Ecology of Male Greater Sage-Grouse In Relation to Wind Energy Development in Wyoming

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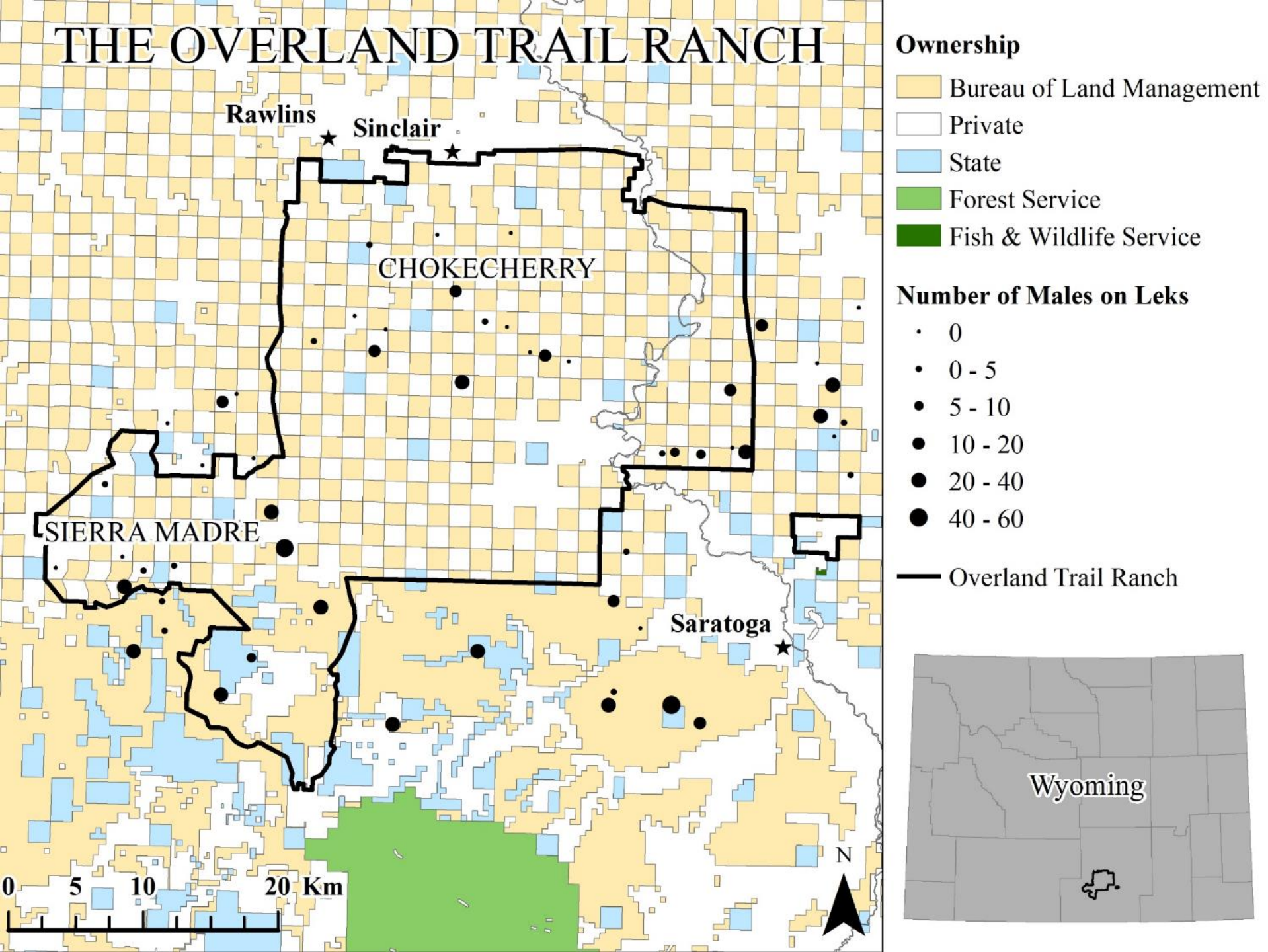
SWCA Environmental Consultants
Wyoming Game and Fish Department

