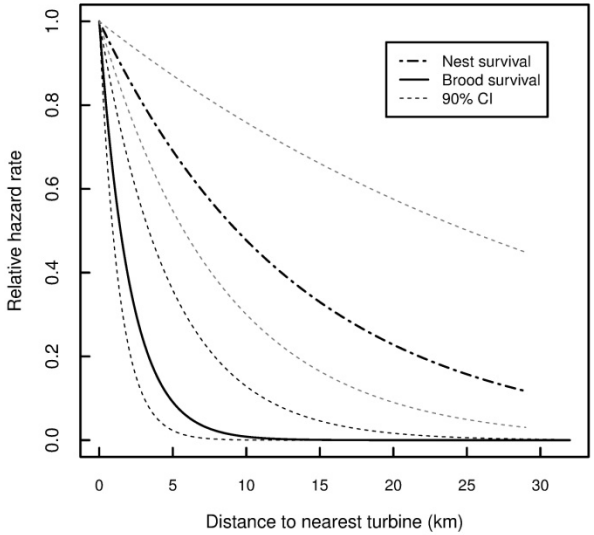


- Study Area
  - Southeastern Wyoming near the town of Medicine Bow
  - Seven Mile Hill Wind Energy Facility (79 GE 1.5 MW turbines; operational December 2008)
- Results
  - 116 female sage-grouse captured and monitored from Apr 2009-Oct 2010
  - Proximity to wind turbines did not influence nest and brood habitat selection (LeBeau 2012).
  - The relative probability of habitat selection increased in habitats in close proximity to wind turbines (LeBeau 2012).

Greater Sage-Grouse



- Results
  - The risk of a nest and brood failing decreased by 7.1% and 38.1%, respectively, with every 1.0 km increase in distance to wind turbine (LeBeau et al. 2014).
  - Female survival was not impacted by proximity to wind turbines (LeBeau et al. 2014).



Greater Sage-Grouse

- Discussion
  - Decreased nest and brood survival may be attributed to increased predation as the result of edge effects, ecological trap habitats, subsidized predators, and compromised defense mechanisms.
  - Strong site fidelity to previously selected habitats prior to wind development
  - The first two study years is part of a larger 5 year collaborative study effort with the National Wind Coordinating Committee (NWCC). Results of this larger study effort will be available in early 2015. http://nationalwind.org/research/collaboratives/sage-grouse/

