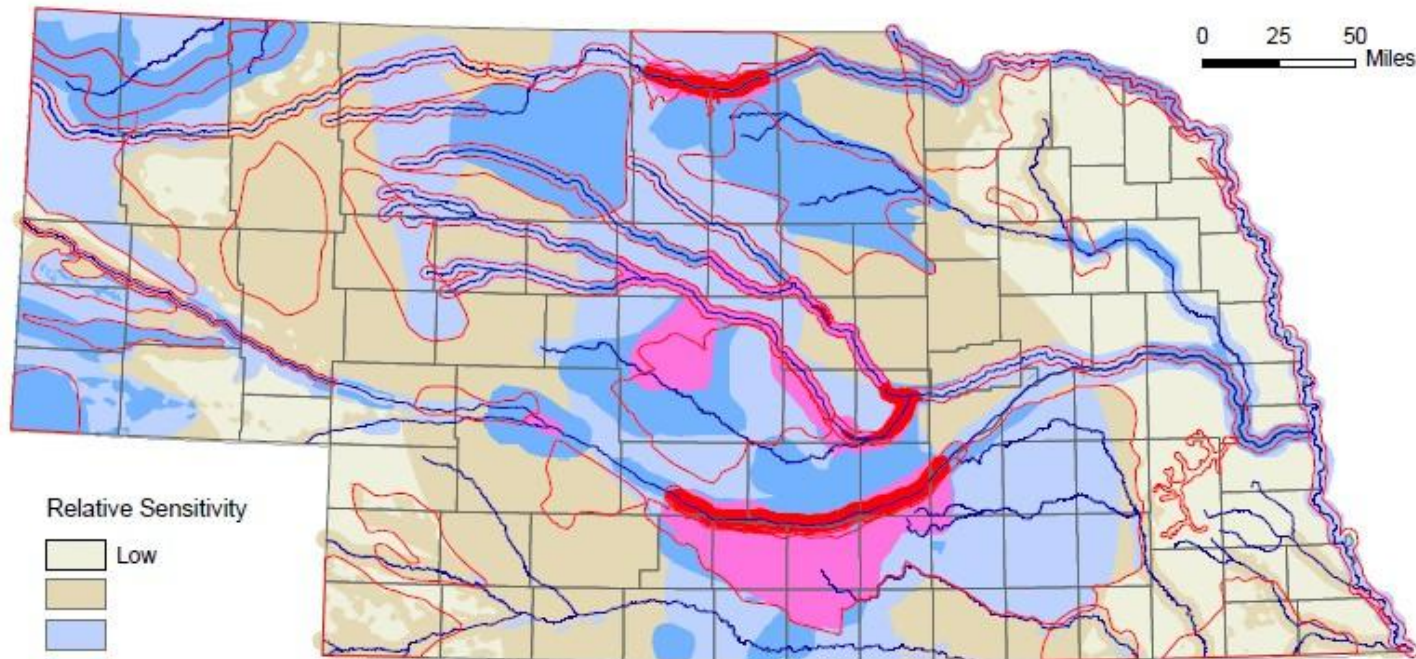




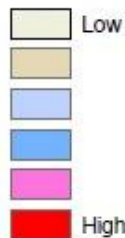
Wildlife avoidance studies: the need to evaluate mechanisms

