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# WIND RESEARCH INITIATIVE

## Limited indirect effects of wind turbines on resident birds

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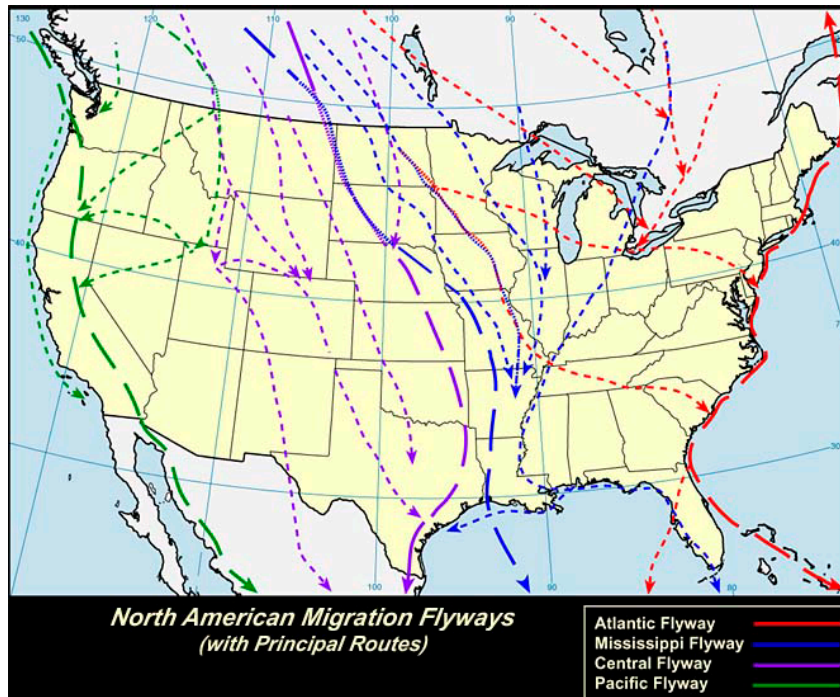
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# Wind-wildlife impacts

- Direct
  - Collision mortality



[www.birdnature.com](http://www.birdnature.com)



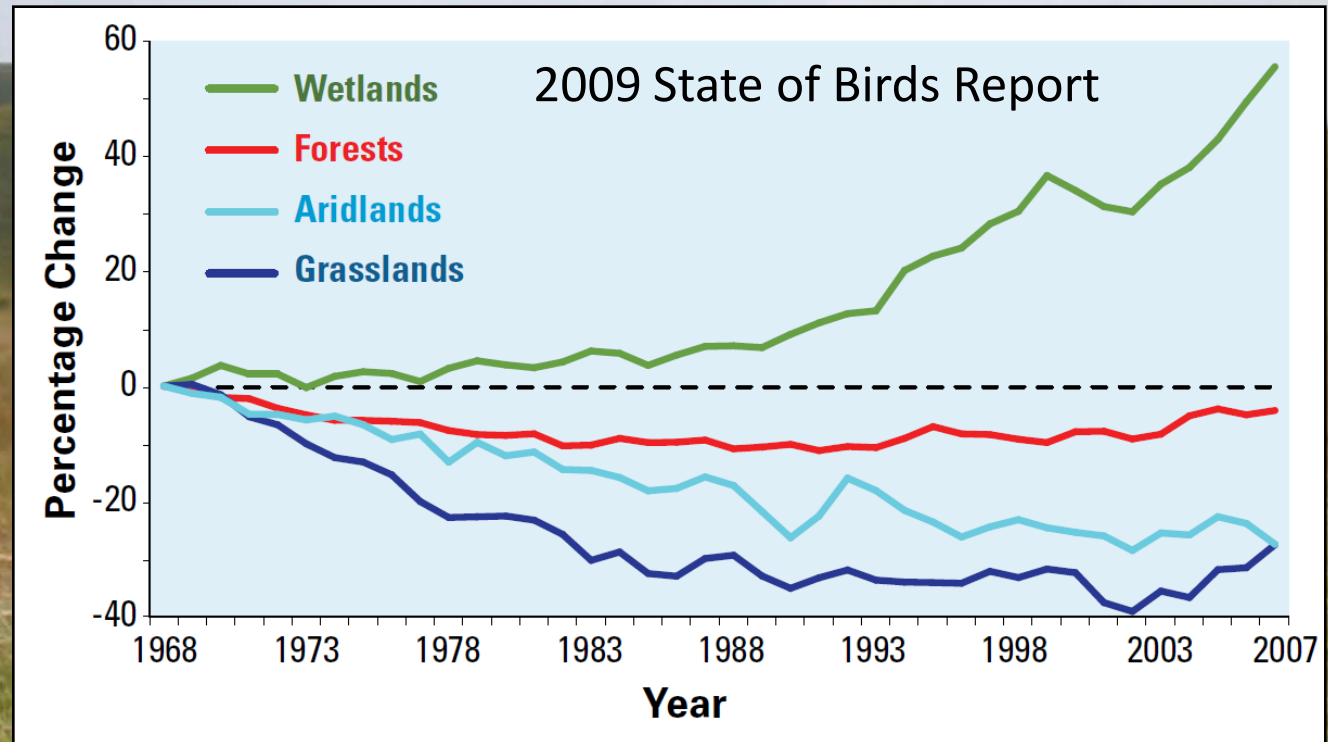
# Wind-wildlife impacts

- Indirect
  - Contribute to habitat loss and fragmentation
  - Disrupt migratory paths
  - Displace wildlife
  - Alter nesting success

