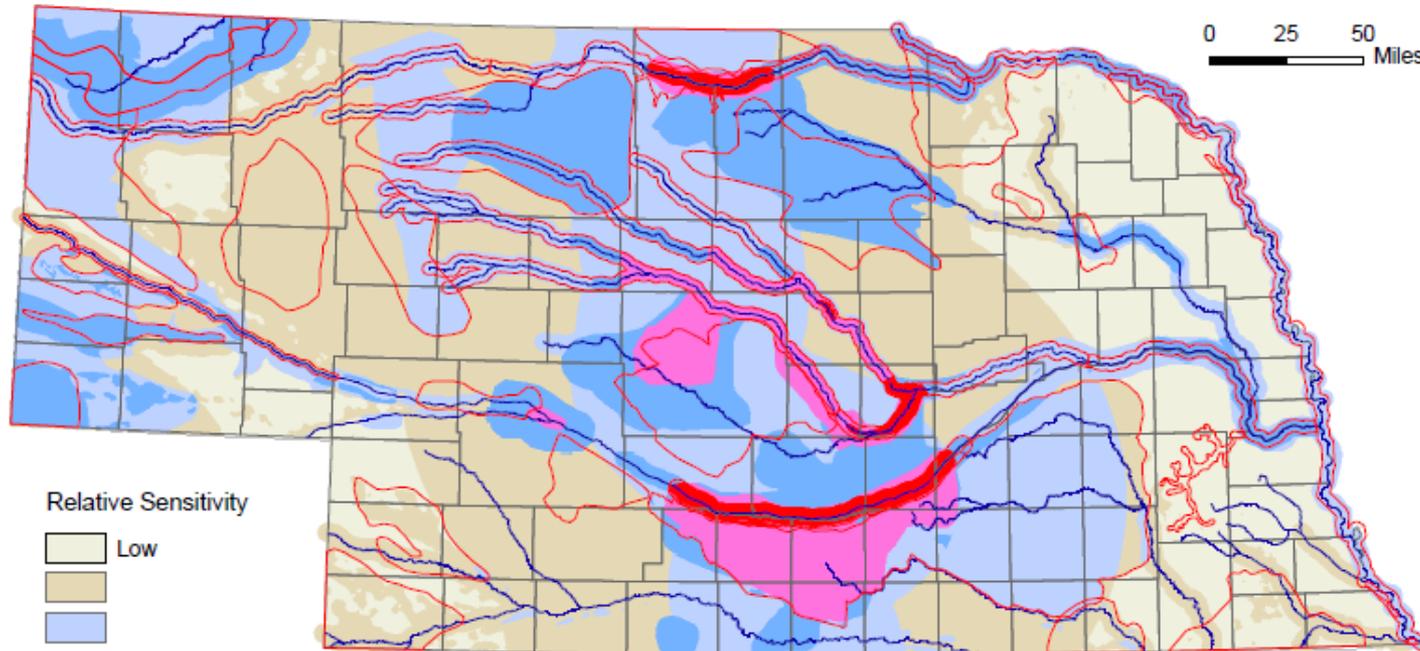




# Wildlife avoidance studies: the need to evaluate mechanisms

Larkin Powell, Mary Bomberger Brown, Jennifer Smith, Caroline Jezierski, Jeffrey Lusk, John McCarty, JoAnn McGee, Joseph Fontaine, Jocelyn Olney, Walter Schacht, Bill Vodehnal, Edward Walsh, Cara Whalen, Heather Wills, and LaReesa Wolfenbarger,

# informing decisions in Nebraska



## Relative Sensitivity

Low



High

## Biologically Unique Landscapes



This map was designed to aid in planning for wind energy development by identifying areas that are considered relatively more sensitive or less sensitive to such development, with respect to species of concern. This map is not designed to evaluate wind farm siting at specific locations. Even in "low sensitivity" areas shown, there will be specific locations where siting of wind power infrastructure can negatively impact significant biological resources (e.g. remnant tallgrass prairie, listed plant species, etc.). Contact the Nebraska Game and Parks Commission and the U.S. Fish and Wildlife Service for potential site-specific impacts and potential conservation measures to avoid "take" under the state Nongame and Endangered Species Conservation Act and the federal Endangered Species Act.

