



Environmental  
& Statistical  
Consultants

# Greater Sage-Grouse Reproductive Habitat Selection and Survival in Response to Wind Energy Infrastructure

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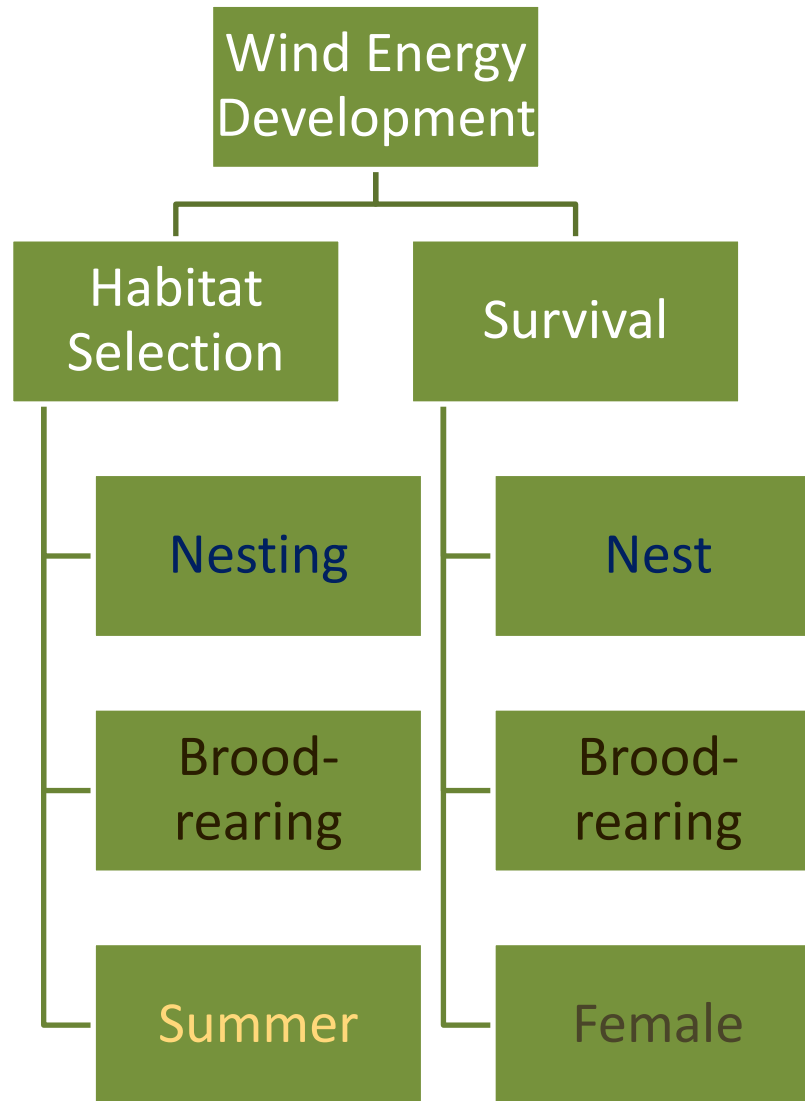
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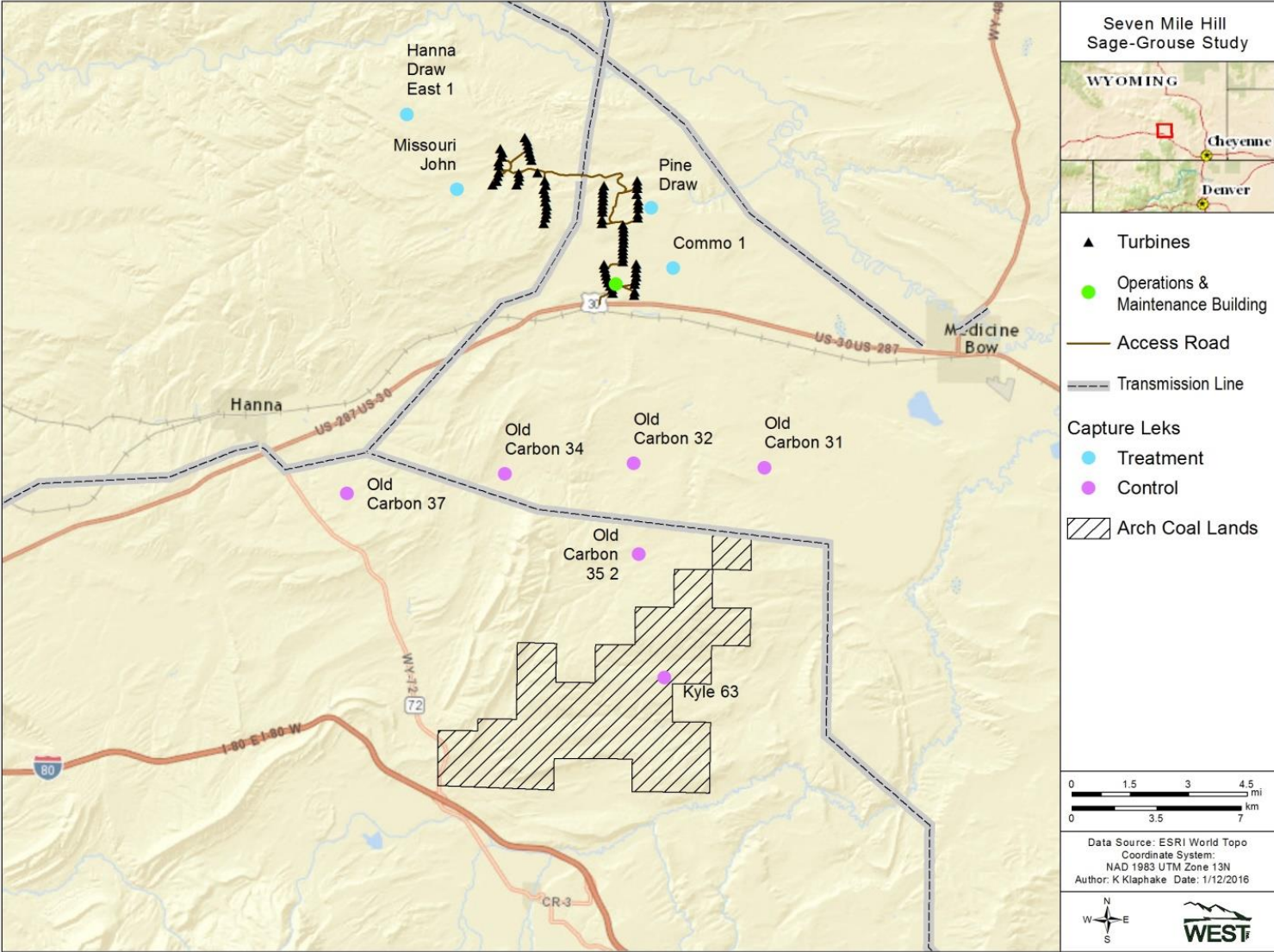
<sup>5</sup>Currently at Image Spatial Consulting, LLC, 552 North Cedar Street, Laramie, WY 82072