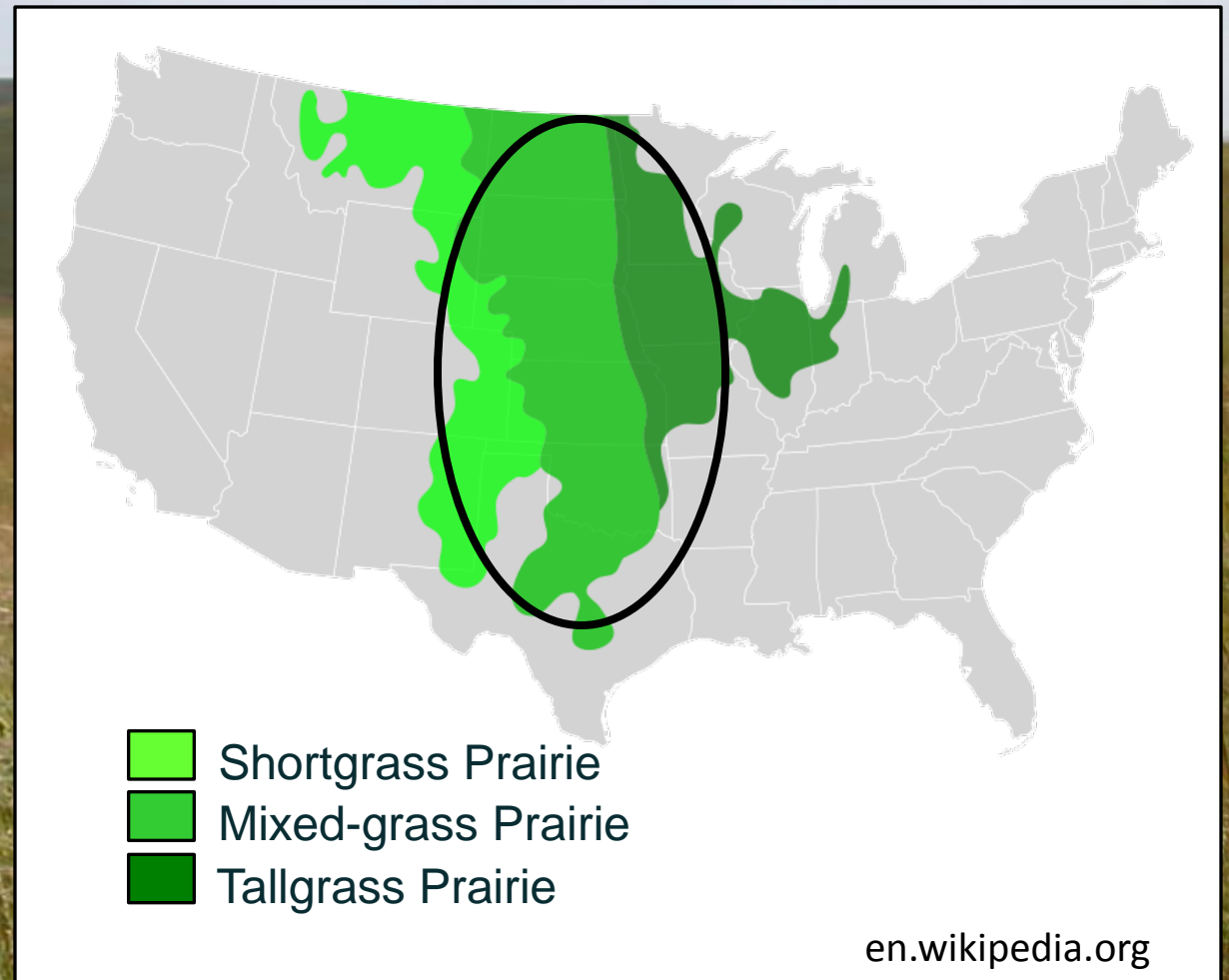




# Grassland birds

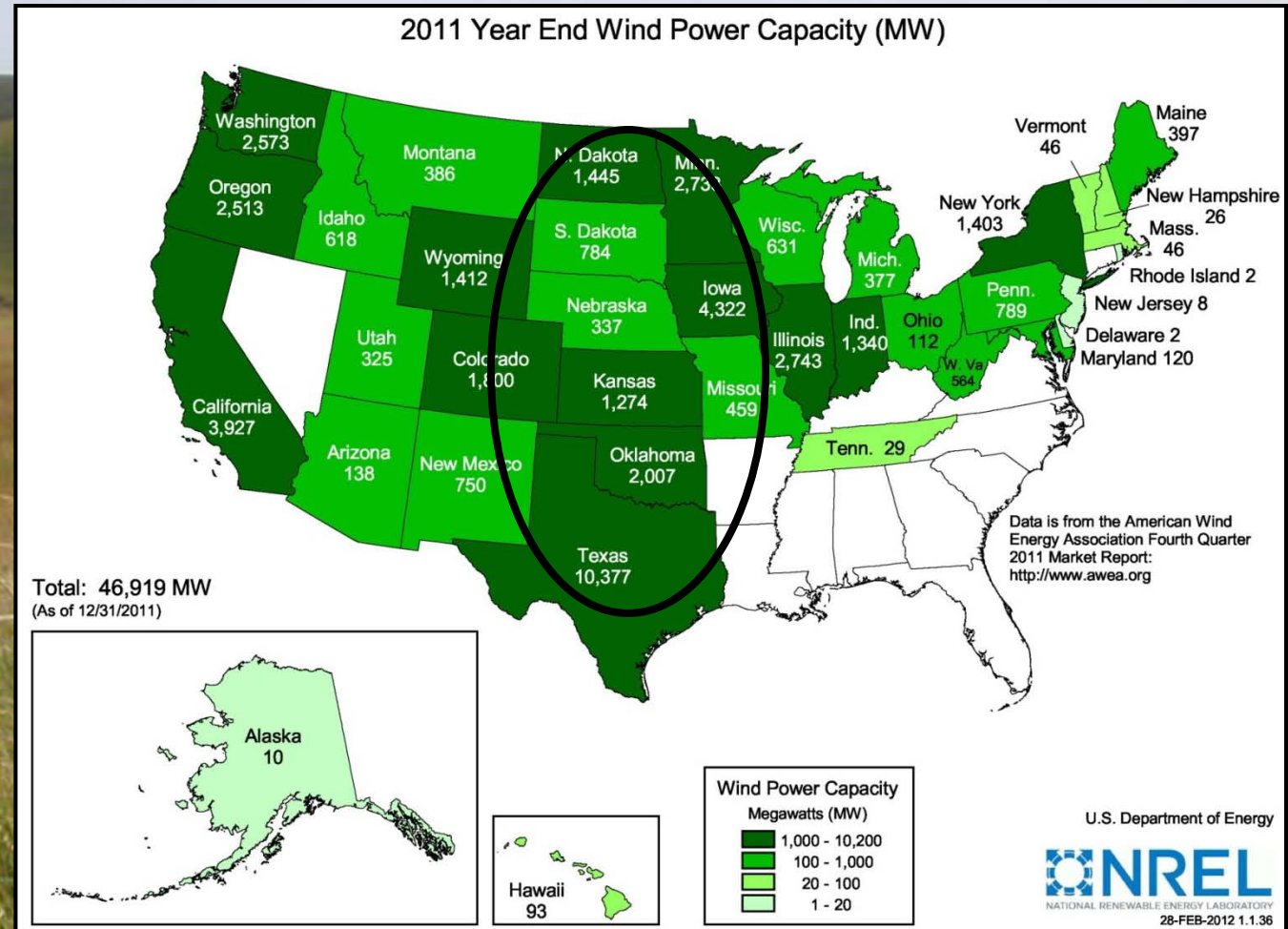


# Grassland birds





# Grassland birds



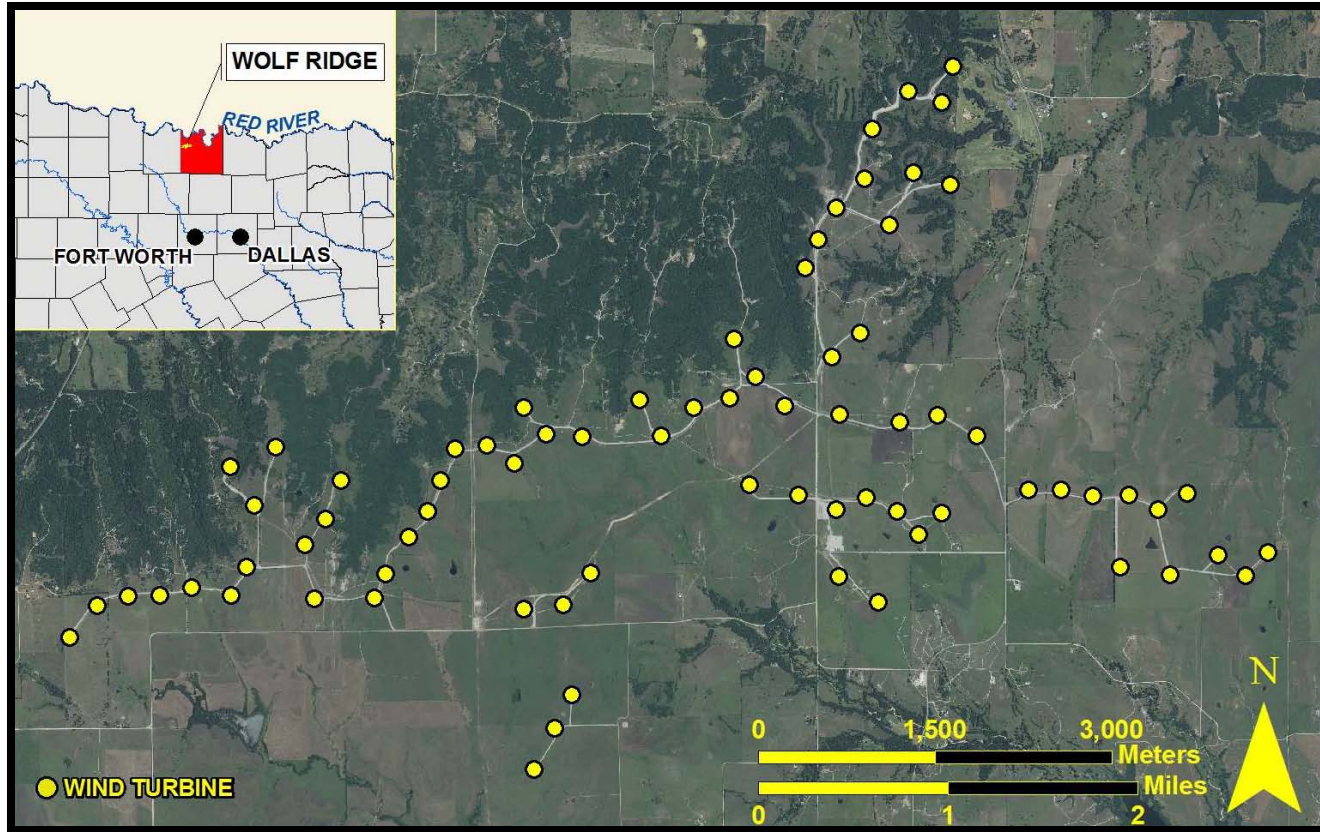
# Indirect effects research questions



- 1) Are breeding birds displaced from wind turbines?
- 2) Are there negative effects of wind turbines on nest success?
- 3) Are wintering birds displaced from wind turbines?