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



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



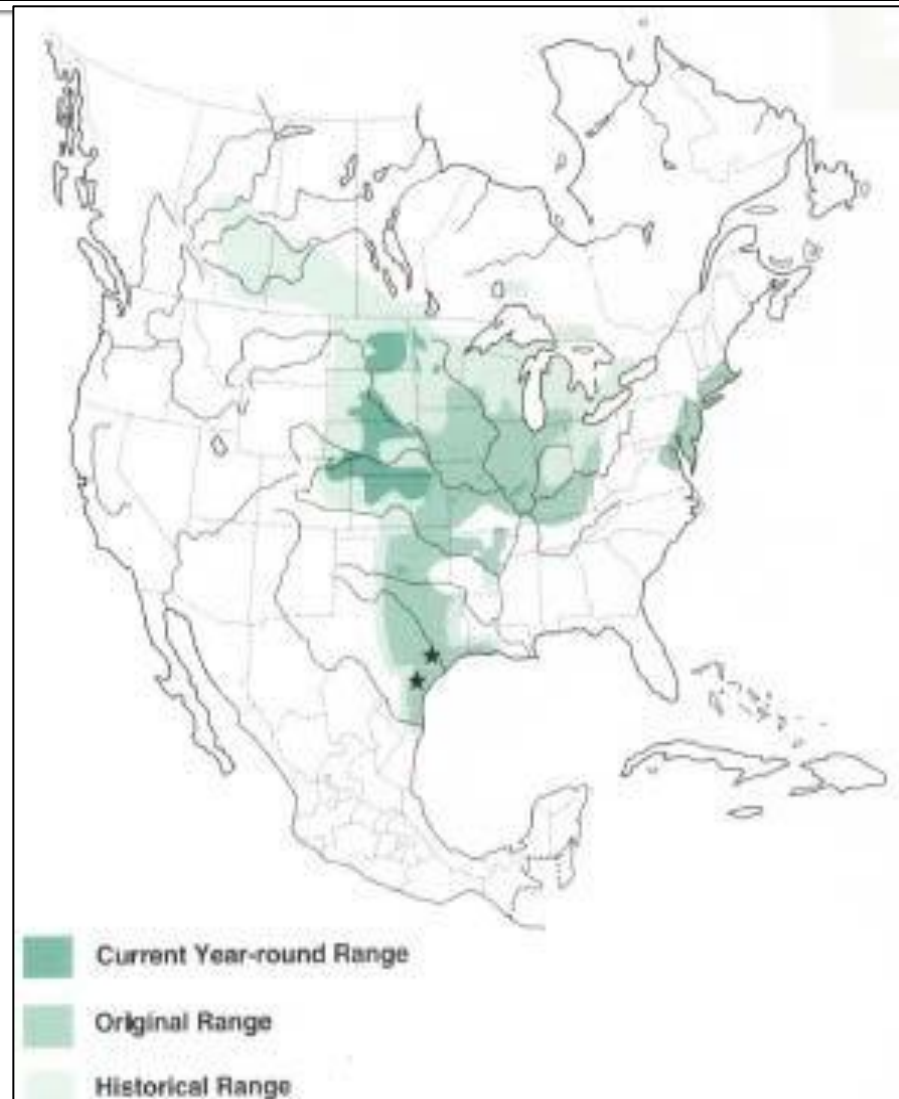
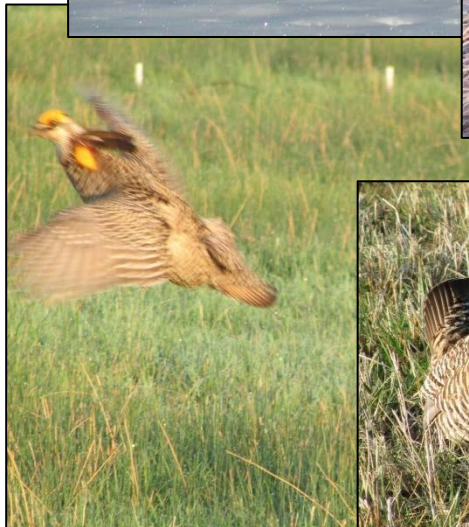
PROJECT AIM:

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

greater prairie-chicken



avoidance of structures

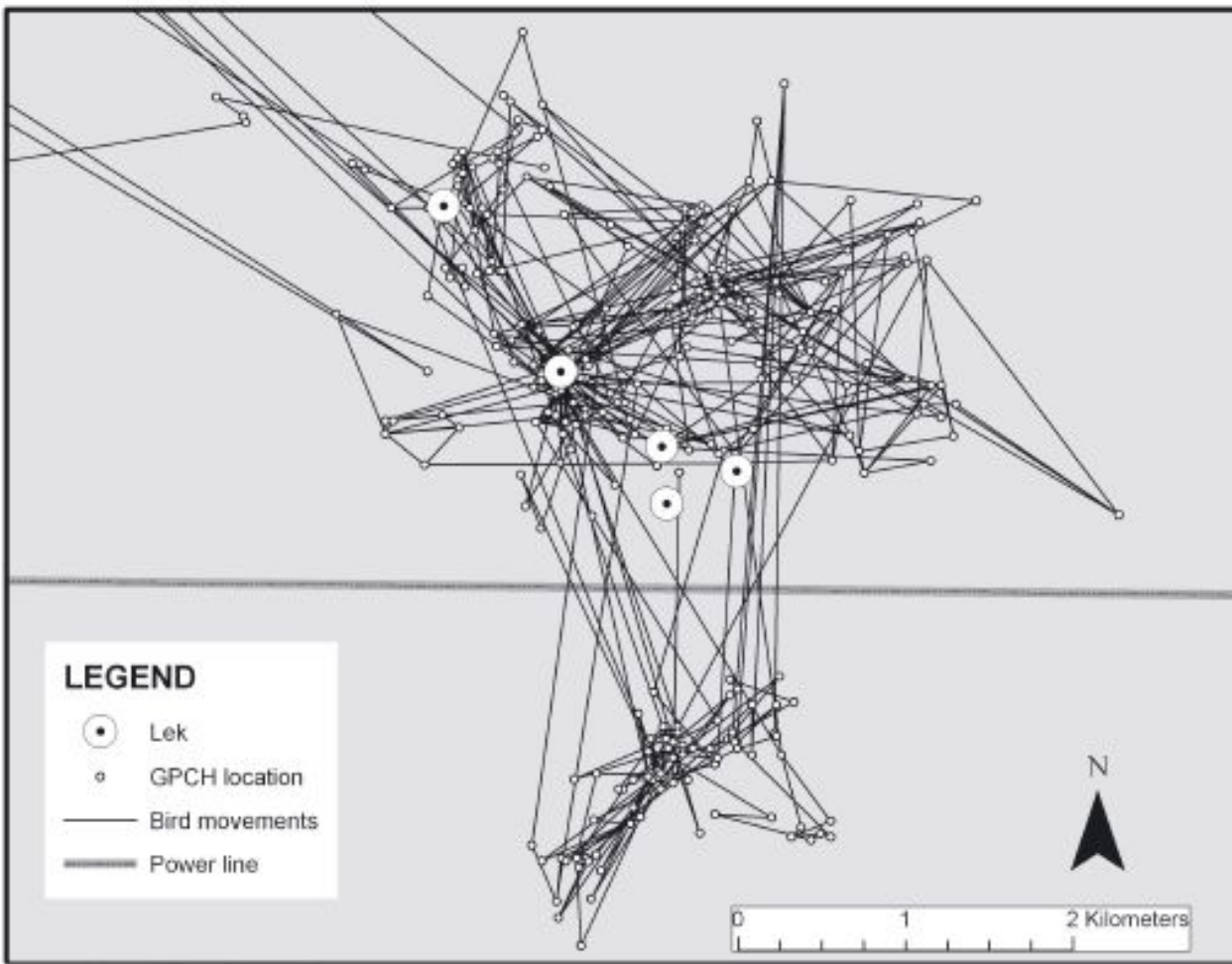
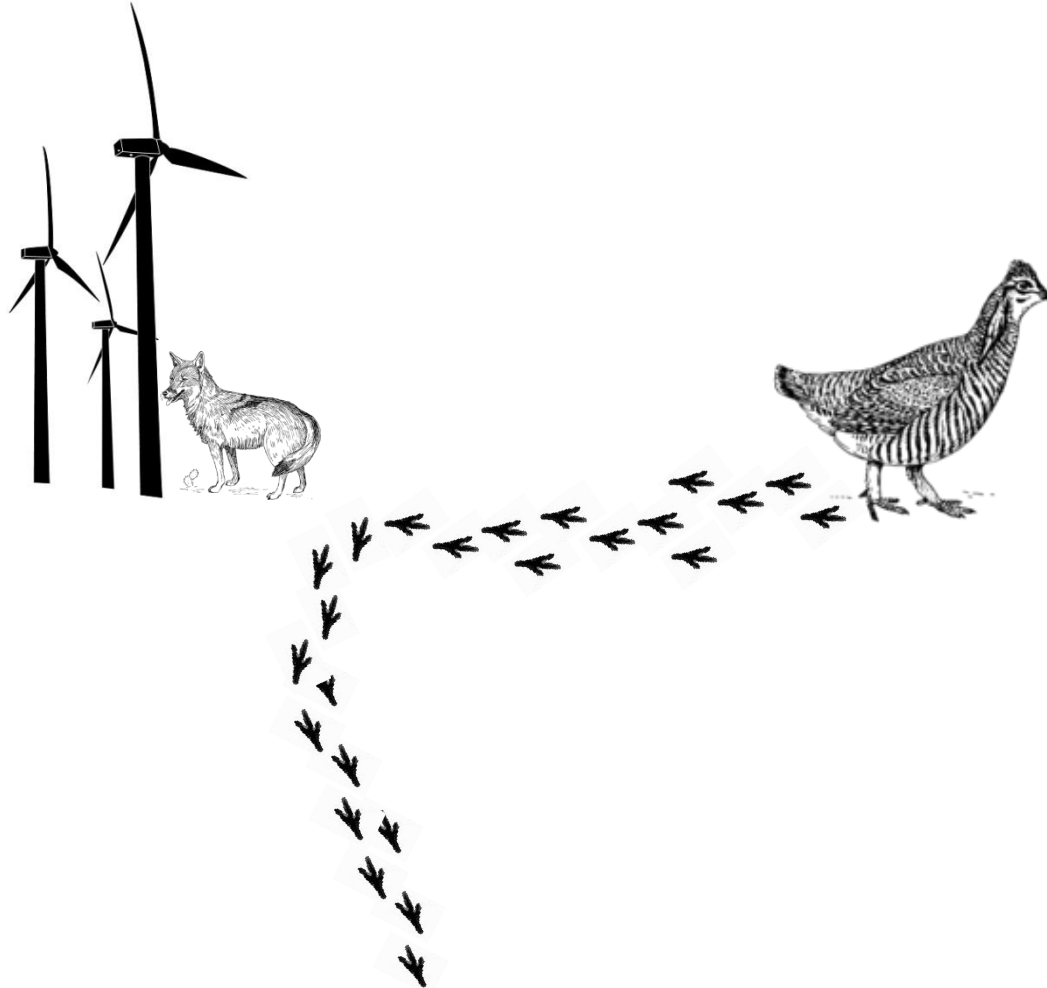