Background

- Power Company of Wyoming, LLC
  - 1,000 turbine, 3,000 MW wind energy facility on the Overland Trail Ranch*
  - Funded study of hen sage-grouse
- Male sage-grouse ecology and wind energy development

*www.powercompanyofwyoming.com


THE OVERLAND TRAIL RANCH
Rawlins
Sinclair
CHOKECHERRY
SIERRA MADRE
Saratoga
0 5 10 20 Km
N
Ownership
Bureau of Land Management
Private
State
Forest Service
Fish & Wildlife Service
Number of Males on Leks
0
0 - 5
5 - 10
10 - 20
20 - 40
40 - 60
Overland Trail Ranch
Wyoming

Objectives

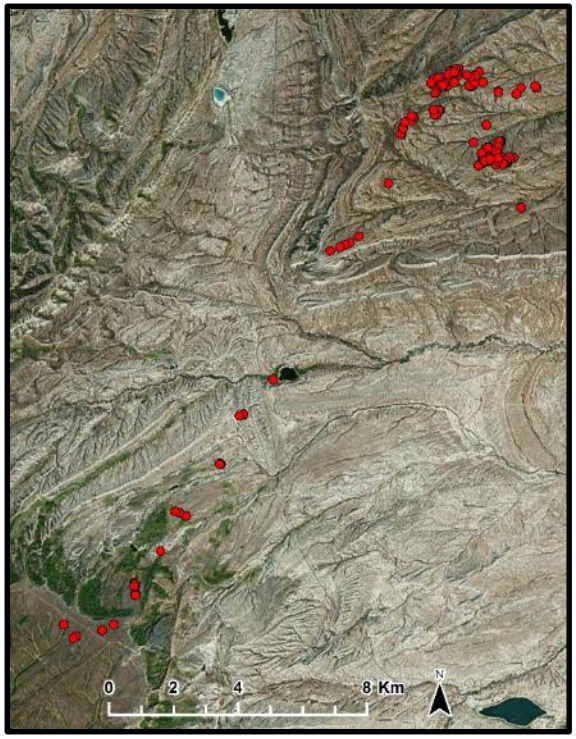
- Determine whether male sage-grouse respond to wind energy development
  - Before-After Control-Impact design
    - Lek dynamics
    - Survival
    - Movements
    - Resource selection

Capture/Tagging

- GPS PTTs on adult/yearling males
  - 145 males tagged
- VHFs on adult/yearling males
  - 137 males tagged
- VHFs on male and female juveniles
  - 66 males and 62 females tagged

Tracking

- Locations from GPS PTTs
  - 5-9 locations per day
  - >184,600 male locations, to date
- Aerial telemetry for VHFs
  - 1 flight each month (2011-2014)
  - Survival analysis