# Wolf Ridge Wind, LLC



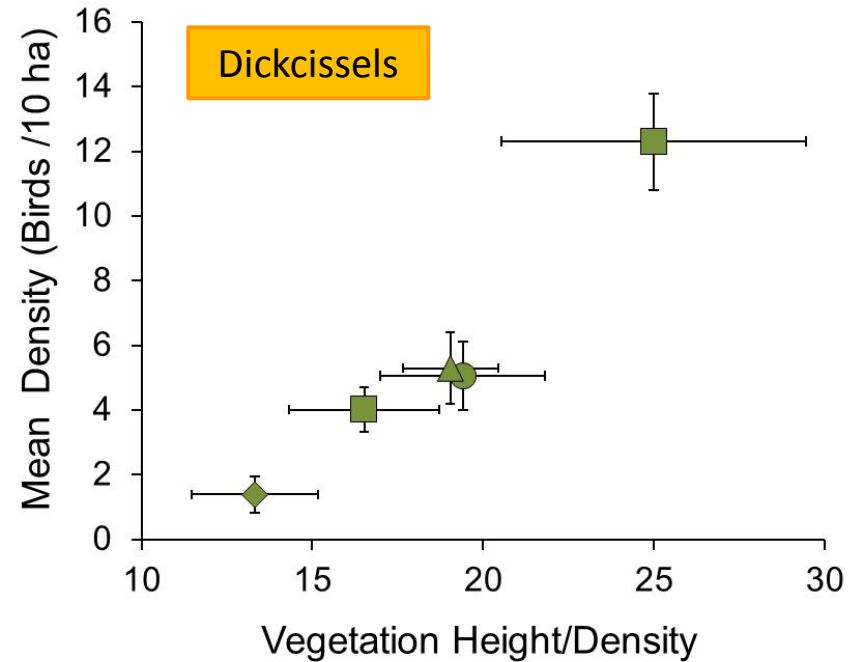
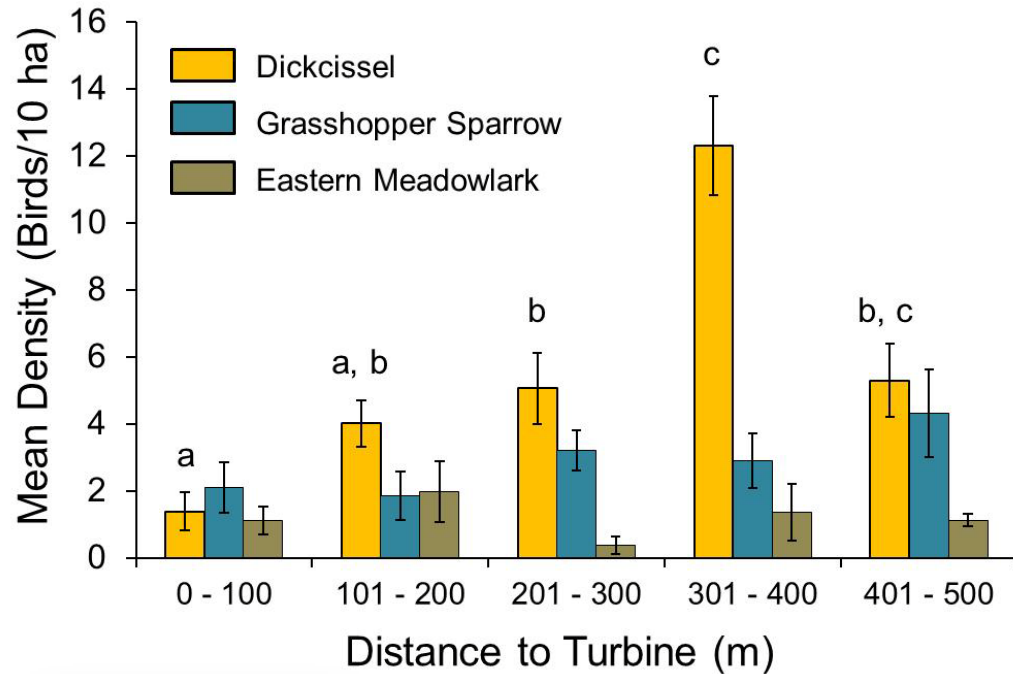
- 112.5 MW wind facility (75 1.5-MW GE turbines) began operations in October 2008



# 1. Are breeding birds displaced from wind turbines?

- Established 9 500-m transects
- Surveyed weekly in 2009 and 2010
  - Identity and location of all birds
    - Dickcissels, Grasshopper Sparrows and Eastern Meadowlarks
  - Vegetation data