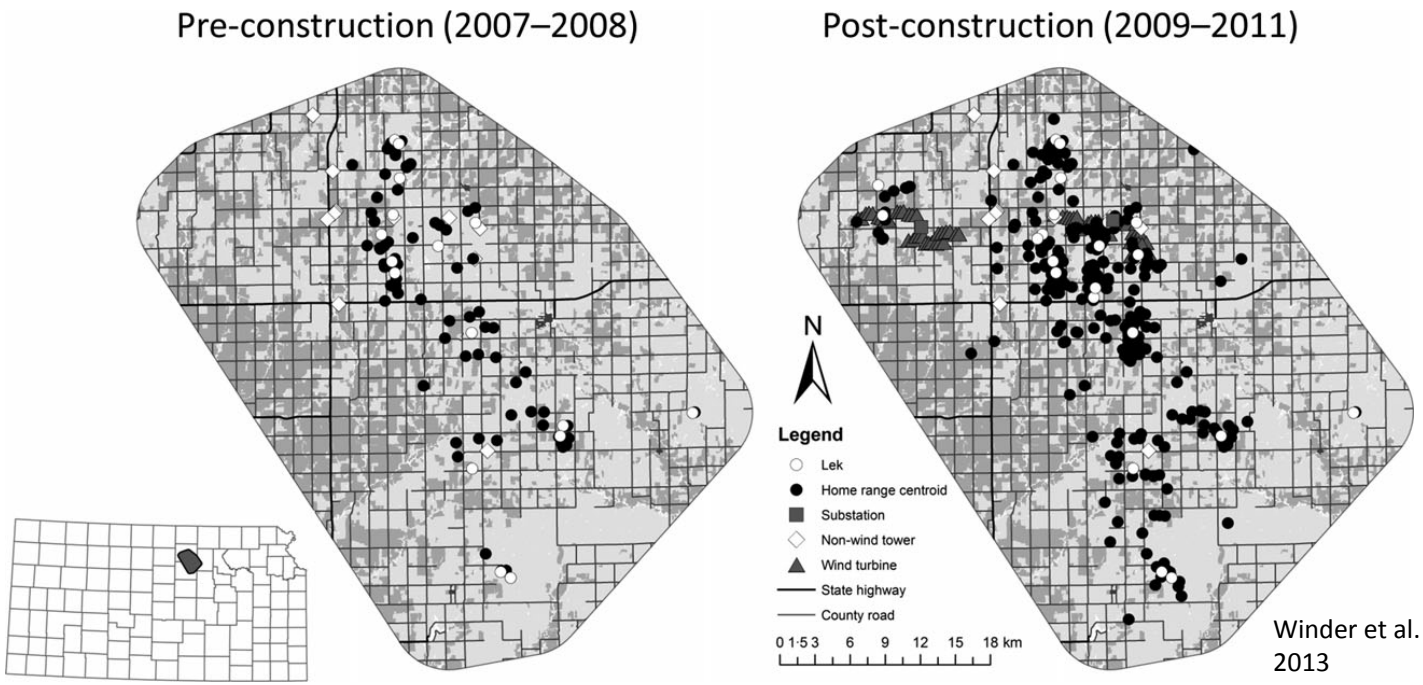
Greater Prairie-Chicken

- Study Area
  - Northcentral Kansas
  - Meridian Way Wind Energy Facility (67 Vestas 3 MW turbines; operational December 2008)
- Results
  - Before-after control-impact study design (2 yrs of data collection prior to construction and 3 yrs of data post construction)