See attached document for a description of the information used to develop this map.

Map version date: October 1, 2011

# project objectives



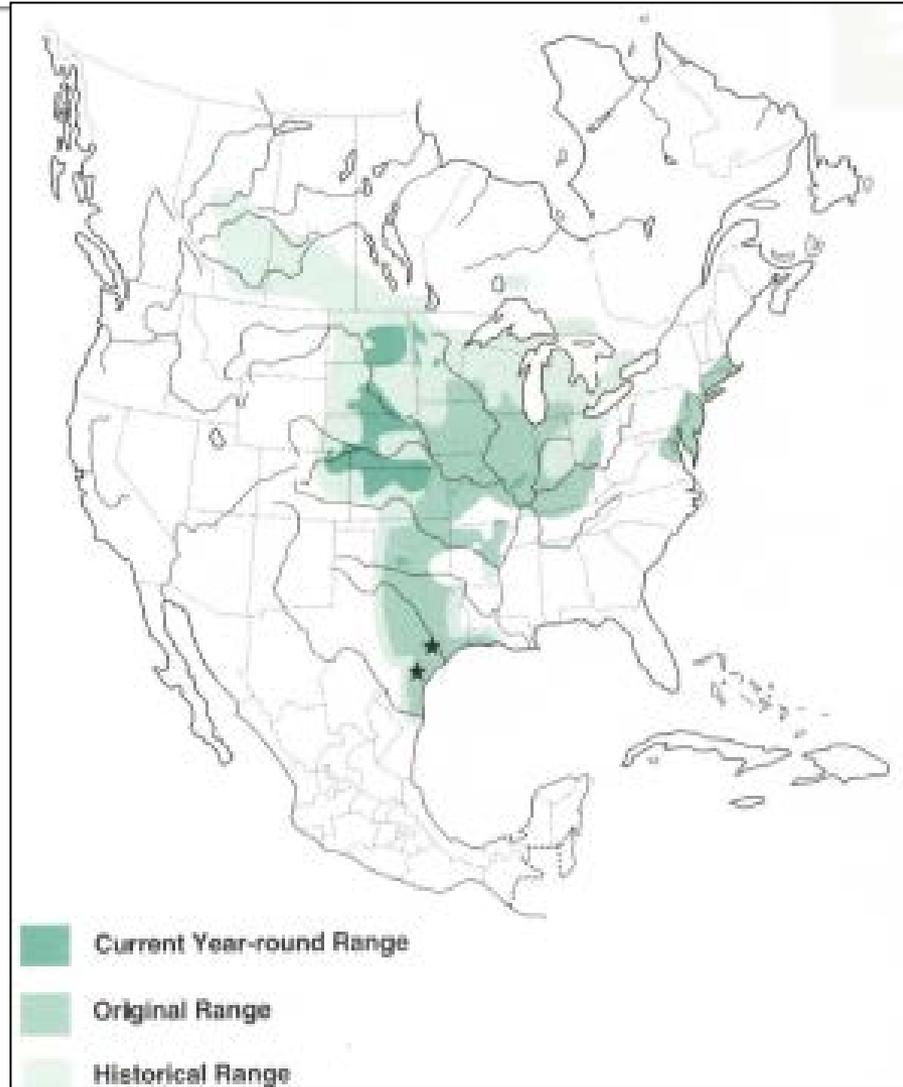
## PROJECT AIM:

To help Nebraskans optimize wind energy development in areas of concern for prairie grouse, while aiding investors, planners, and policy makers to identify ideal locations for future wind energy projects.