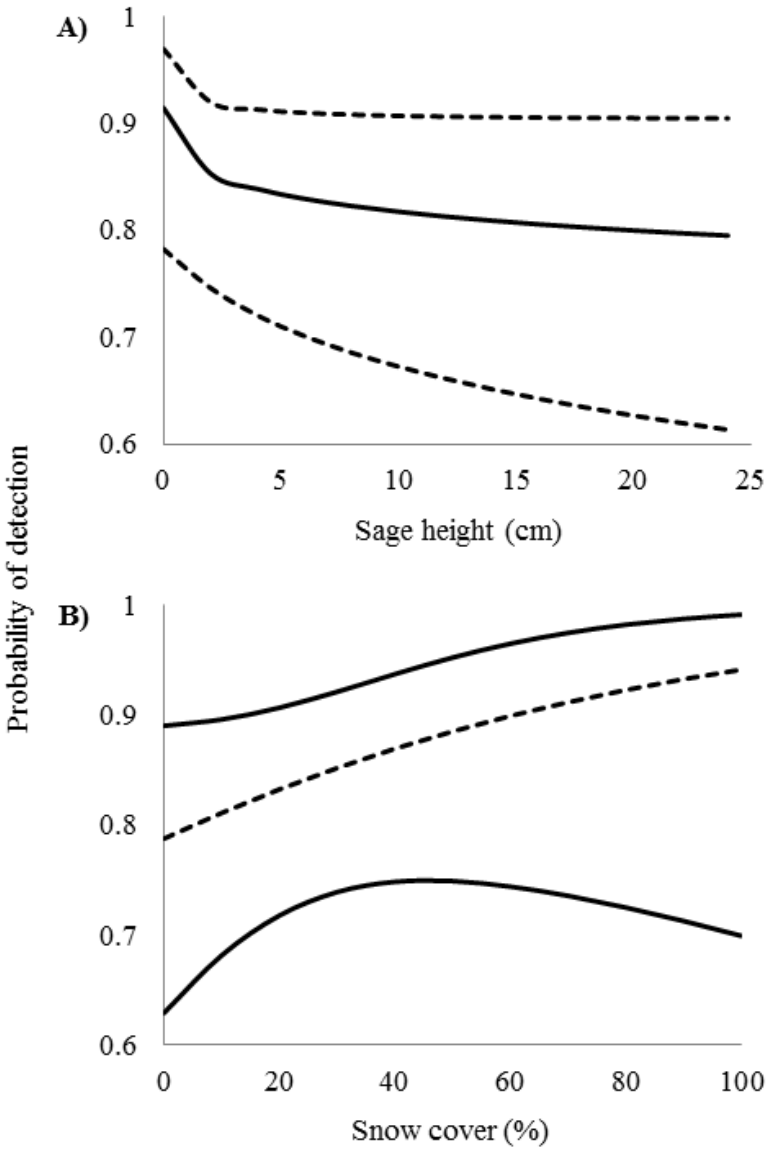
Lek Dynamics: Lek Count

Year	Leks counted	Leks occupied	Avg. males/occupied lek (SE)
2011	44	20	23.2 (2.8)
2012	49	24	20.1 (3.1)
2013	56	29	17.0 (2.4)
2014	58	33	21.8 (3.0)
2015	58	33	25.3 (3.3)
2016	58	36	27.0 (3.2)

Lek Dynamics: Sightability

Sightability

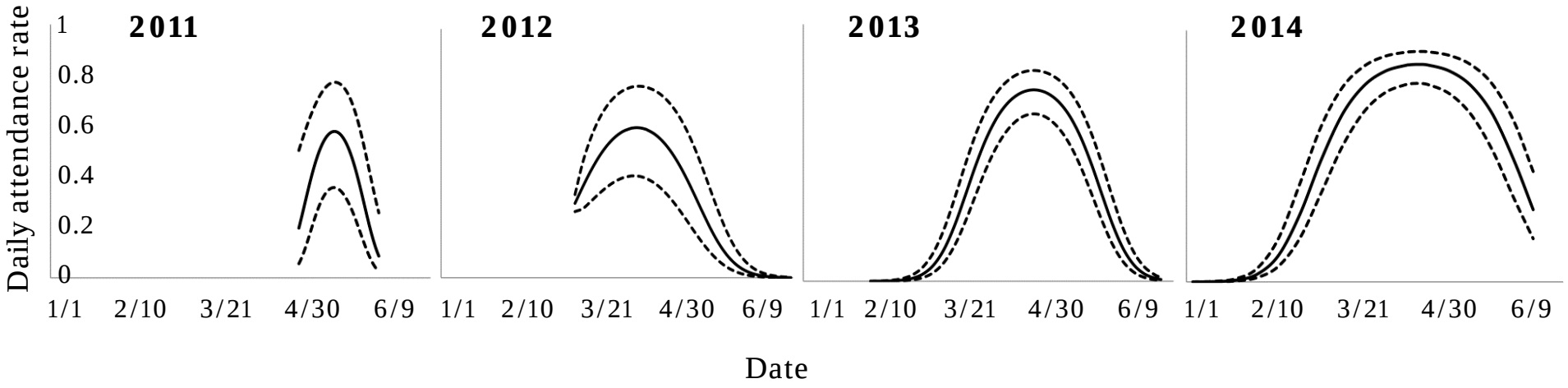
- Average detection probability
  - 87% (95% CI: 78-93%)
- Lek specific detection probabilities
  - 77% (95% CI: 58-89%) – 93% (95% CI: 73-98%)
- Corrected abundance by 17-19% each year