Figure 1. (a) Lesser Prairie-Chicken and (b) Greater Prairie-Chicken movements and lek locations in relation to a power line and a highway in shortgrass prairie of Harper County, Oklahoma (U.S.A.) and in the tallgrass prairie of Osage County, Oklahoma (U.S.A.), respectively.

mechanisms

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

hypothetical example



Why?

True behavioral response

- address with planning, mitigation

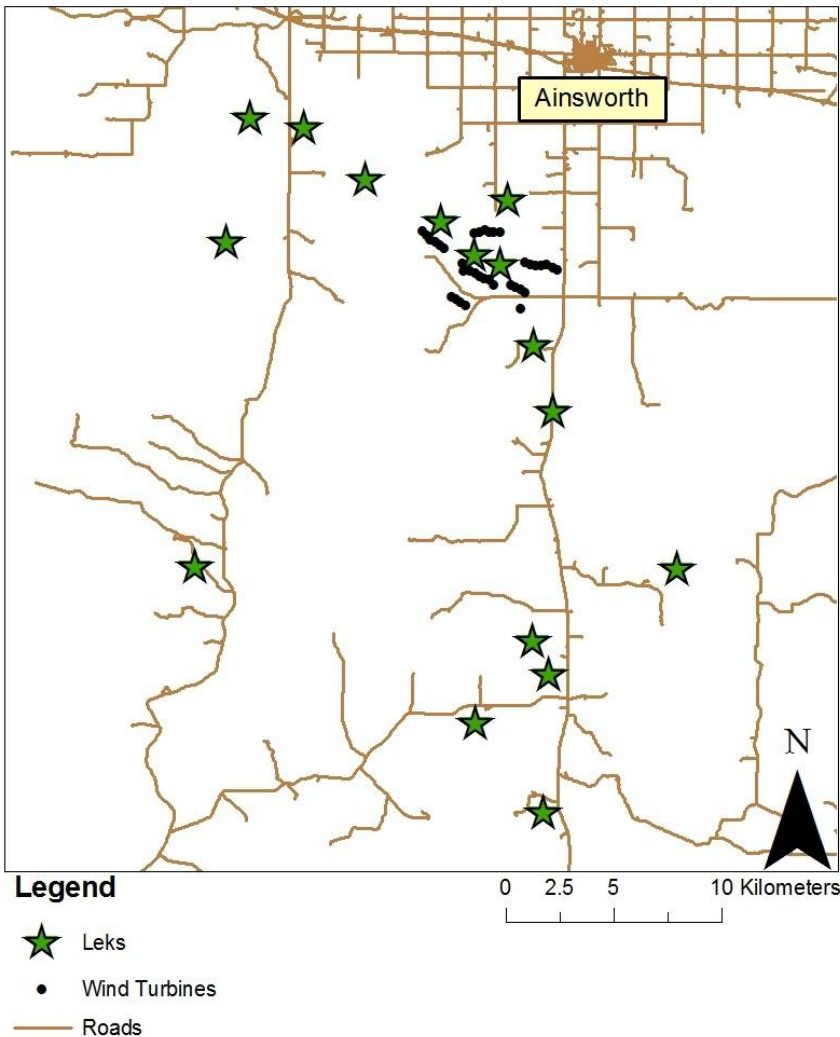
Response to predators

- address with management

our real example



study area



16 leks (booming grounds)