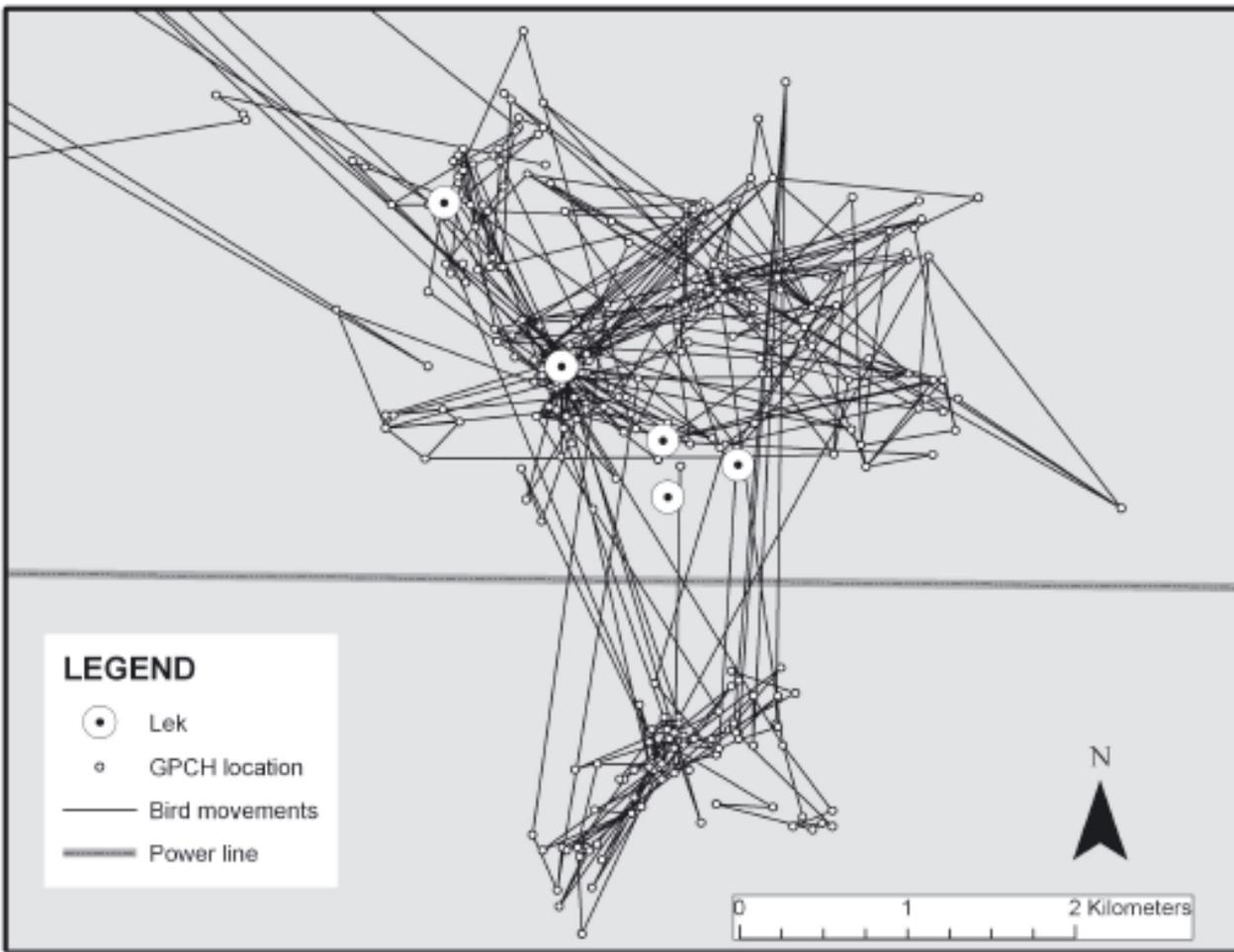
## NGPC STATED PURPOSE (2011):

- Provide information and analyses to aid in the management of prairie grouse in Nebraska in relation to wind-power development.
- Inform decisions regarding the siting of towers and facilities and to aid in preparation of mitigation standards.
- At what distance from towers, facility infrastructure, and the overall facility do any effects, if present, of the facility and related infrastructure become negligible?

