



Vesper Sparrow
Pooecetes gramineus



Western Meadowlark
Sturnella neglecta



Killdeer
Charadrius vociferous
Generalist species



Northern Pintail
Anas acuta



Blue-winged Teal
Spatula discors



Northern Shoveler
Spatula clypeata

Gadwall
Mareca strepera



Mallard
Anas platyrhynchos

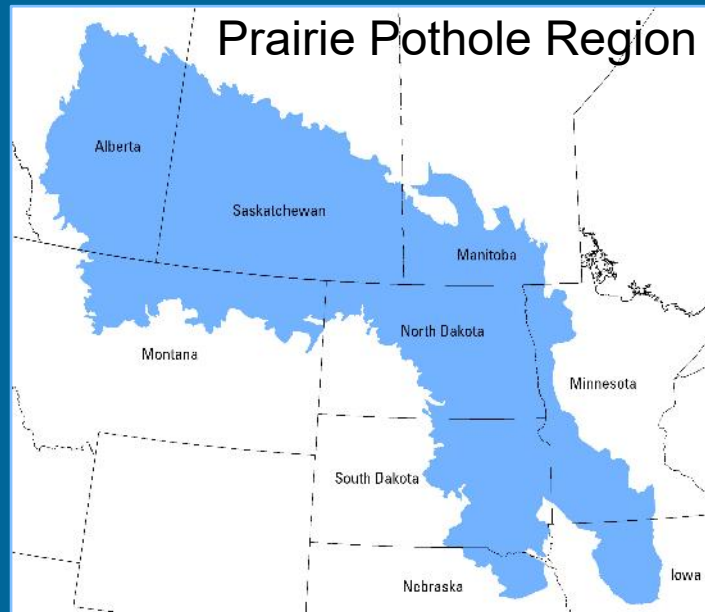


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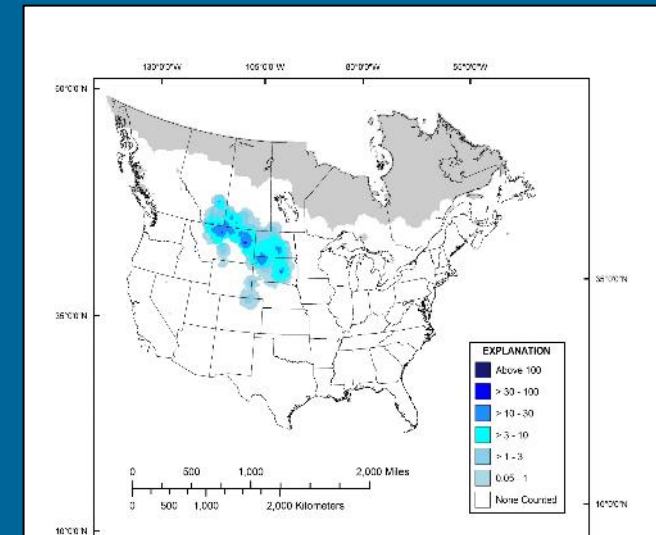
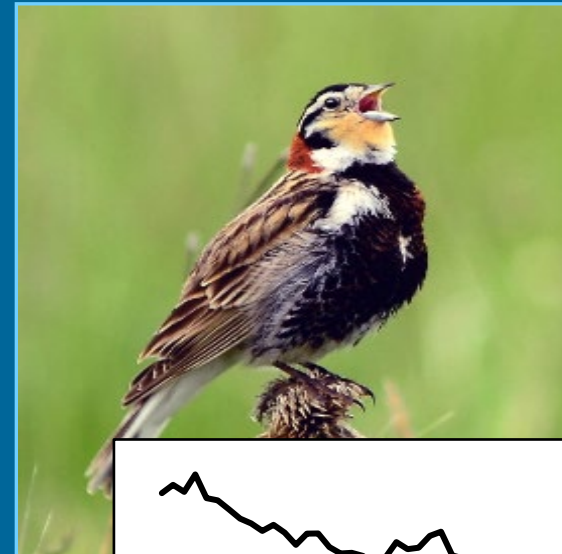
Each PowerPoint explores a specific aspect of behavioral displacement

1

Importance of ecoregion
to grassland birds and
waterfowl



Species Status
Importance
Population Trends



Chestnut-collared Longspur
Grassland-obligate
PPR-specialist



-4.32% / year

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2

- Study Design
- Field Methods
- Definitions & Analysis
- Detailed Results

Shaffer, J.A., and Buhl, D.A., 2016. Effects of wind-energy facilities on breeding grassland bird distributions. *Conservation Biology* 30: 59–71.