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# Study Outline



# Study Area

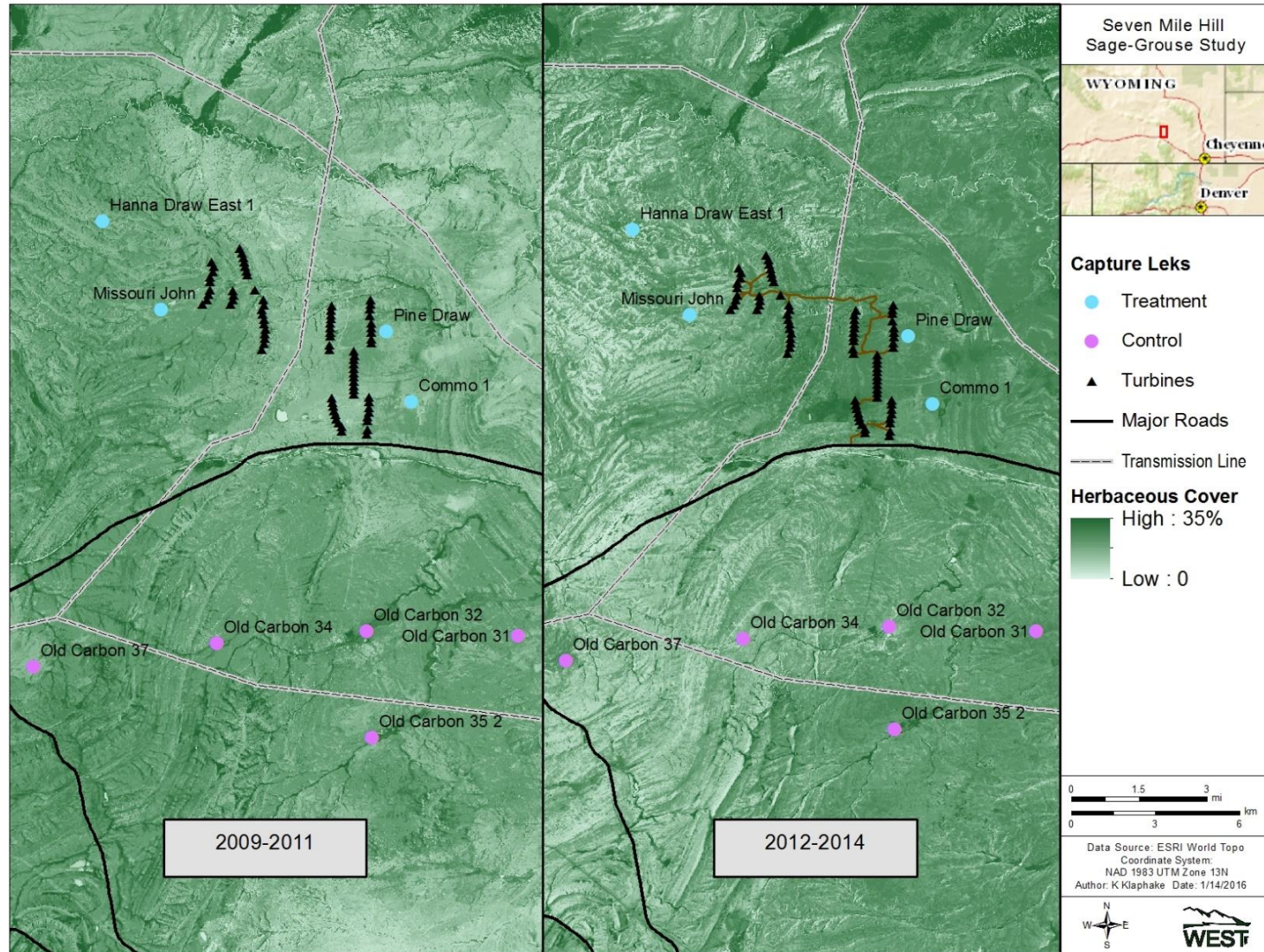


# Field Methods

- Study 2009 – 2014
- Captured 346 females (160 treatment; 186 control)
- 22-g necklace-mounted VHF radio transmitter (666 days)



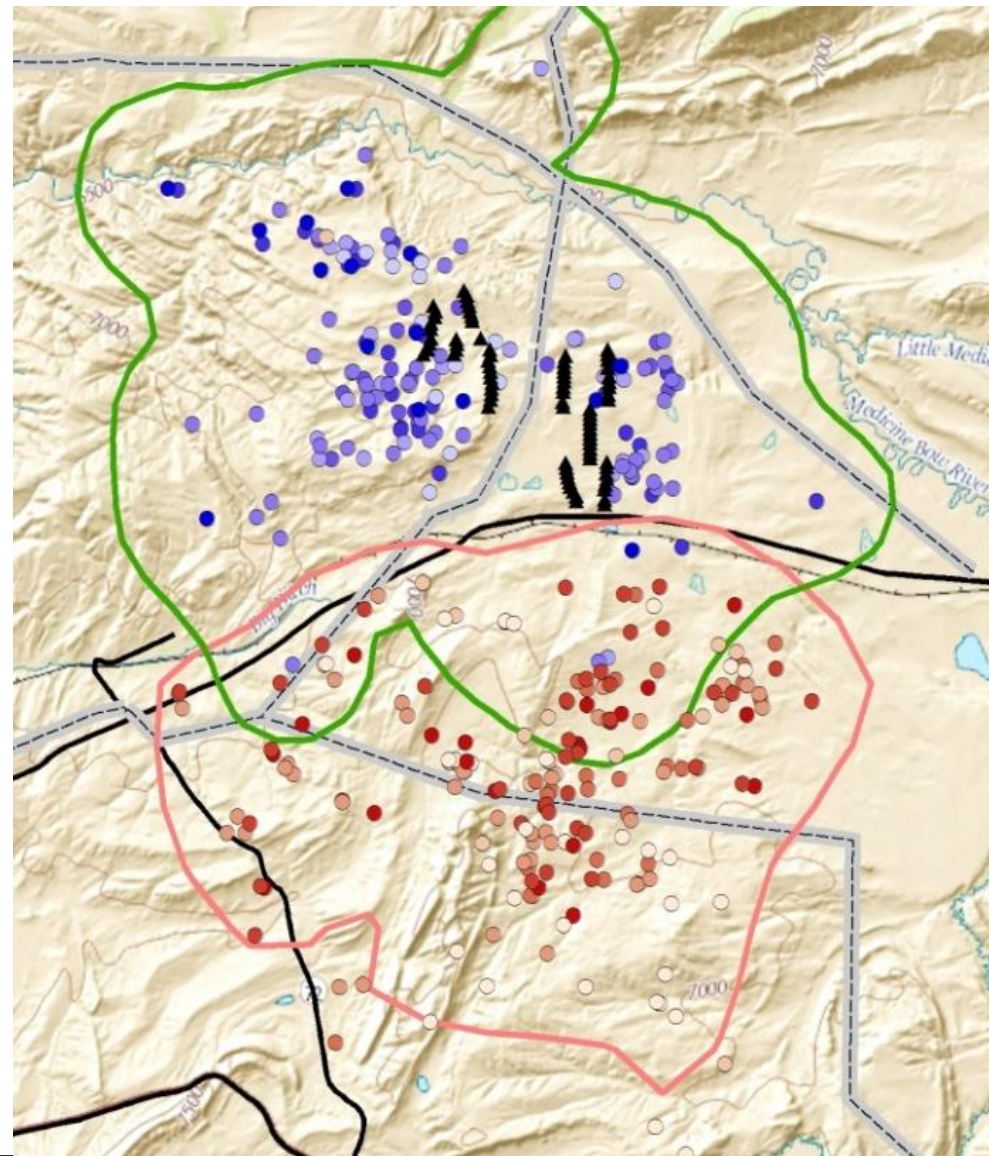
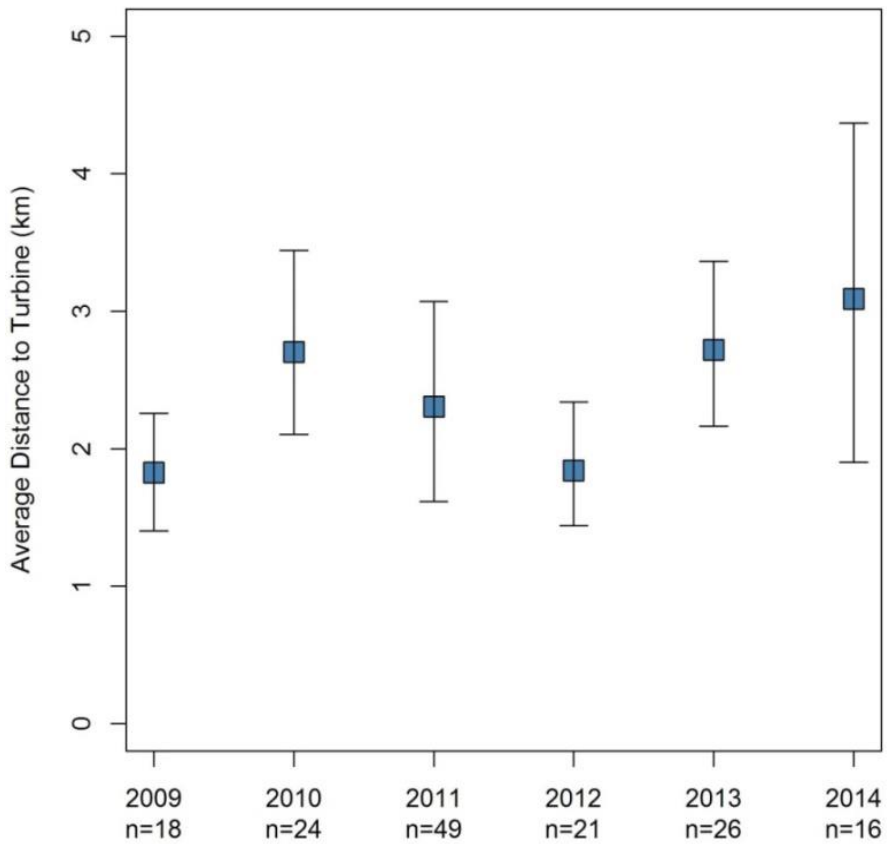
# Covariate Data