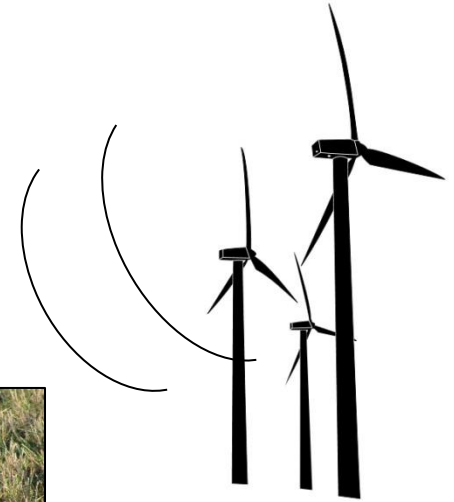
25 km gradient away from wind turbines

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

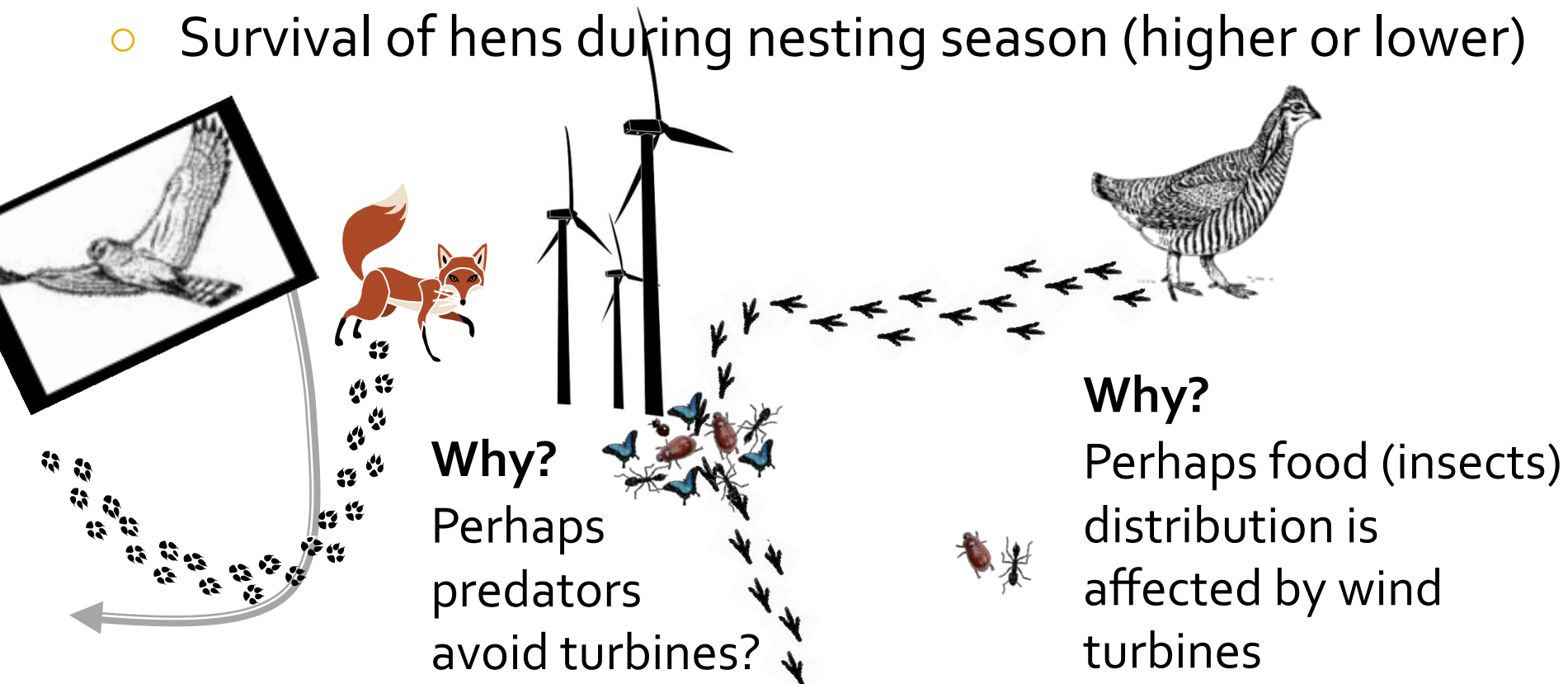


Avian stress hormone: corticosterone analyses
from fecal samples from the booming grounds