Loesch, C.R., Walker, J.A., Reynolds, R.E., Gleason, J.S., Niemuth, N.D., Stephens, S.E., and Erickson, M.A., 2013. Effect of wind energy development on breeding duck density in the Prairie Pothole Region. *Journal of Wildlife Management* 77: 587–598.

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2

- Study Design

Before-After, Control-Impact

Before: Conduct bird surveys in areas where wind turbines will be constructed, before they are constructed



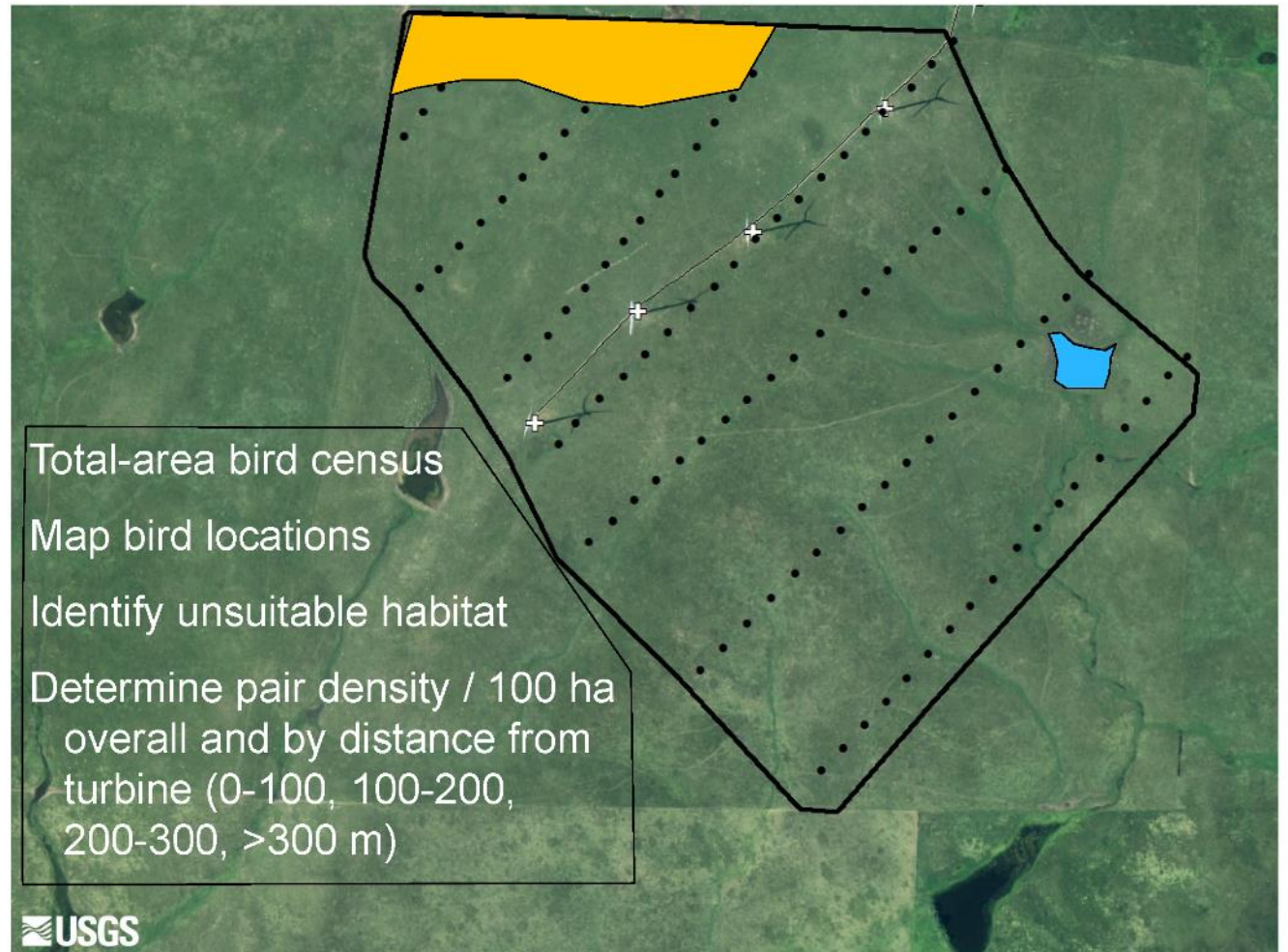
After: Conduct surveys in the same locations in the years after construction