# Habitat Selection



# Results – Nest Site Selection



# Results – Nest Site Selection; No Effect

## Final Model

Distance to lek of capture (-)

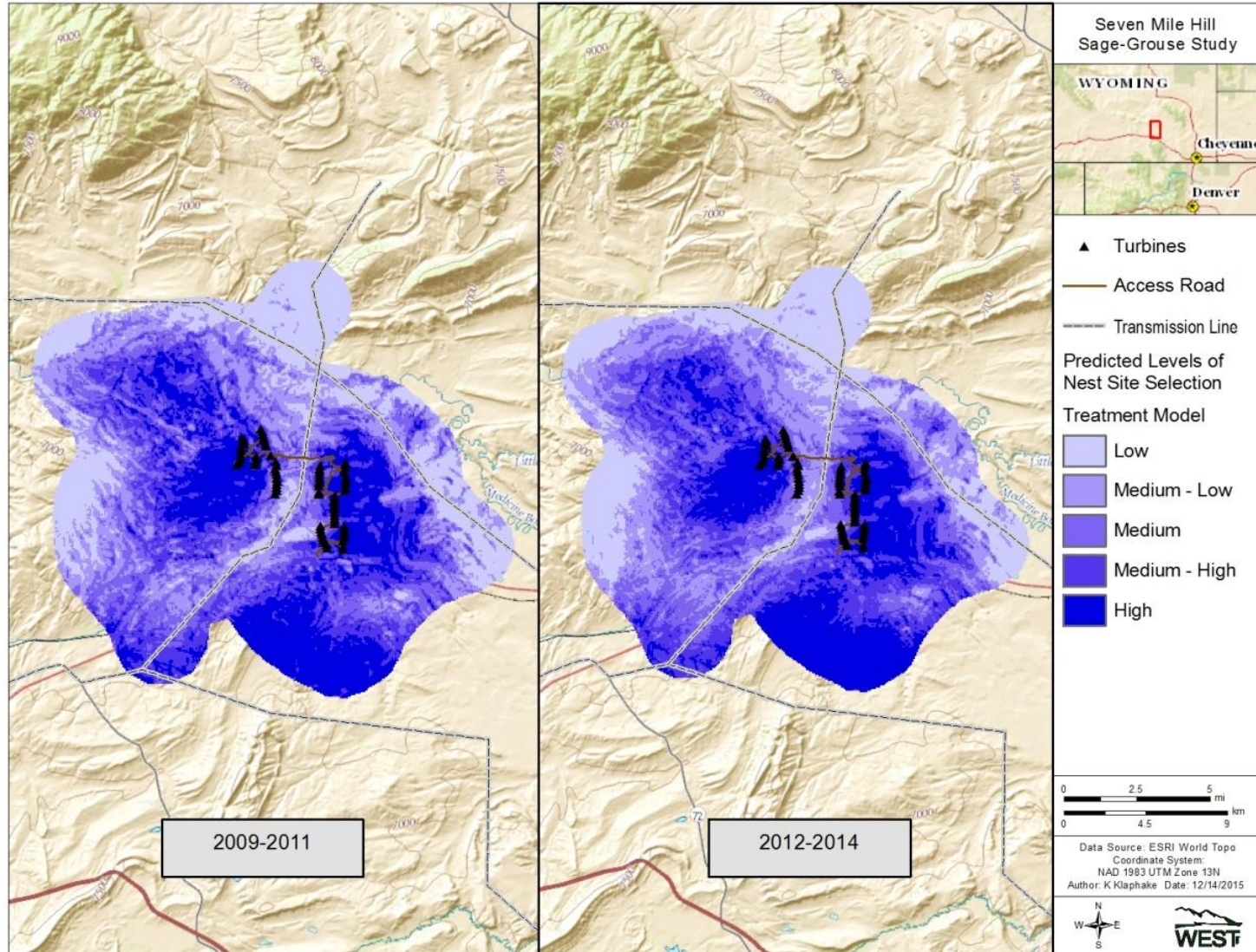
Bare ground (-)

Litter (+)

Wyoming big sagebrush (+)