Lek Dynamics: Lek Attendance

Lek Attendance

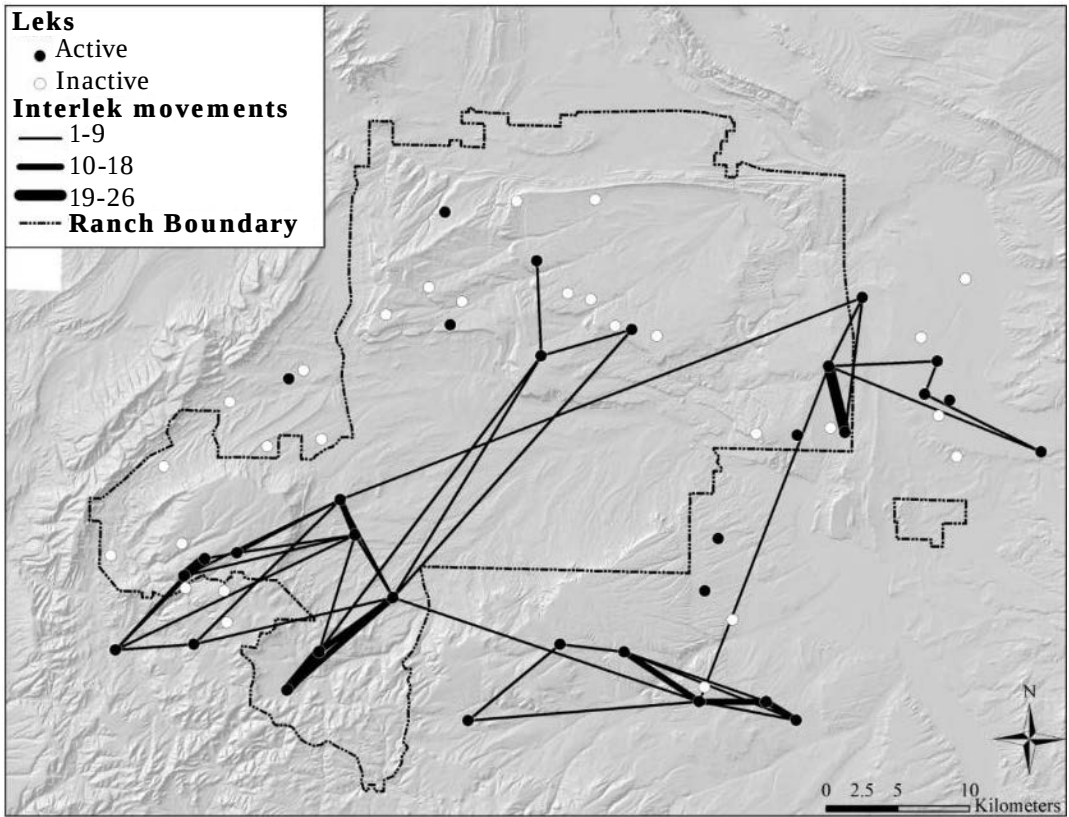
- Average and peak daily attendance varied annually
  - 36.3% (95% CI: 18.1-54.5%) in 2011
  - 79.1% (95% CI: 68.9-89.3%) in 2014
  - Peak attendance: 8 April in 2012; 12 May in 2011
- Precipitation negatively affects attendance



Lek Dynamics: Interlek Movements

Interlek Movements

- High daily fidelity
  - 0.3% - 1.0% chance of moving daily
  - 5% - 42% chance of moving throughout spring
  - 33% of males moved among leks at least once
- Movements to higher elevation leks
  - Peak = 6 March