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- Field Methods

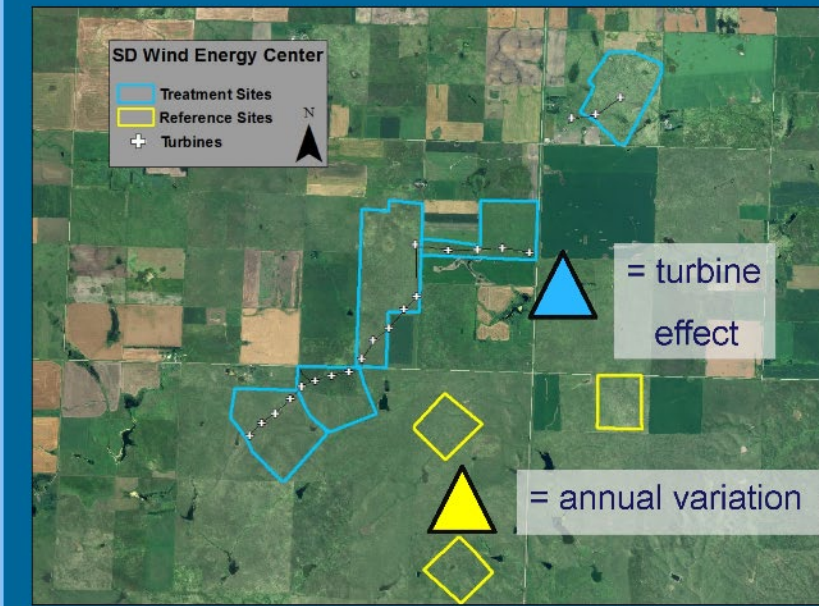


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2

- Definitions & Analysis

Definition of Displacement



Change in density on treatment sites from the pre- to the post-treatment years, relative to reference sites

( - )

- = displacement
+ = attraction

USGS

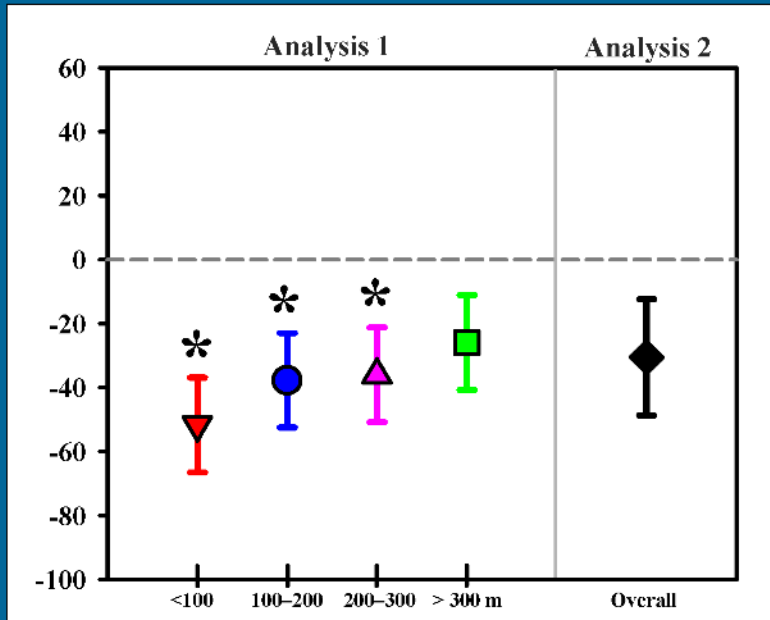
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2

- Detailed Results

Grasshopper Sparrow at Tatanka

Difference in
change in density / 100 ha



Delayed Turbine Effects



Conclusion for Grasshopper Sparrow

No significant immediate displacement; however, large negative effects within 100 m of turbines may be biologically important

Significant negative delayed effects were observed within 200 m of turbines and usually extended out to 300 m

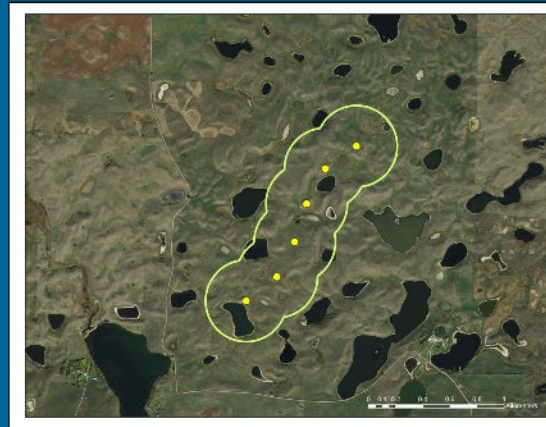


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3

- Step-by-step Demonstration of Avian-Impact Offset Method (AIOM)