# 2010 Results



Flickr: Feltonbeasley

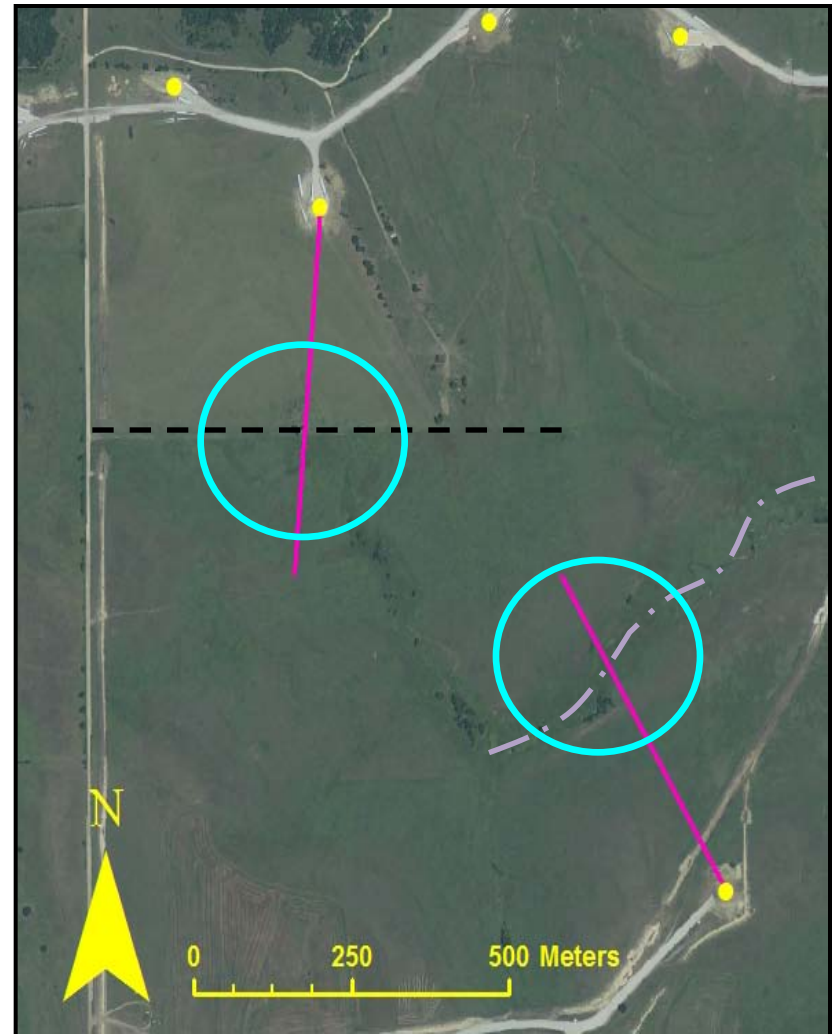
Observed more  
Dickcissels far from  
wind turbines  
( $H = 24.69$ ,  $P < 0.001$ )

Dickcissel density  
increased with vegetation  
height/density  
( $r = 0.97$ ,  $P = 0.005$ )

*Spiza americana*

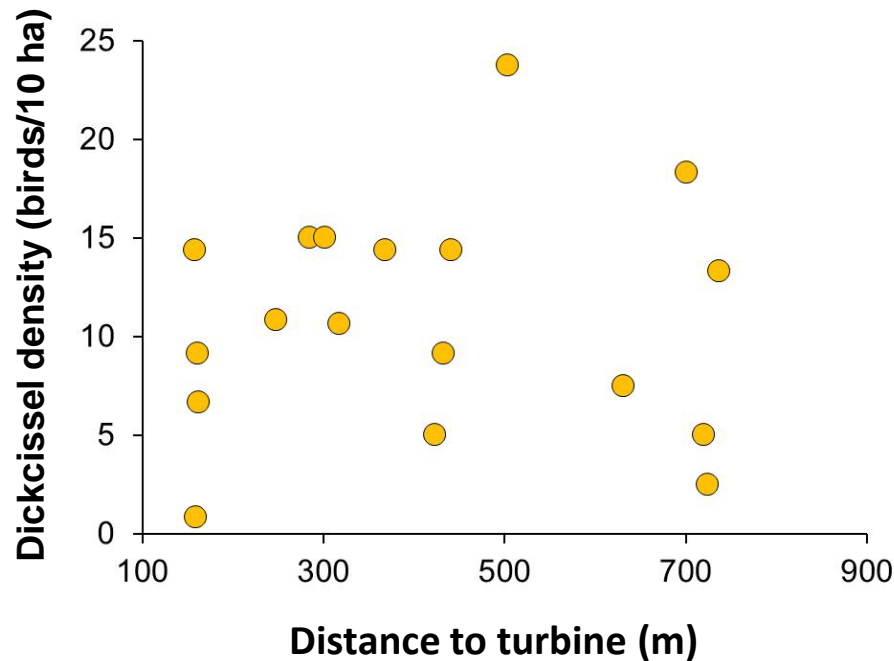
# Are Dickcissels displaced from wind turbines?

- Our 2009 & 2010 results suggested that Dickcissels were displaced from wind turbines
- 7 of 9 transects crossed fencelines or drainages (301-400 m)
- Thus, we changed our survey methodology in 2011

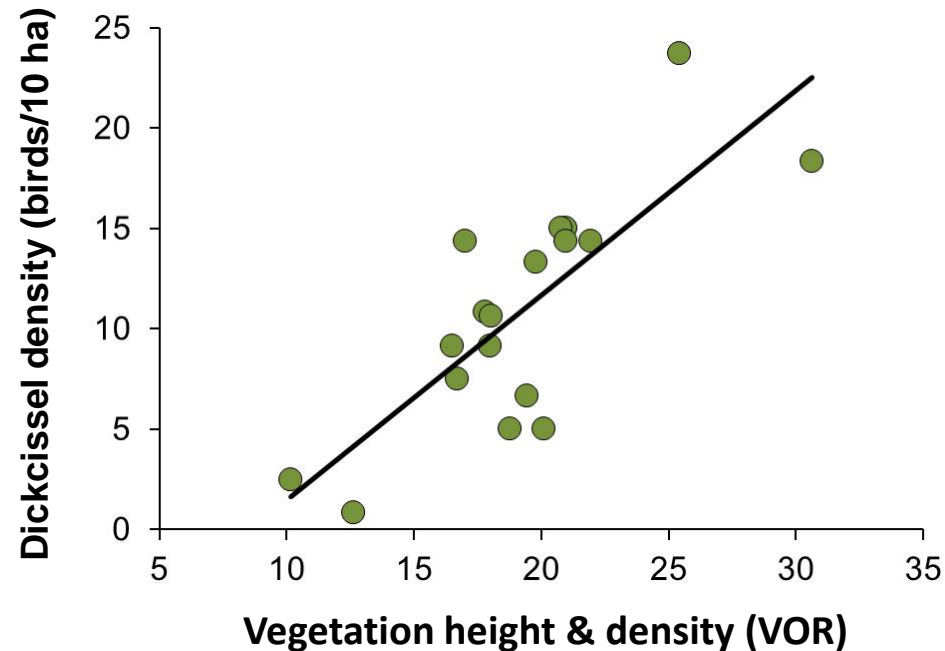




# 2011 Results: territory mapping in 18 4-ha plots



No evidence of  
displacement in  
Dickcissels  
( $r = 0.04$ ,  $P = 0.85$ )