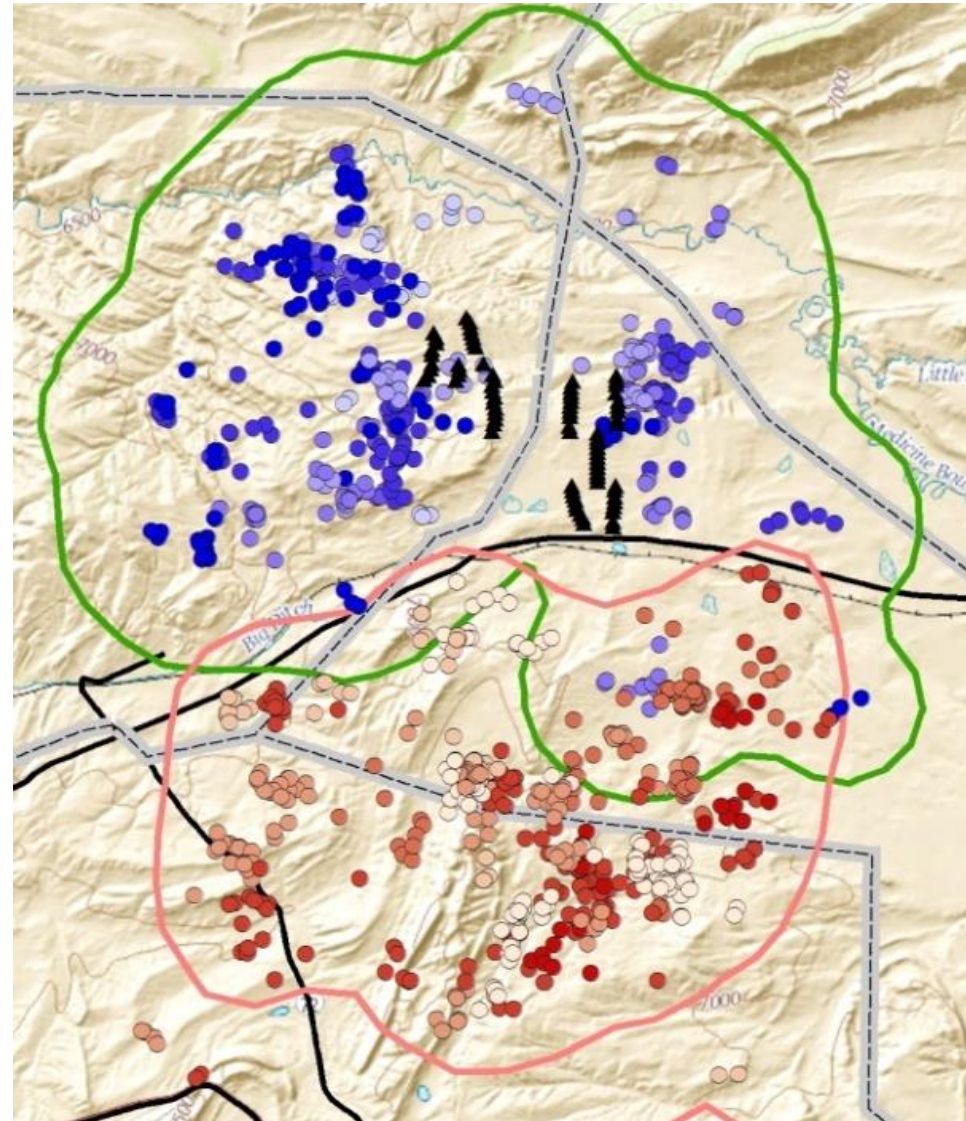
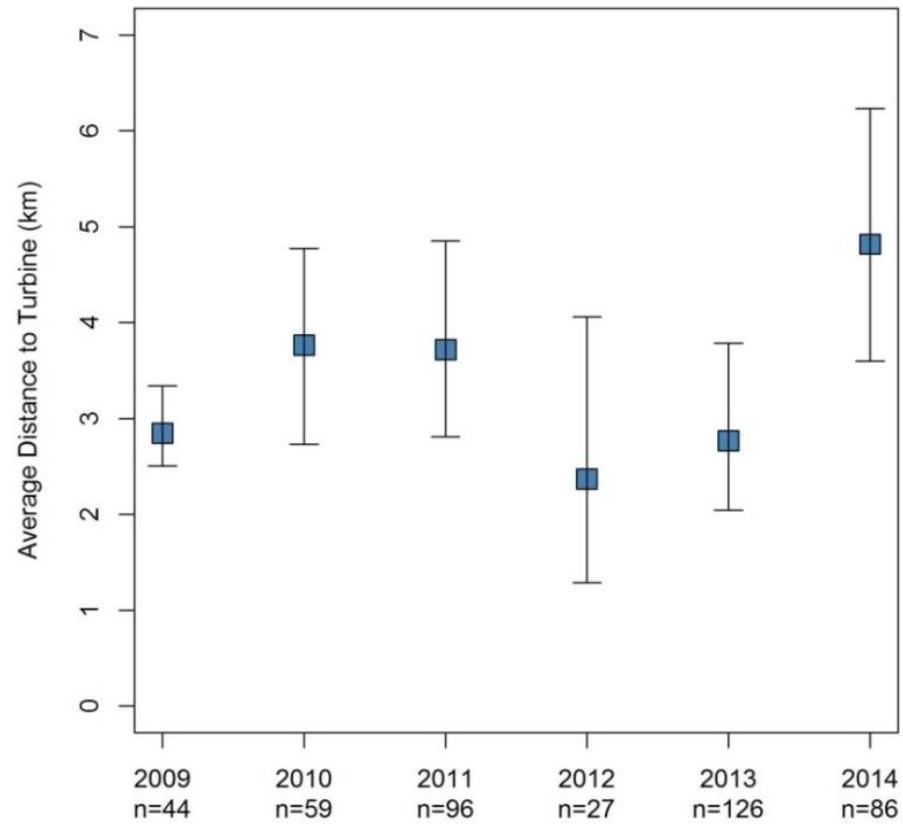
Distance to Transmission Line (+)

(Distance to Transmission Line)<sup>2</sup> (-)