# greater prairie-chicken



# avoidance of structures

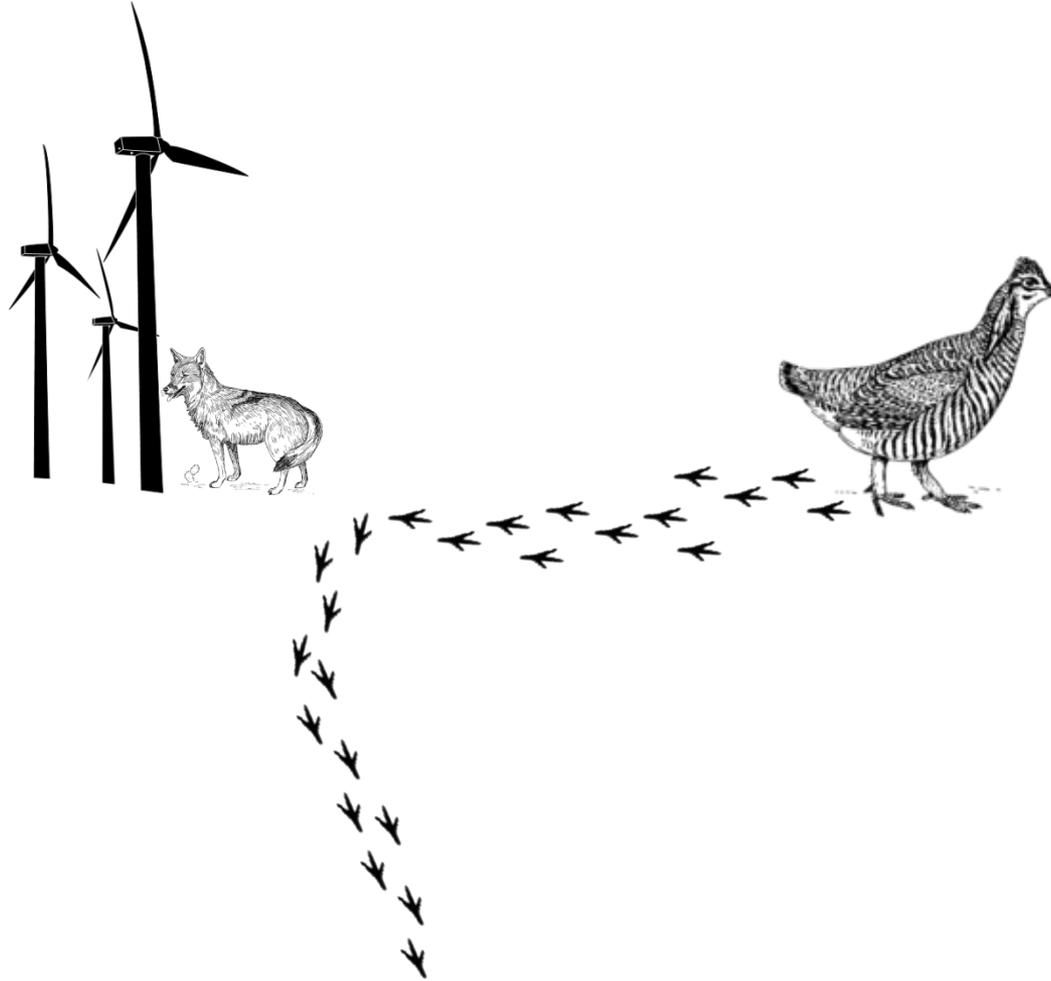


*Figure 1. (a) Lesser Prairie-Chicken and (b) Greater Prairie-Chicken movements and lek locations in relation to a power line and a highway in shortgrass prairie of Harper County, Oklahoma (U.S.A.) and in the tallgrass prairie of Osage County, Oklahoma (U.S.A.), respectively.*

# mechanisms

- Answer “why”
- Provide ecological meaning
- Enable effective response through planning, management, mitigation