Dickcissel density is  
strongly correlated  
with vegetation  
( $r = 0.78$ ,  $P < 0.001$ )

## 2. Does nesting success vary with distance to turbine?

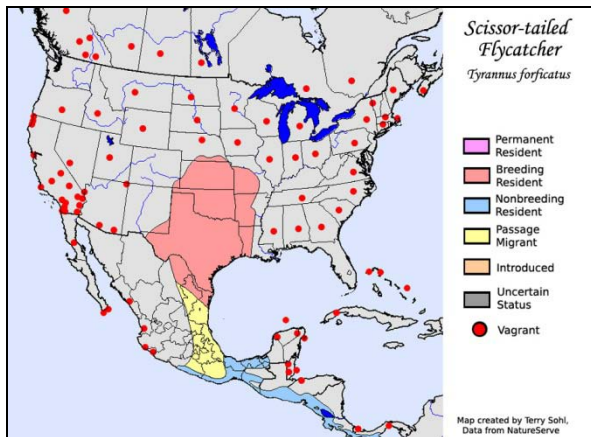




# Scissor-tailed Flycatchers (*Tyrannus forficatus*)



- 32 nests in 2009
- Nest success was low: ~16%
- Attributes of successful nests
  - Low canopy cover
  - Often located on telephone poles
  - Close to wind turbines



**Reduced predation**



# Dickcissels (*Spiza americana*)



- 193 nests 2010-2011
- Nest success was ~30%
- Nest density increased with increasing vegetation density and height
- No variation in nest site characteristics or nest density with distance to turbine



# What is driving Dickcissel nesting success?

## Potential Variables

**Distance to wind turbine (2)**

**Year (3)**

Search area

**Nest initiation day (1)**

**Distance to wooded edge (4)**

Distance to county road

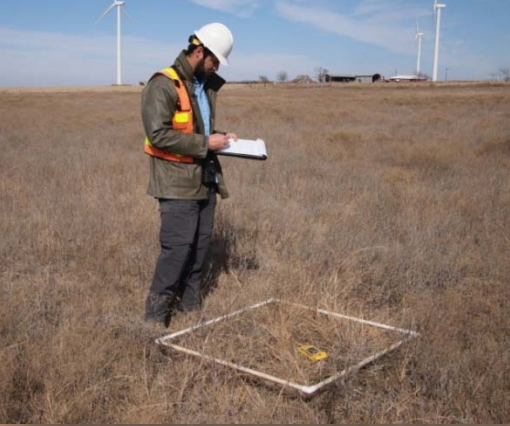
Vegetation height & density

% Grass

- #1 – Earlier nests more successful
- #2 – Closer nests more successful
- #3 – 2011 more successful
- #4 – Nests farther from wooded edge more successful

Positive  
association  
with wind  
turbines

### 3. Are wintering birds displaced by wind turbines?



- Surveyed 210 1-ha plots over two winters 2009-2010 and 2010-2011
  - Identity and location of all birds
  - Vegetation data



# Winter bird observations

Le Conte's Sparrow

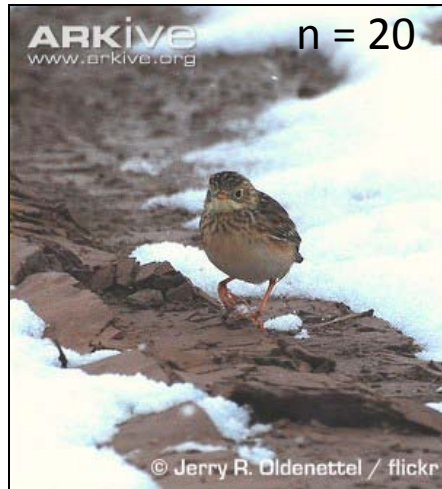


**Displacement ( $P = 0.0002$ )**

**Flyers** (Grzybowski 1983)



Sprague's Pipit



Savannah Sparrow



Meadowlarks



***Stevens et al. (In Revision) Ibis***

A background image showing several white wind turbines in a green field under a blue sky with some birds.