Survival

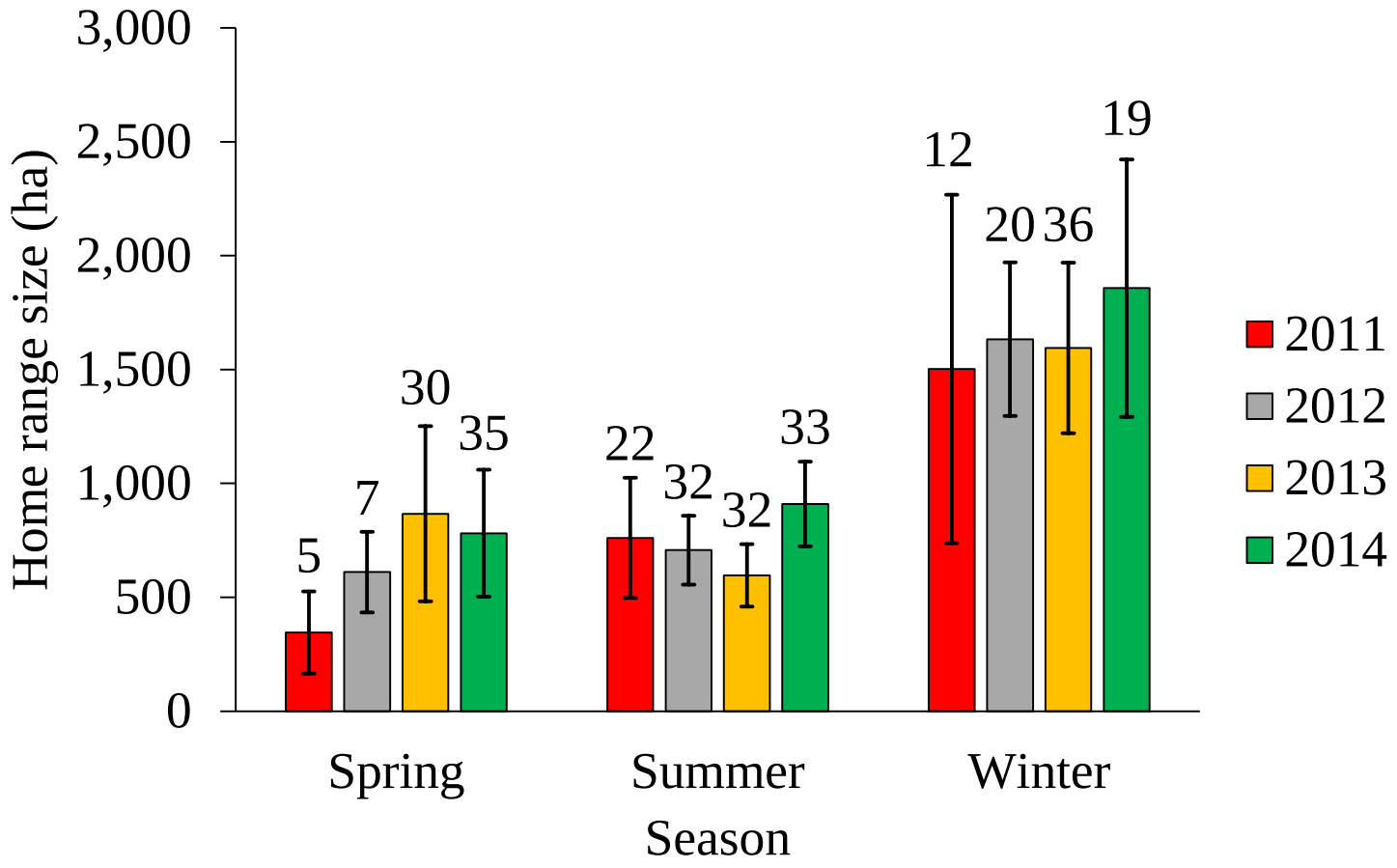
Survival

- Adult/Yearling annual survival--GPS PTT
  - Low: 21% (CI:9-51%) in 2011
  - High: 38% (CI: 26-54%) in 2013
- Adult/yearling annual survival--VHF
  - Low: 27% (CI: 10-55%) in 2011
  - High: 41% (CI:27-58%) in 2013
- Juvenile overwinter survival
  - Males: 41% (CI:28-55%)
  - Females: 46% (CI:30-63%)