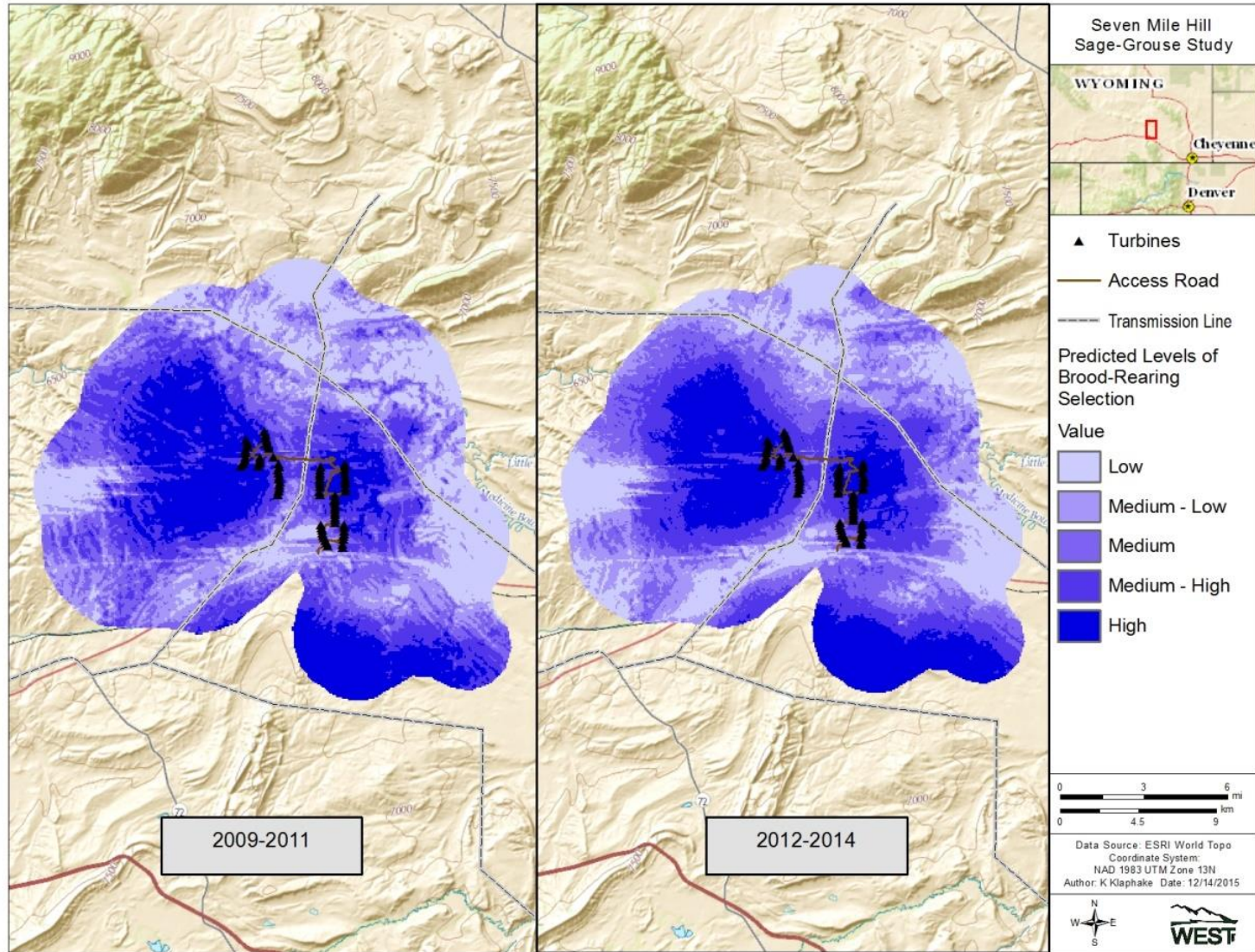
# Results – Brood-Rearing Habitat Selection



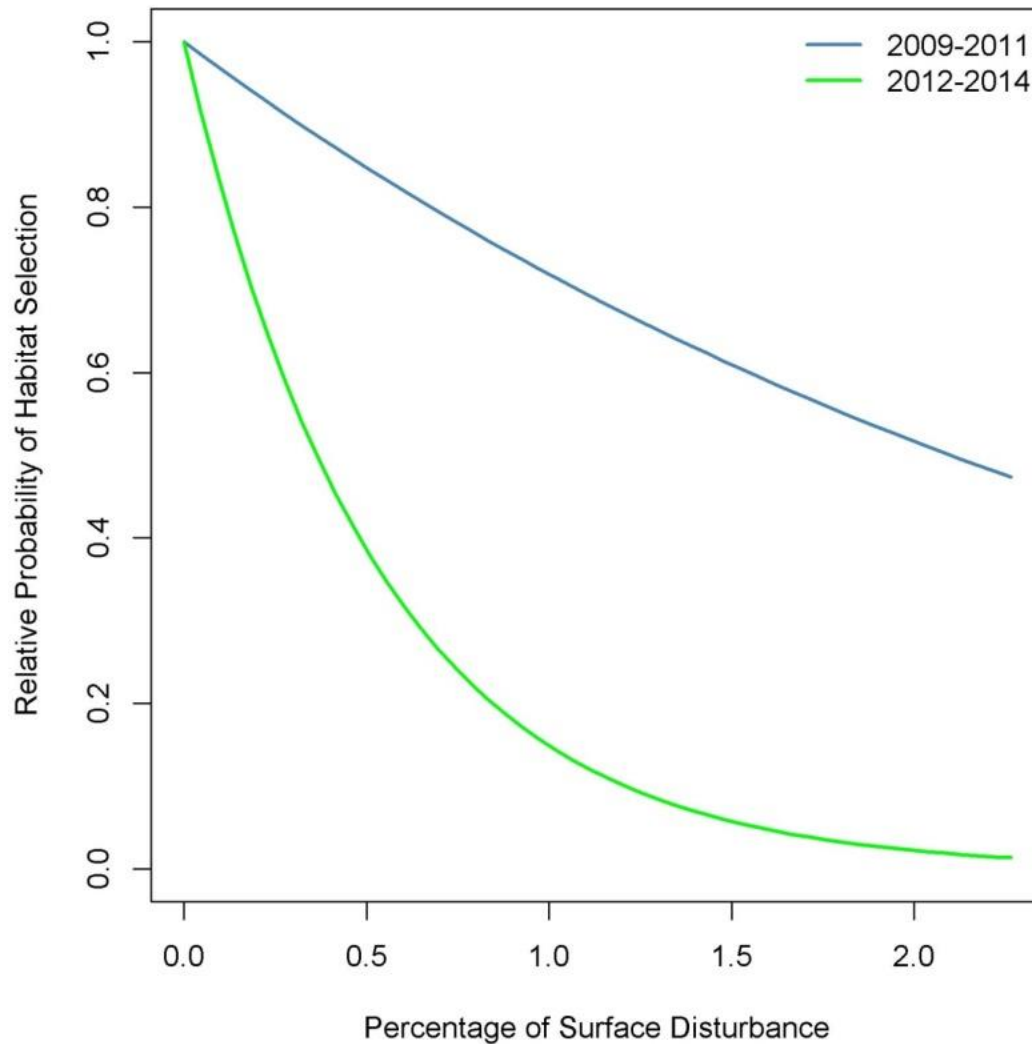
# Results – Brood-Rearing Habitat Selection; Negative Effect