# hypothetical example



## Why?

True behavioral response

- address with planning, mitigation

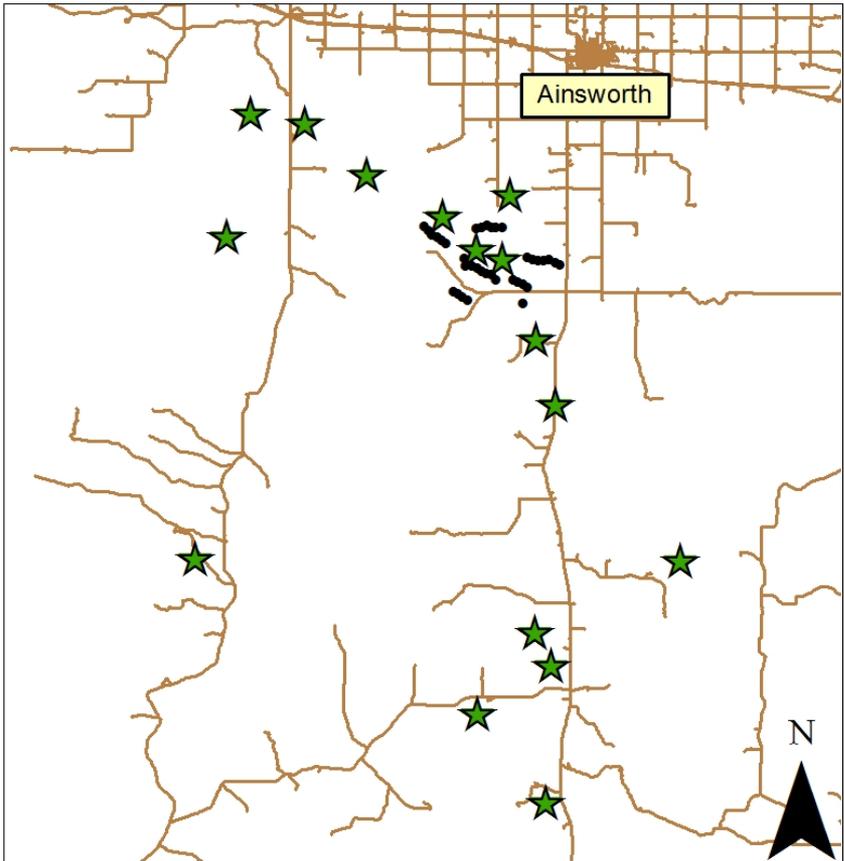
Response to predators

- address with management

# our real example



# study area



## Legend

- ★ Leks
- Wind Turbines
- Roads

16 leks (booming grounds)

25 km gradient away from wind turbines

# prairie-chicken concerns

- Booming ground attendance
- Booming ground behavior

## Why?

Perhaps females cannot hear male displays?



## Why?

Perhaps turbine presence affects stress levels?



## Why?

Perhaps males have to 'shout' over noise interference?