prairie-chicken concerns

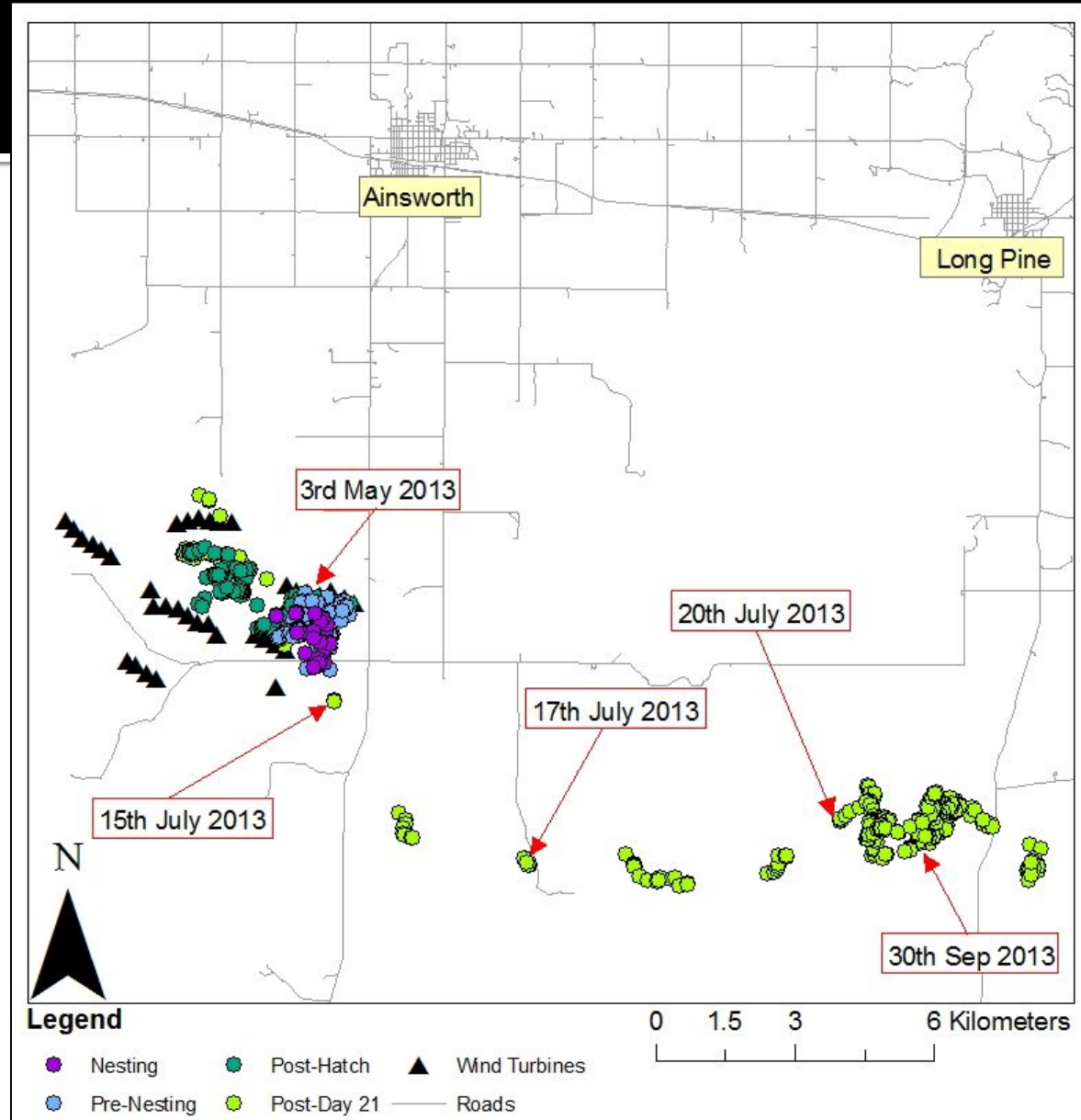
- Movement of hens during nesting season (avoidance or attraction)
- Survival of hens during nesting season (higher or lower)