## Final Model

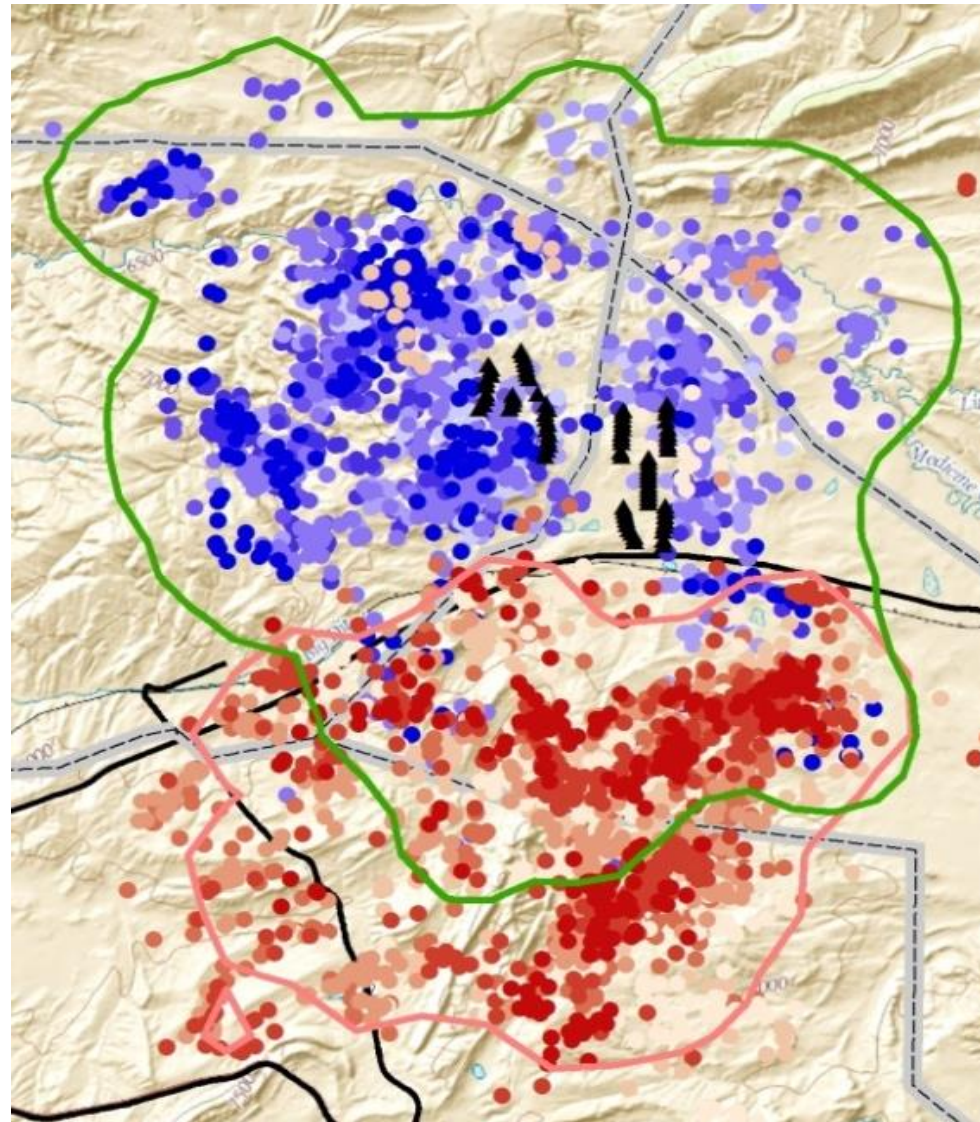
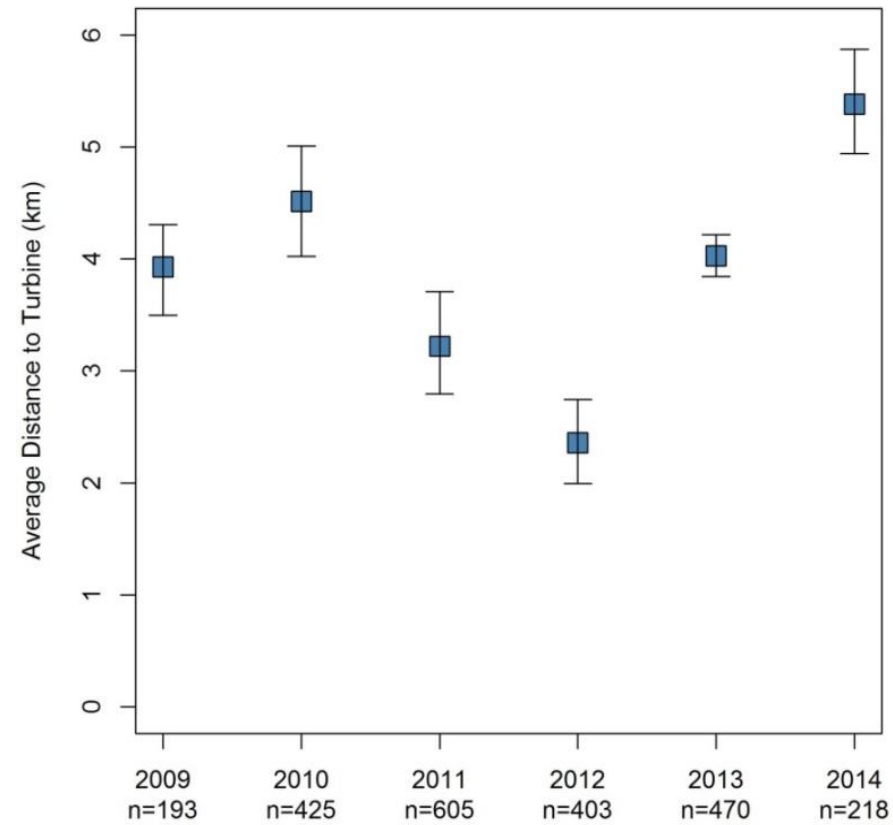
- Distance to lek of capture (-)
- Wyoming big sagebrush (+)
- Elevation (+)
- Bare ground (-)
- SD shrub height (-)
- Distance to transmission line (+)
- (Distance to Transmission Line)<sup>2</sup> (-)
- Distance to major roads (+)
- (Distance to major roads)<sup>2</sup> (-)
- Percent of SWEF surface disturbance (-)



# Results – Brood-Rearing Habitat Selection; Time Lag



# Results – Summer Habitat Selection



# Results – Summer Habitat Selection; Negative Effect

## Final Model

Distance to lek of capture (-)

Herbaceous (-)

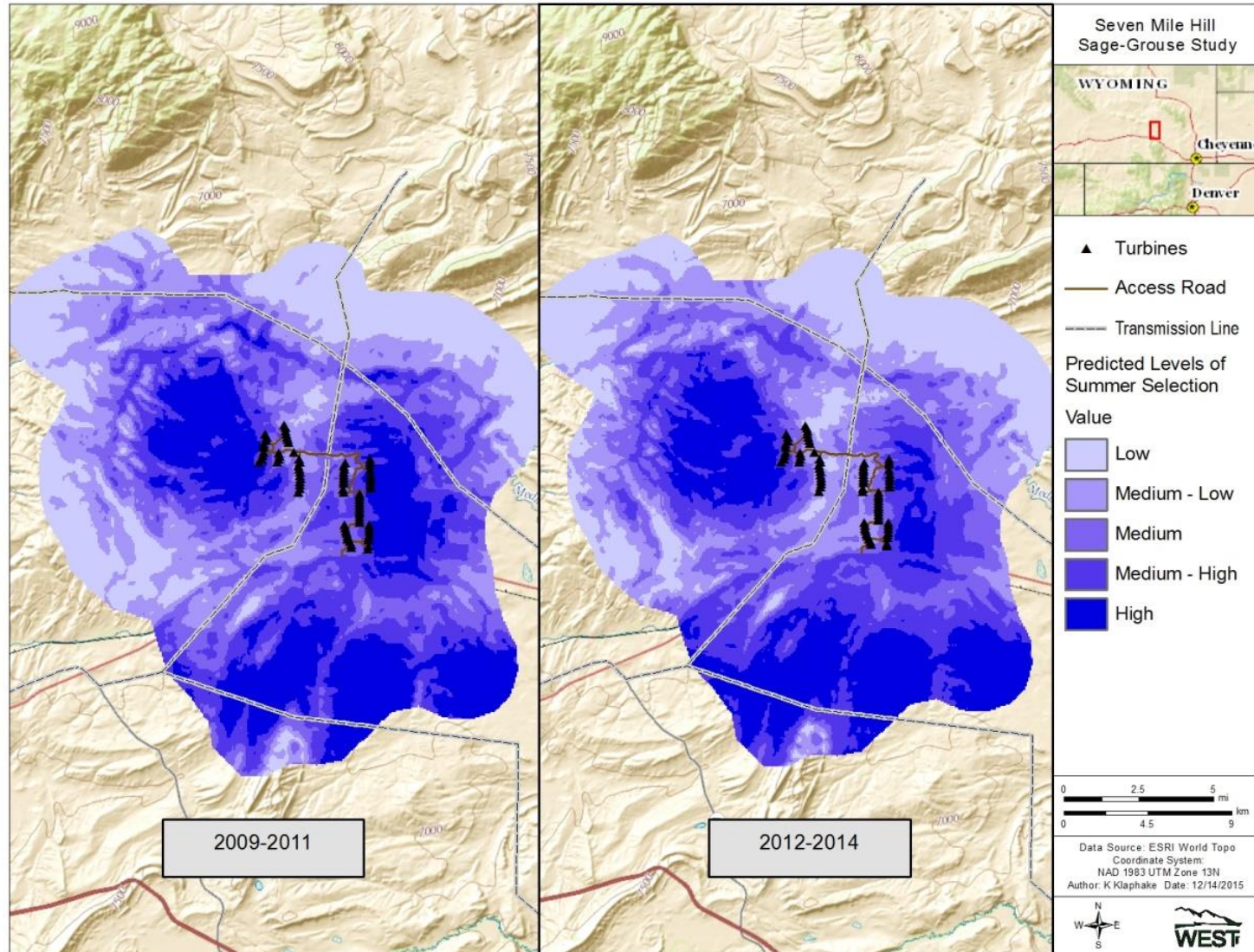
TPI (-)