# Displacement in Le Conte's Sparrows (*Ammodramus leconteii*)

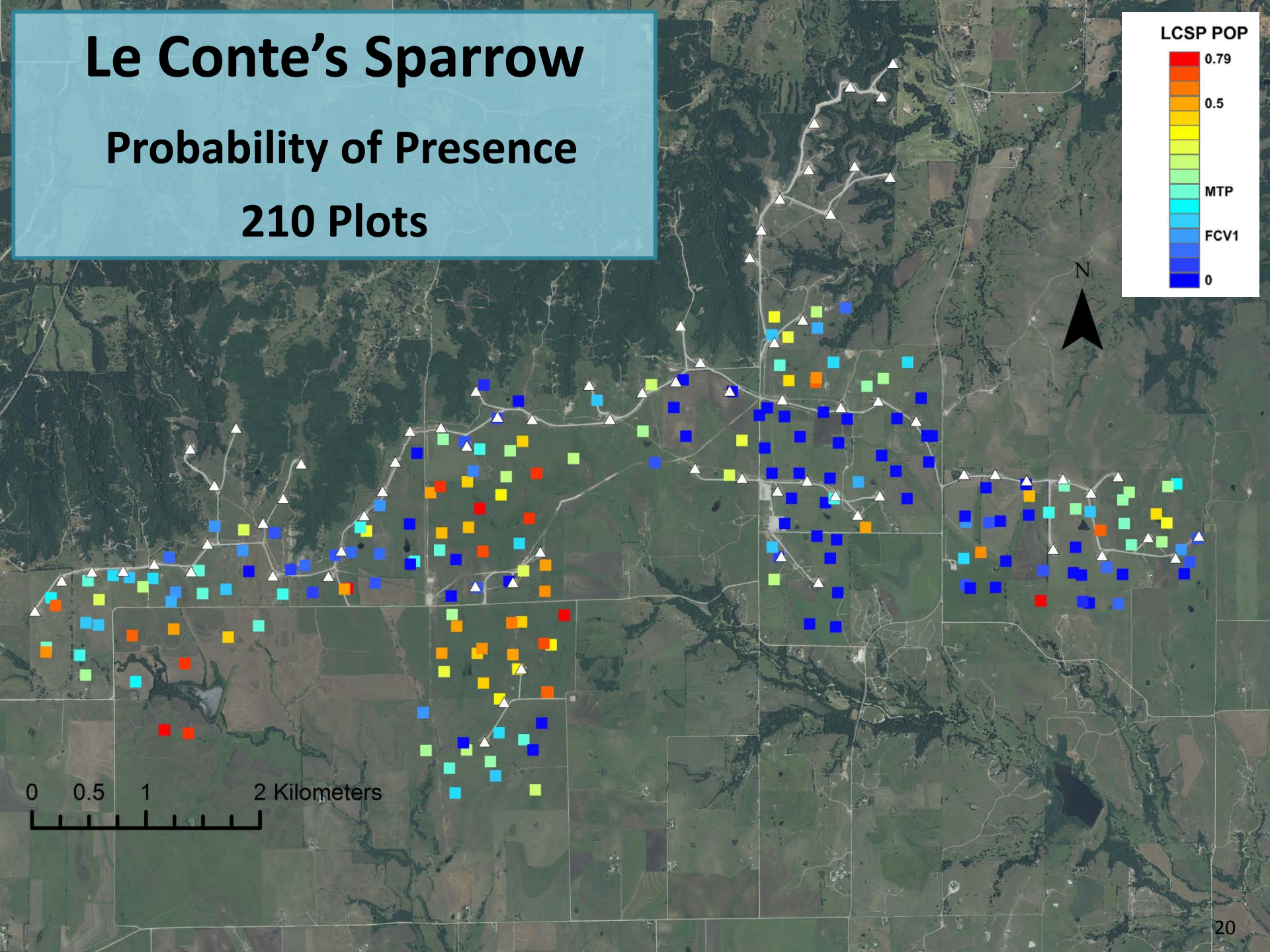
- Is this displacement real? OR
- Is suitable habitat found far from wind turbines?
  - Ecological niche modeling
    - Maxent: presence only data  
(Phillips et al. 2006)
    - Ecological variables
    - Probability of presence