Movement

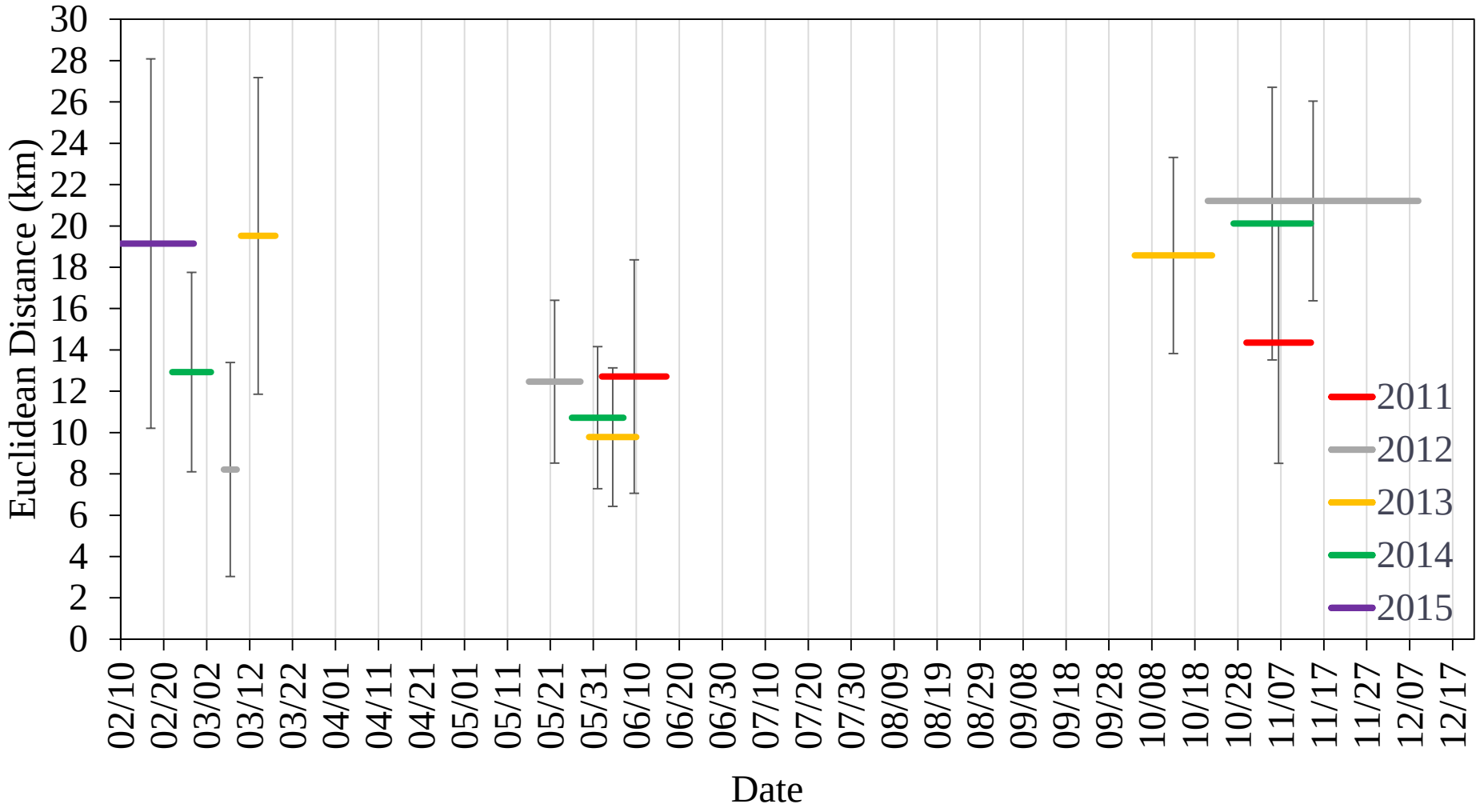
Movement

- Seasonal home range size



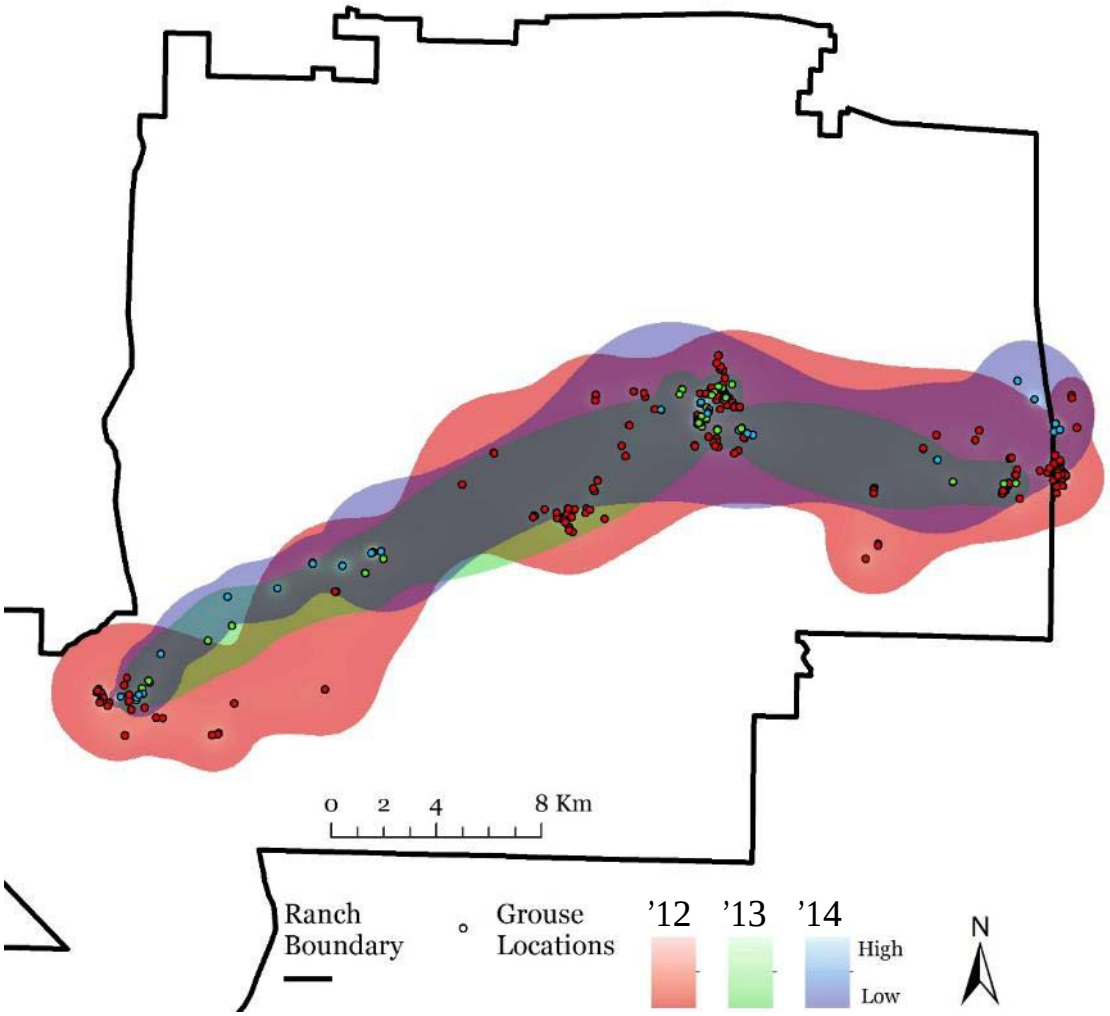
Movement

- Timing and distance of migrations



Movement