# measures



Sound Recordings



Behavioral Observation

# measures

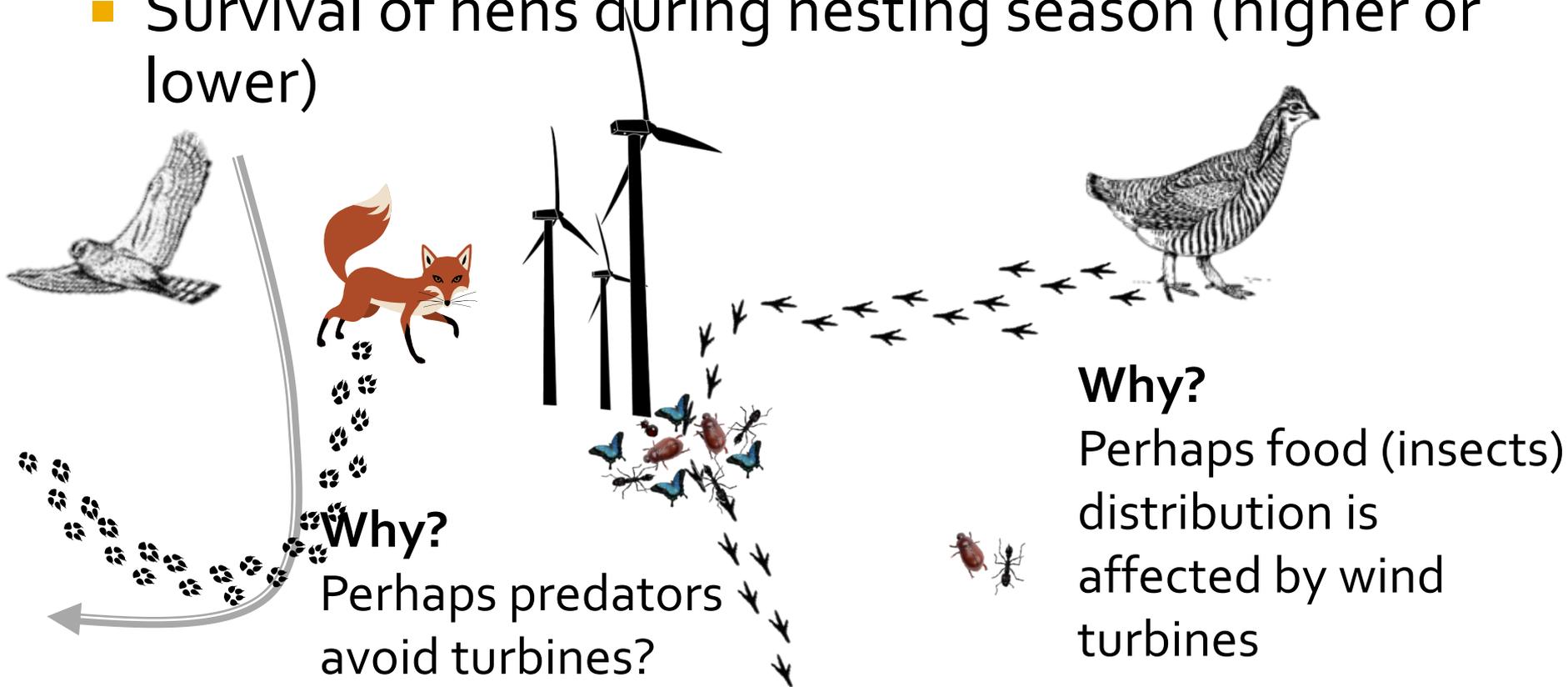


Avian stress hormone: corticosterone analyses from fecal samples from the booming grounds



# prairie-chicken concerns

- Movement of hens during nesting season (avoidance or attraction)
- Survival of hens during nesting season (higher or lower)



# measures

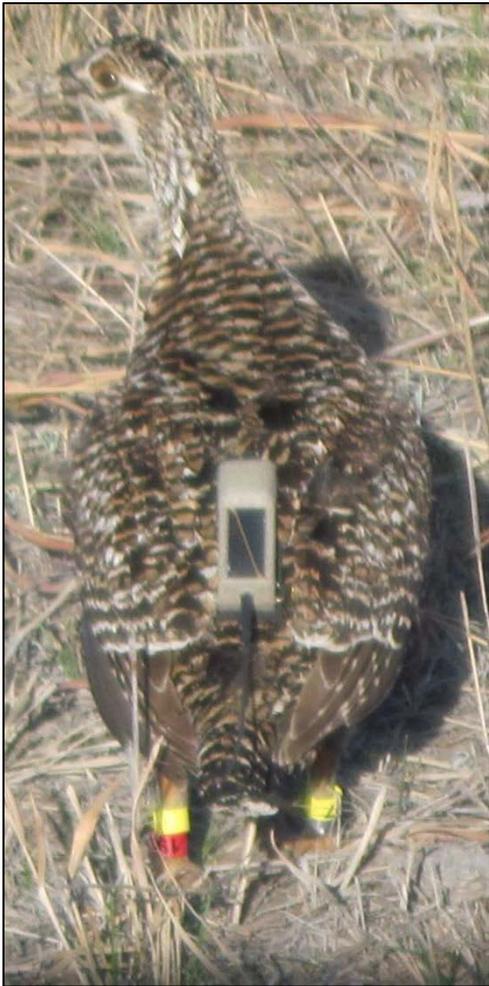
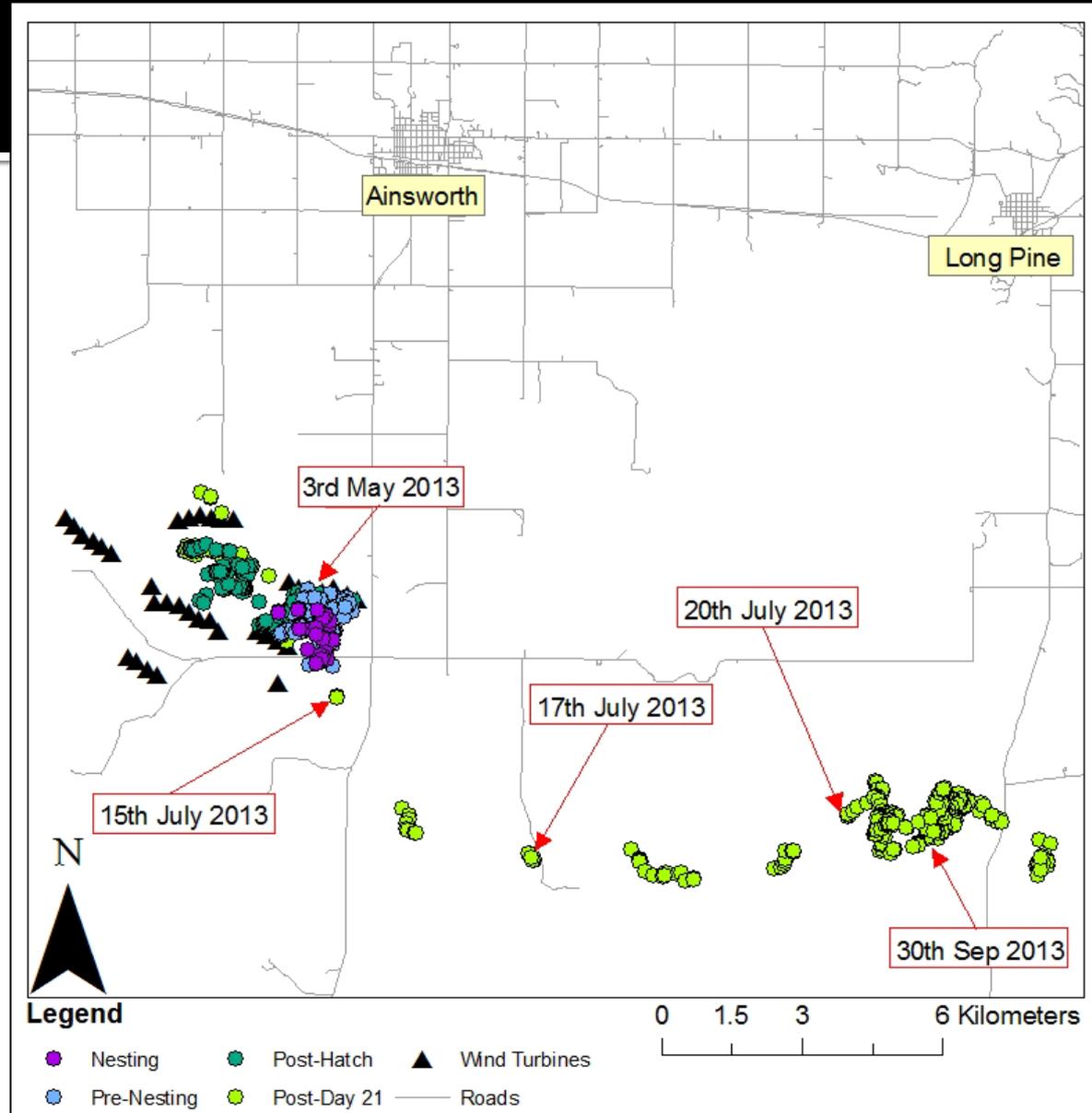