Computation of area needed to support displaced pairs of grassland birds



Impact Distance = 300 m

Impact Area (a) = 112 ha, or 277 ac

Pre-Impact Density (d_1) = 1.9 pairs / ha

Percent Displacement (r) = 53%

Step 1

Calculate number of breeding pairs within impact area

p = no. pairs within 300-m buffer zone

$$= a \times d_1$$

$$112 \text{ ha} \times 1.9 \text{ pairs / ha} = 213 \text{ pairs}$$

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3

- Step-by-step Demonstration of Avian-Impact Offset Method (AIOM); 4 Examples



Example 1. Grassland Birds & Wind—
Impact site & offset site are of equal
biological value.

Example 2. Grassland Birds & Wind—
Impact site & offset site are NOT of
equal biological value.



Example 3. Grassland Birds & Oil/Gas



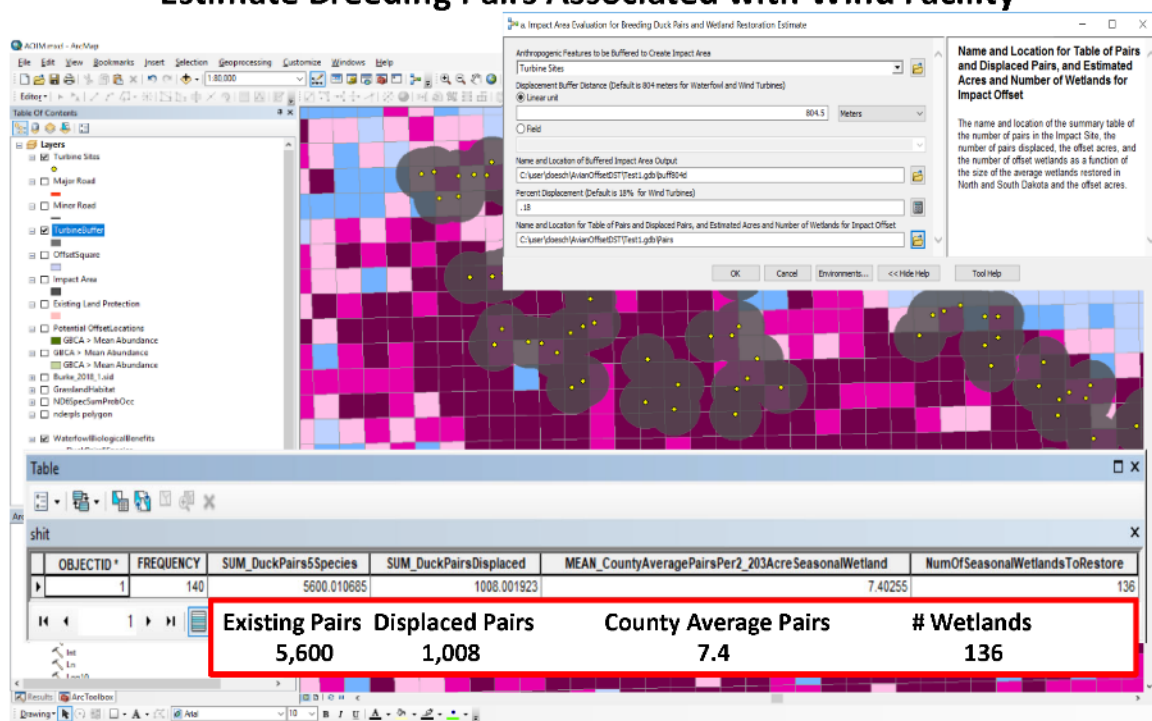
Example 4. Waterfowl & Wind

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4

- Demonstration of Decision Support Tools

Estimate Breeding Pairs Associated with Wind Facility



The screenshot shows the ArcMap interface with a map of a wind facility. A dialog box titled "Impact Area Evaluation for Breeding Duck Pairs and Wetland Restoration Estimate" is open, showing settings for "Antropogenic Features to be Buffered to Create Impact Area" and "Displacement Buffer Distance". Below the map, a table displays the results of the analysis.

OBJECTID*	FREQUENCY	SUM_DuckPairs5Species	SUM_DuckPairsDisplaced	MEAN_CountyAveragePairsPer2_203AcreSeasonalWetland	NumOfSeasonalWetlandsToRestore
1	140	5600.010685	1008.001923	7.40255	136

Existing Pairs: 5,600
Displaced Pairs: 1,008
County Average Pairs: 7.4
Wetlands: 136

USGS science for a changing world

Tool 3: Worksheets

Example Worksheets

Blank Template