Shrub SD (+)

Slope (-)

Distance to major roads (+)

Percentage of SWEF Disturbance (-)



# Discussion – Habitat Selection

- Turbine locations did not affect nest site selection patterns
- Females shifted selection patterns during the brood-rearing and summer period away from turbines
- Density of turbines was more important than proximity
- As percentage of disturbance increased brood-rearing and summer habitat selection decreased

Habitat Selection	Turbine Effect
Nest	No Effect
Brood-Rearing	Negative Effect (1.2 km)
Summer	Negative Effect (1.2 km)

# Survival



# Analysis Methods – Survival

- Combined all data
- Cox proportional hazards
- Nest survival – 28 days
- Brood survival – 37 days post hatch
- Female survival – capture through October
- Random effect of leks





# Results – Nest Survival; No Turbine Effect

## Final Model

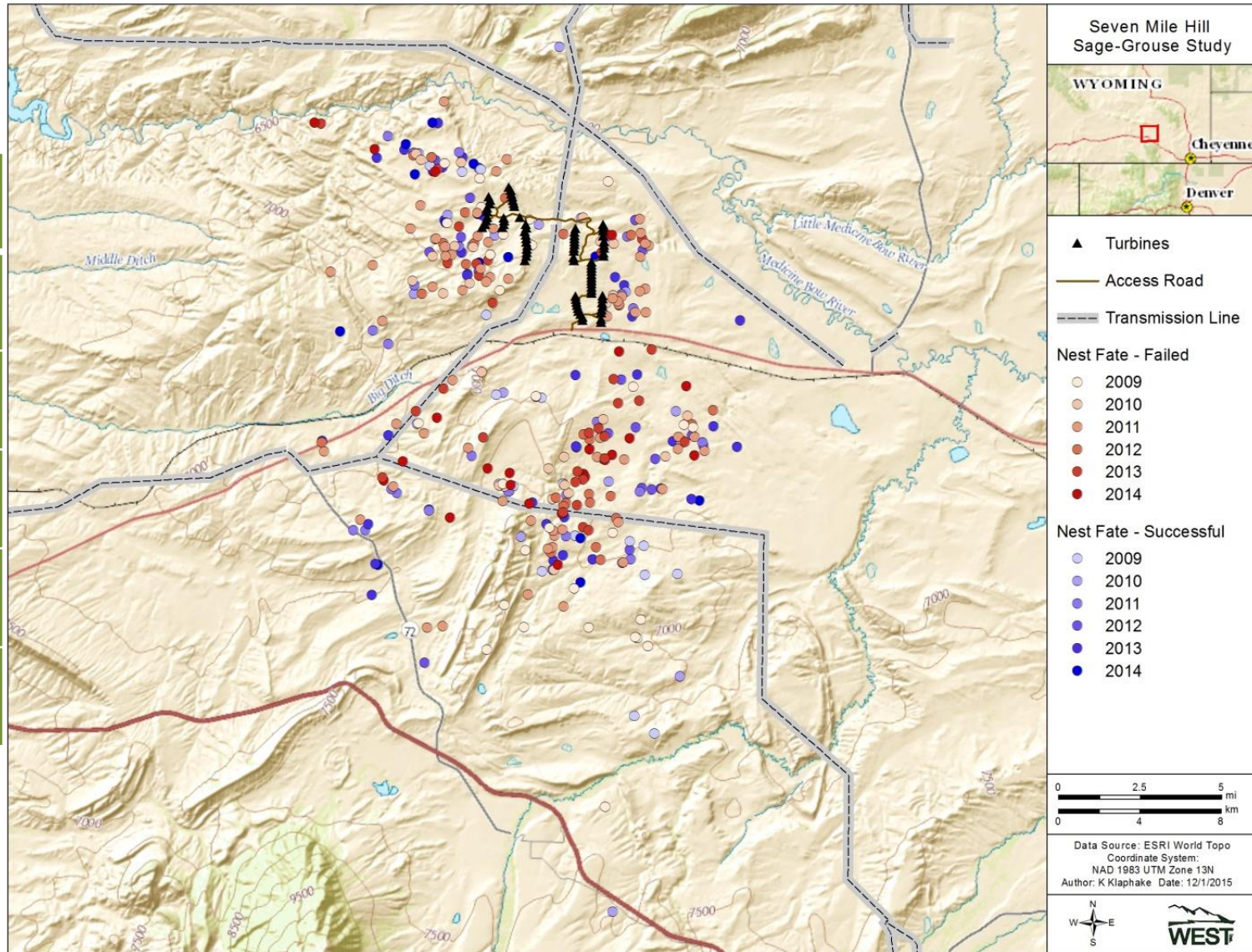
Shrub SD (-)

TPI (-)

Distance to major roads (+)