Photo: J Olney



# measures



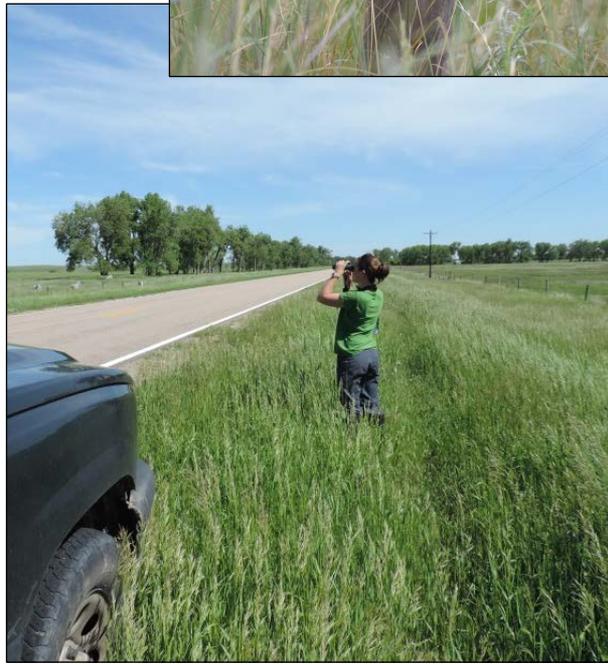
Striped Skunk  
(*Mephitis mephitis*)



American Badger  
(*Taxidea taxus*)



06-15-2013 14:12:47



Northern Harrier

(*Circus cyaneus*)