- Migration corridor fidelity



Resource Selection

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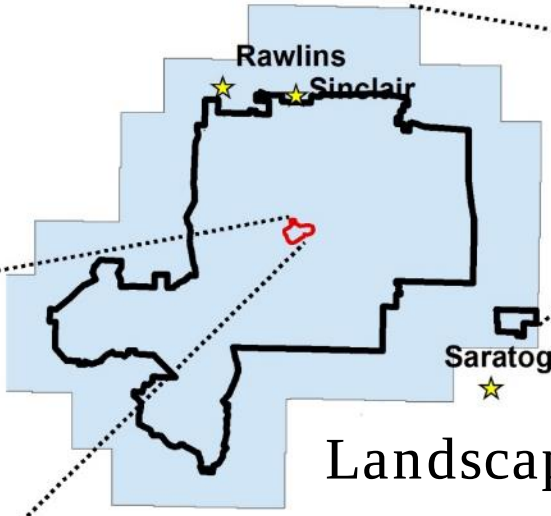
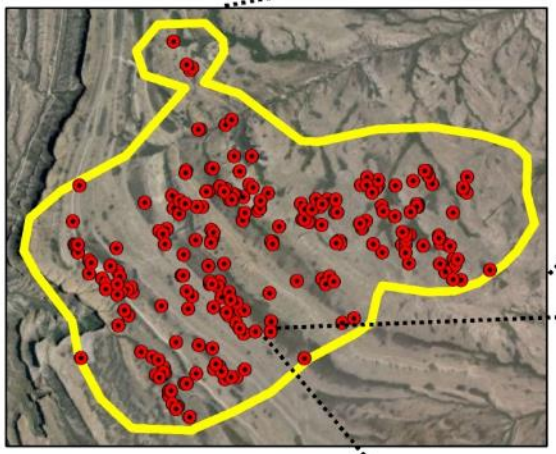