McNew et al. 2014

Winder eta al. 2014a

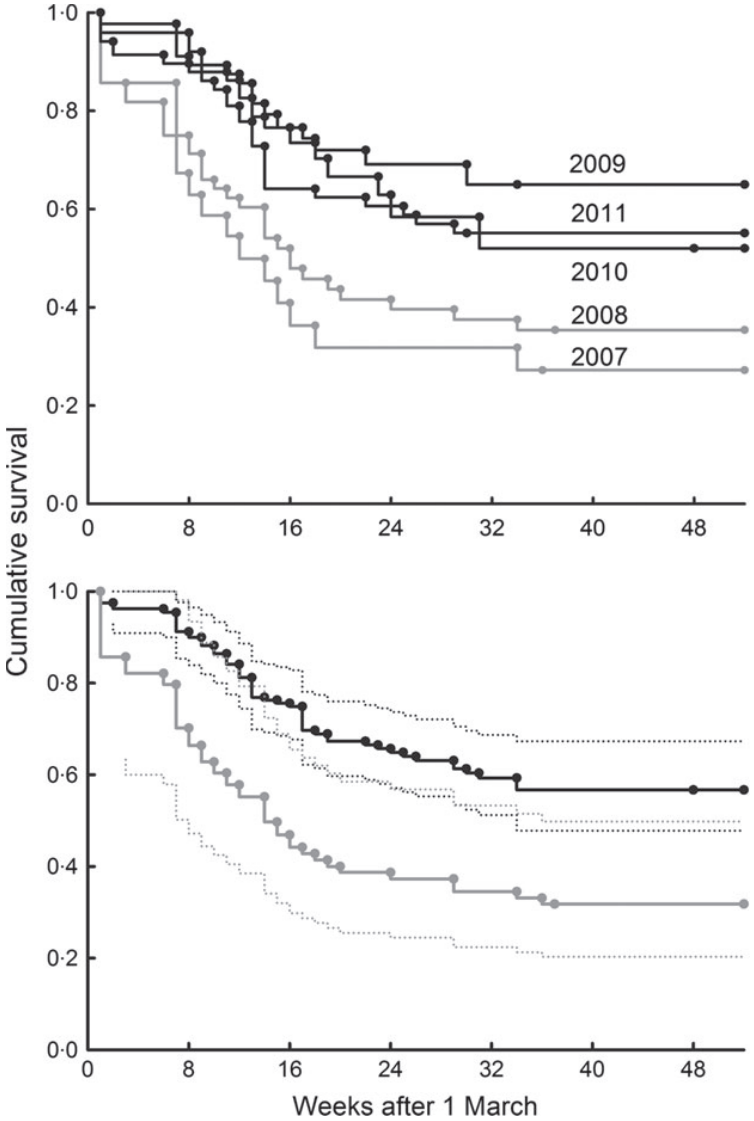
Winder et al. 2014b



Winder et al. 2013

Greater Prairie-Chicken

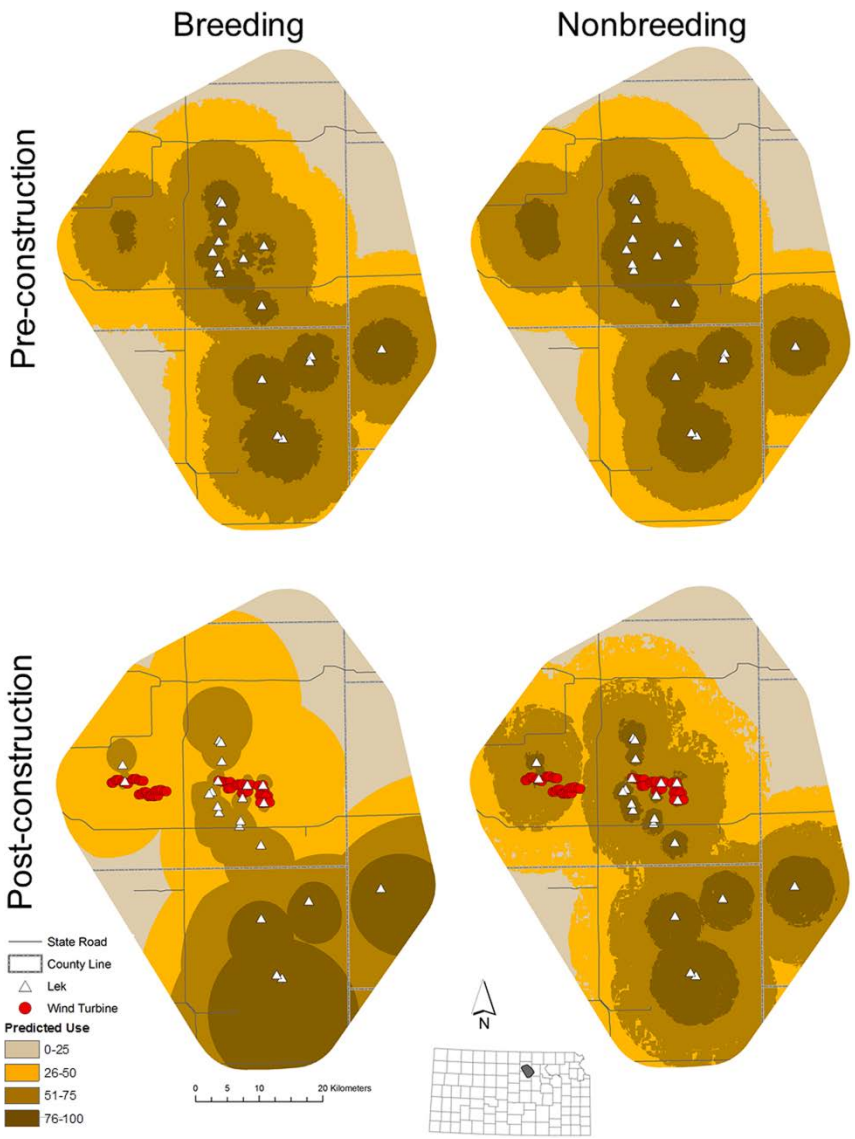
Winder et al. 2013



- Results
  - Vegetation features were important for nest survival and nest site selection (McNew et al. 2014).
  - Proximity to wind turbines did not influence nest survival and nest site selection (McNew et al. 2014).
  - Annual female survival increased from the pre-construction period (0.32) to the post-construction period (0.57; Winder et al. 2014b).
  - Females avoided wind turbines and the average home range size increased from the pre-construction to post-construction period (Winder et al. 2014a).

Greater Prairie-Chicken

Winder et al. 2014a



Greater Prairie-Chicken

- Discussion
  - Nest site selection, nest survival, and female survival was not impacted by the wind energy development and was influenced more by rangeland management.
  - Other forms of energy development experienced opposite impacts. This discrepancy is likely the result of types of infrastructure associated with different developments.
  - Female greater prairie-chickens avoided wind turbines but there was no negative impacts on demographic performance.

Cumulative Assessment

Parameter	Greater Sage-Grouse	Greater Prairie-Chicken
Nest Survival	*Negatively affected*	*No effect*
Brood Survival	*Negatively affected*	*Unknown*
Annual female Survival	*No effect*	*Positively affected*
Nest Site Selection	*No effect*	*No effect*
Brood selection	*No effect*	*Unknown*
Female breeding selection	*Positively affected*	*Negatively affected*

Cumulative Assessment

- Predation is the main source of nest and brood failure, and female mortality for both grouse species.
  - Greater sage-grouse nest and brood survival decreased in close proximity to wind turbines; however, no affect was estimated for greater prairie-chicken nest survival.
    - Unique ecosystems and degree of habitat fragmentation
    - Different rangeland management practices