Red-tailed Hawk

(*Buteo jamaicensis*)



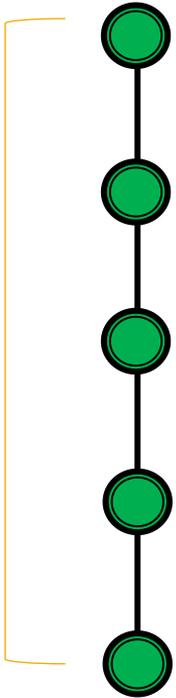
Swainson's Hawk

(*Buteo swainsoni*)

# measures



200m



200m



Photos: J Smith & bugguide.net

# prairie-chicken concerns

- Brood (chick) survival near turbines
- Nest survival near turbines

## Why?

Perhaps food (insects)  
distribution is  
affected by wind  
turbines



## Why?

Perhaps hens are  
disturbed on nests  
closer to turbines?

# measures



Photos: J Olney

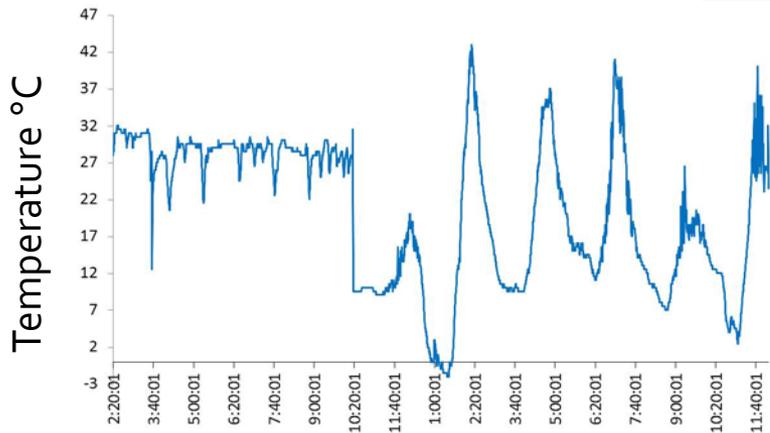


Photo: Joel Sartore

Mammalian & avian predators will **avoid** wind farm



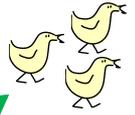
LOWER nest attentiveness



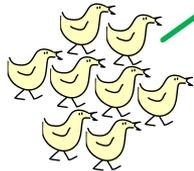
HIGHER nest attentiveness



LOWER brood survival



HIGHER brood survival



Vocalization characteristics modified



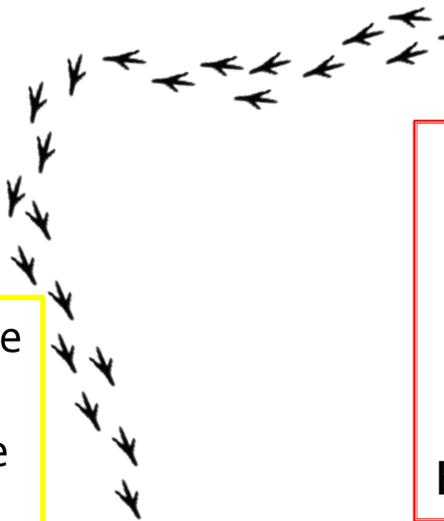
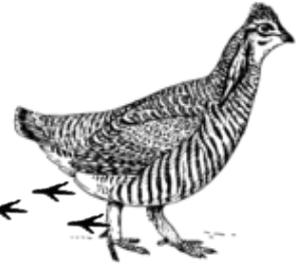
INCREASED visual displays



Invertebrate prey abundance LOWER



Chickens will **avoid** wind farm  
↓  
Change in **habitat selection**



# mechanisms are important

- Why? Why? Why?
- Mechanistic data must be collected at the same time as spatial movement data
- Indirect effects of wind energy
- The complications of ecology of the landscape
- Defendable decisions

# acknowledgements



Nebraska Public Power District  
*Always there when you need us*



- NGPC – funding through a Federal Aid in Wildlife Restoration program
- National Science Foundation: graduate fellowship
- NDOR & Dr. Scott Hyngstrom – supply of trail cameras
- NPPD for support and land access
- Private landowners for cooperation and land access
- Field assistants