# Le Conte's Sparrow

## Probability of Presence

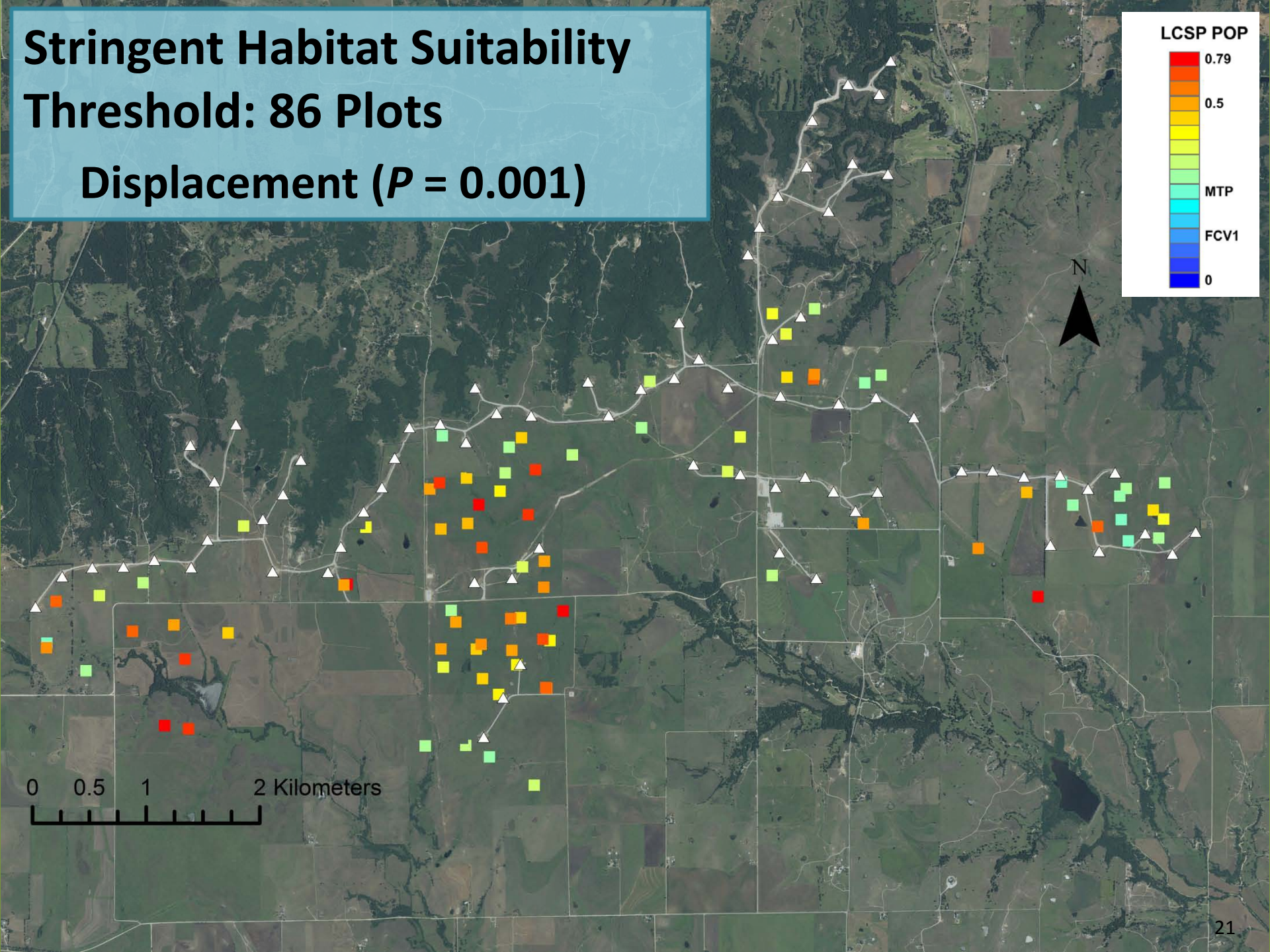
### 210 Plots



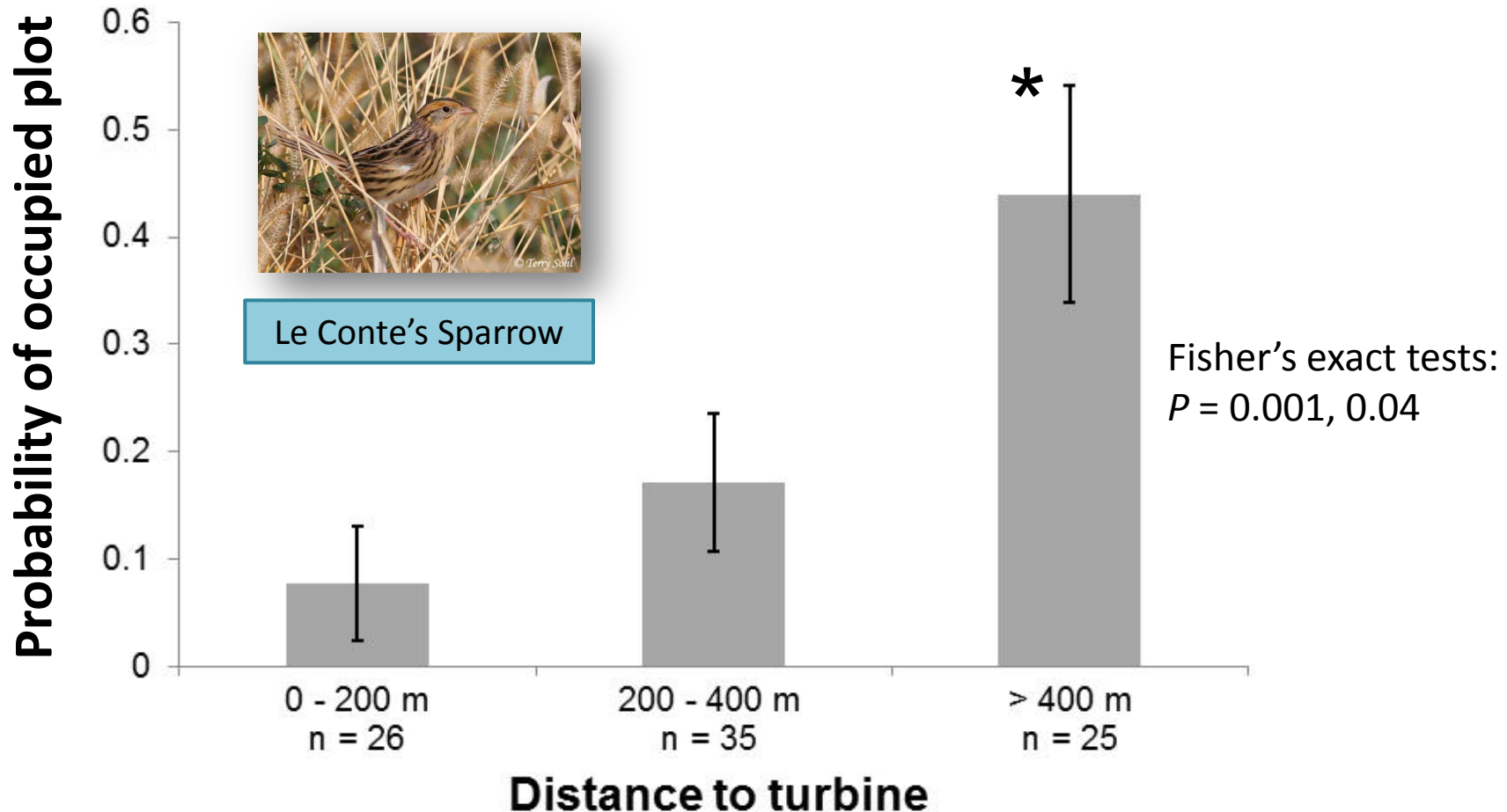


# Stringent Habitat Suitability Threshold: 86 Plots

Displacement ( $P = 0.001$ )



# Plot occupancy doubled > 400 m from nearest wind turbine





# Why is displacement species-specific?

## 1) Depends on predator avoidance strategy



**Cryptic  
Evasion**



**Social  
Evasion**

Displacement more likely

## 2) Depends on tolerance to disturbed habitats



Displacement more likely in  
sensitive species





# Lessons learned from Wolf Ridge

- **Displacement from wind turbines**
  - Not common in human-altered grasslands
  - Recommend plot-based methodologies
  - Surveys should focus on those species predicted to be at greatest risk
  - Need to consider winter birds



# Lessons learned from Wolf Ridge

- **Impacts of wind turbines on nesting success**
  - No negative effects at this site
  - Encourage incentives to develop wind energy in human-altered landscapes
  - Research is needed to determine if wind turbines are affecting the predator community



# Acknowledgements

## Thank You

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