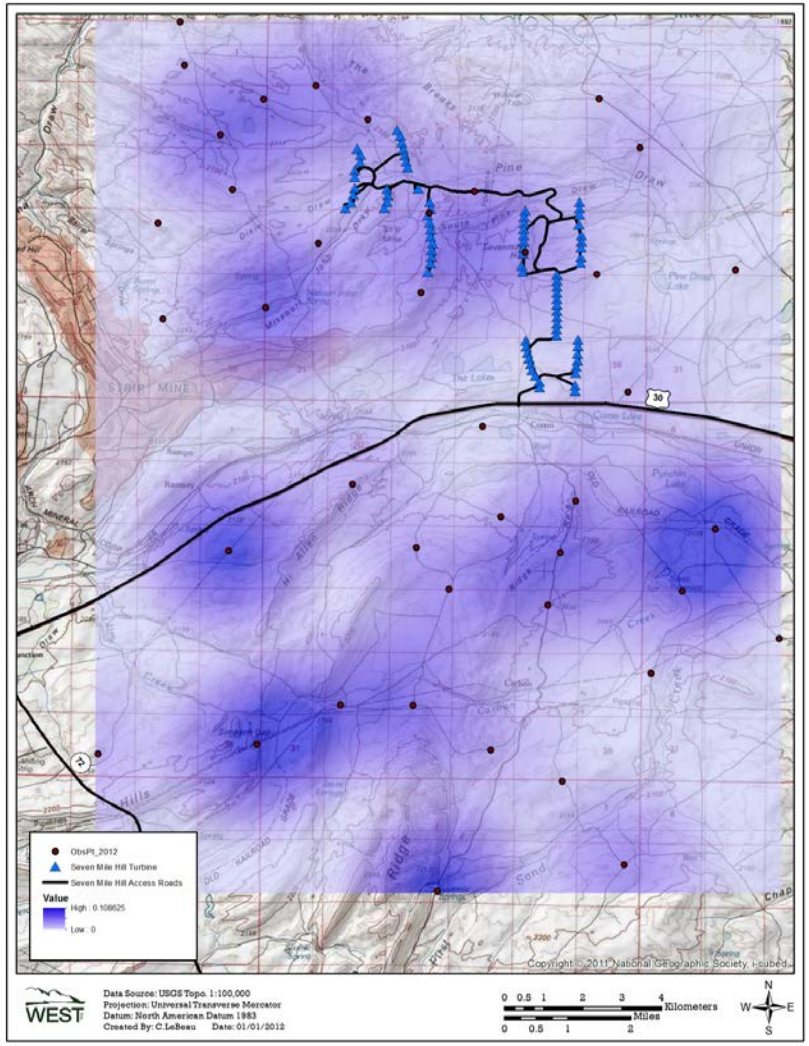
Cumulative Assessment

- Greater sage-grouse female survival was not affected by wind turbines and greater prairie-chicken survival increased with the addition of the facility to the landscape.
  - Avian predation

- Female greater prairie-chickens avoided turbines whereas greater sage-grouse selected habitats in close proximity to wind turbines.
  - Site fidelity
  - Lag effect

Mitigation and Future Research

- Implementing site specific rangeland management practices that are beneficial to prairie chickens
- Additional long-term BACI studies estimating impacts to prairie grouse species within different ecosystems
- Investigation into the mechanisms that are affecting sage-grouse nest and brood survival
- Habitat Conservation Banks
- Core Area Models



Research References

- **LeBeau, C. W. 2012**. Evaluation of greater sage-grouse reproductive habitat and the response to wind energy development in south-central, Wyoming. *Thesis*, University of Wyoming, Laramie, USA.

- **LeBeau. C. W., J. L. Beck, G. D. Johnson, M. J. Holloran. 2014**. Short-term impacts of wind energy development on greater sage-grouse fitness. *Journal of Wildlife Managem*ent 78:522-530.

- **McNew, L. B., L. M. Hunt, A. J. Gregory, S. M. Wisely, B. K. Sandercock. 2014**. Effects of wind energy development on the nesting ecology of Greater Prairie-Chickens in fragmented grasslands. *Conservation Biology*, in press.

- **Winder, V.L., L.B. McNew, A.J. Gregory, L.M. Hunt, S.M. Wisely, and B.K. Sandercock. 2014*a***. Space use of female Greater Prairie-Chickens in response to wind energy development. *Ecosphere* 5:1-17

- **Winder, V.L., L.B. McNew, A.J. Gregory, L.M. Hunt, S.M. Wisely, and B.K. Sandercock. 2014*b*.** Effects of wind energy development on the survival of Greater Prairie-Chickens. *Journal of Applied Ecology* 51:395-405