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



Photos: J Smith & bugguide.net



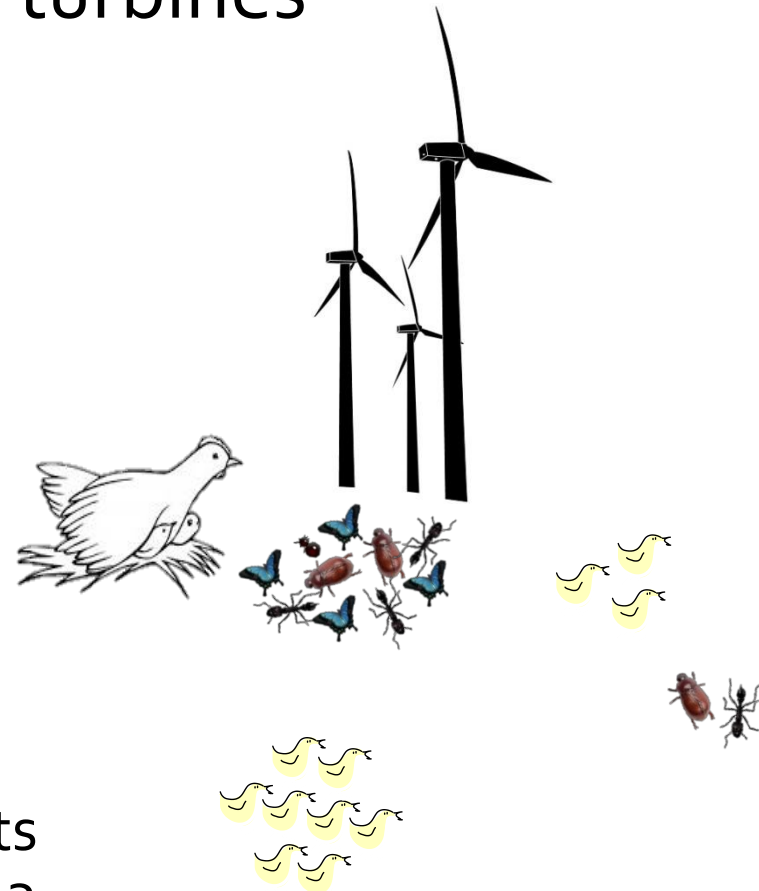
200m

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

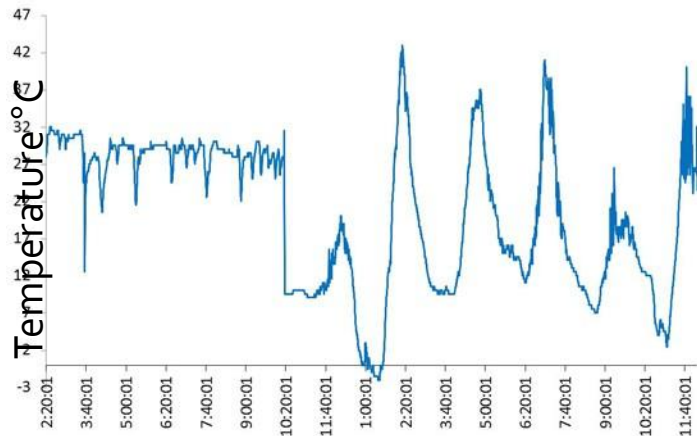
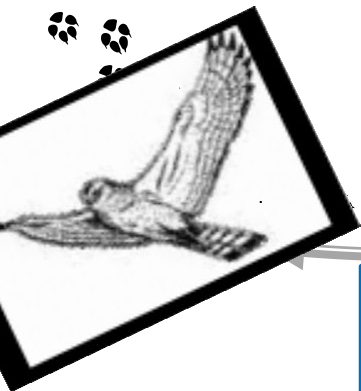


Photo: Joel Sartore

Mammalian & avian predators will avoid wind farm



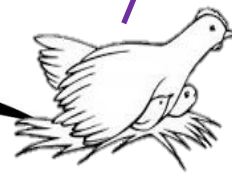
Vocalization characteristics modified



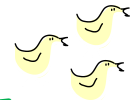
visual displays



HIGHER nest attentiveness

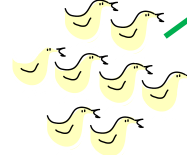


LOWER nest attentiveness



LOWER brood survival

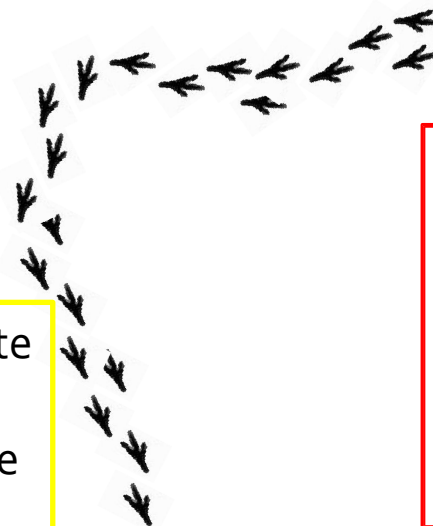
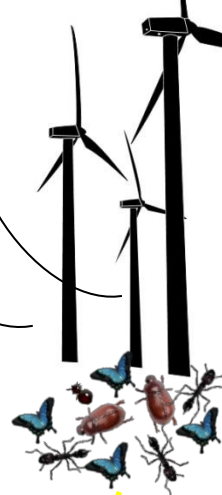
brood



Invertebrate prey abundance LOWER



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
- 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