Landscape Scale



Home Range Scale

Microsite Scale

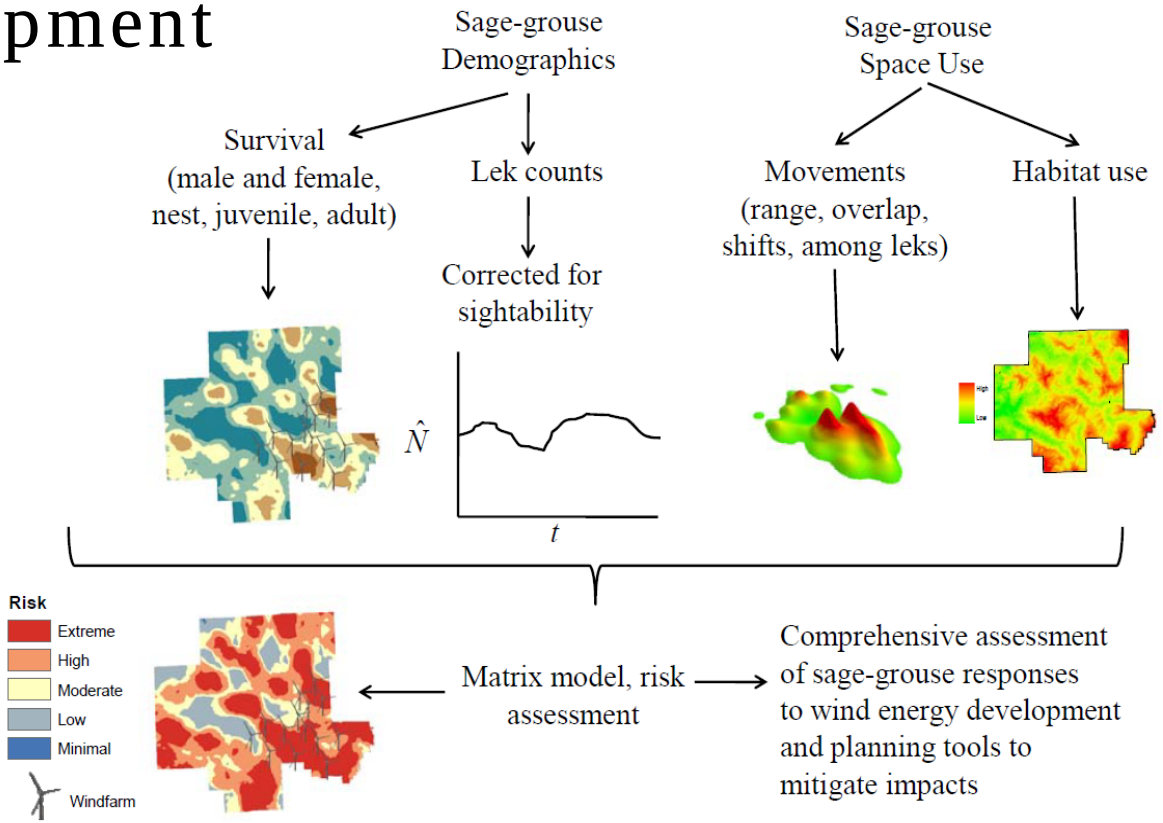
Resource Selection

- Microsite scale (summer, diurnal)
  - 147 male and 441 paired-random sites measured
  - Generally selected sites with higher moisture
    - More visual obstruction
    - More forbs and grasses
    - Taller vegetation


Used Site
Available Site

Future Research

- Collect similar data during construction and post-construction periods
- Evaluate response of sage-grouse to wind energy development



Acknowledgments

- National Renewable Energy Laboratory
- National Fish and Wildlife Foundation
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- National Wind Coordinating Collaborative
- Bureau of Land Management
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- University of Missouri

Questions?