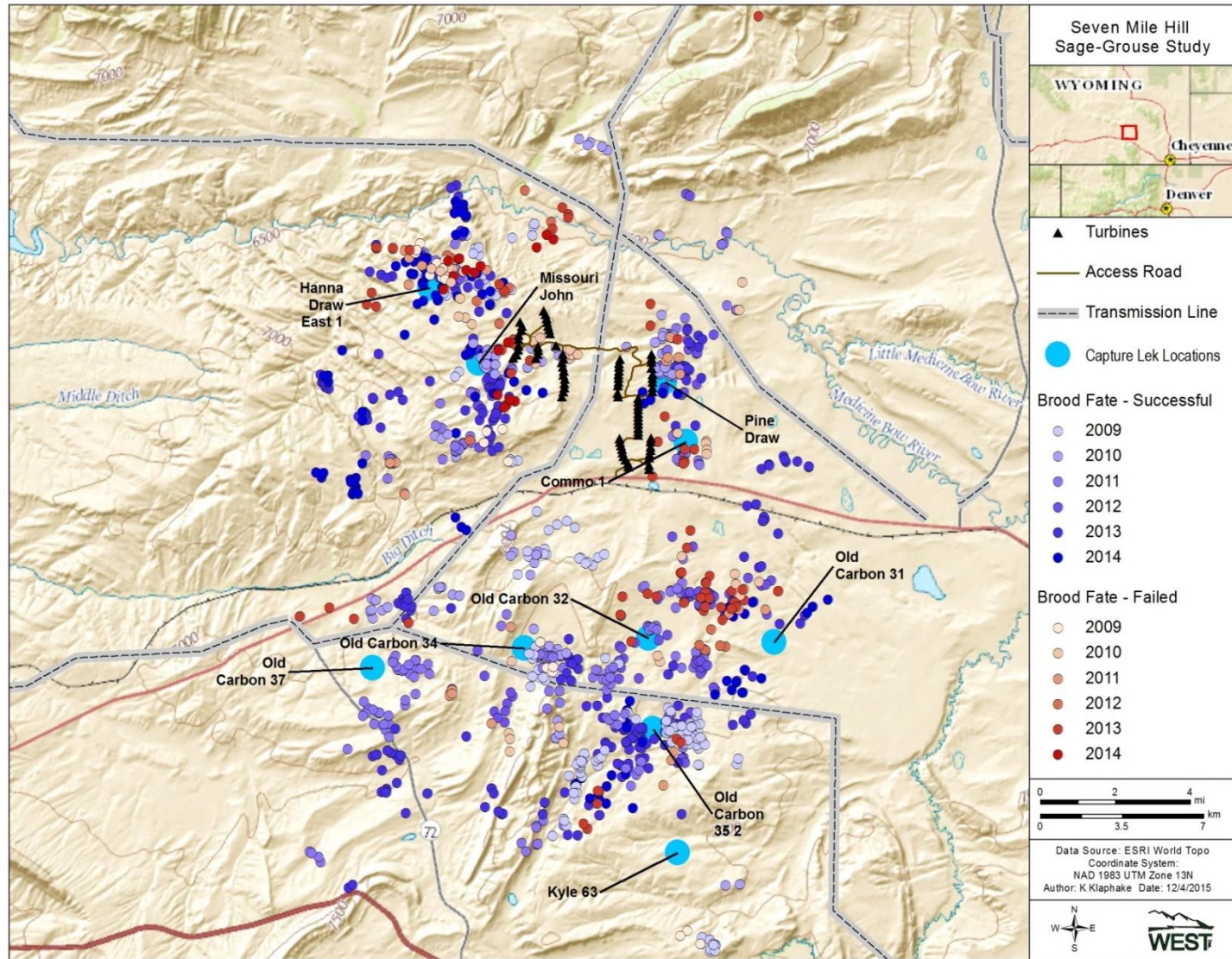
(Distance to major roads)<sup>2</sup> (-)

Distance to transmission line (+)



# Results – Brood-Rearing Survival; No Turbine Effect

- Final Model**
- Terrain Ruggedness (-)
- TPI (-)
- Distance to Capture Lek (+)
- Distance to Major Roads (+)
- Distance to Transmission line (+)
- Distance to Transmission line<sup>2</sup> (-)



# Results – Summer Female Survival; Positive Effect

## Final Model

Bare ground (+)

CTI (-)

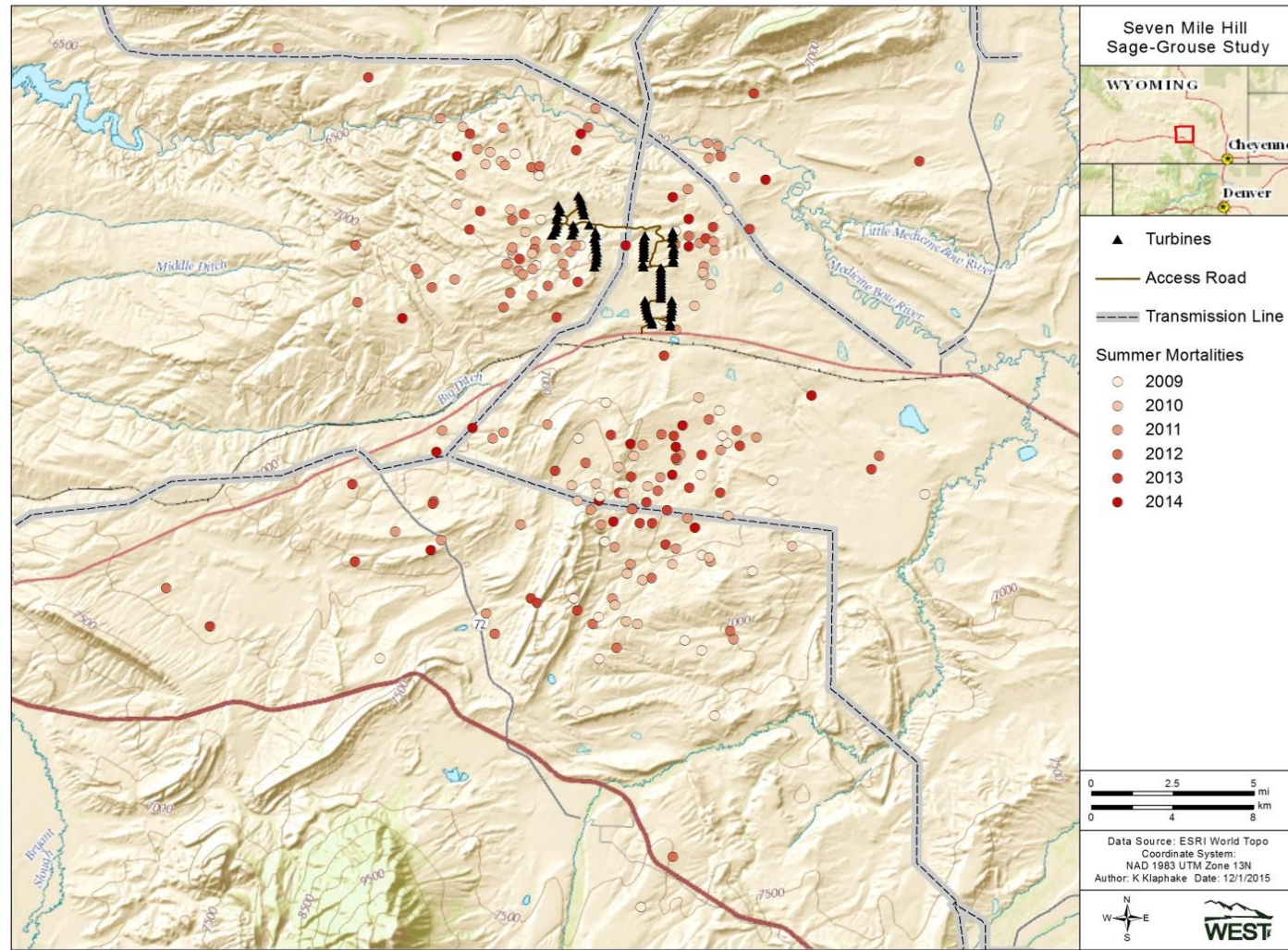
Herbaceous (+)

Terrain Ruggedness (+)

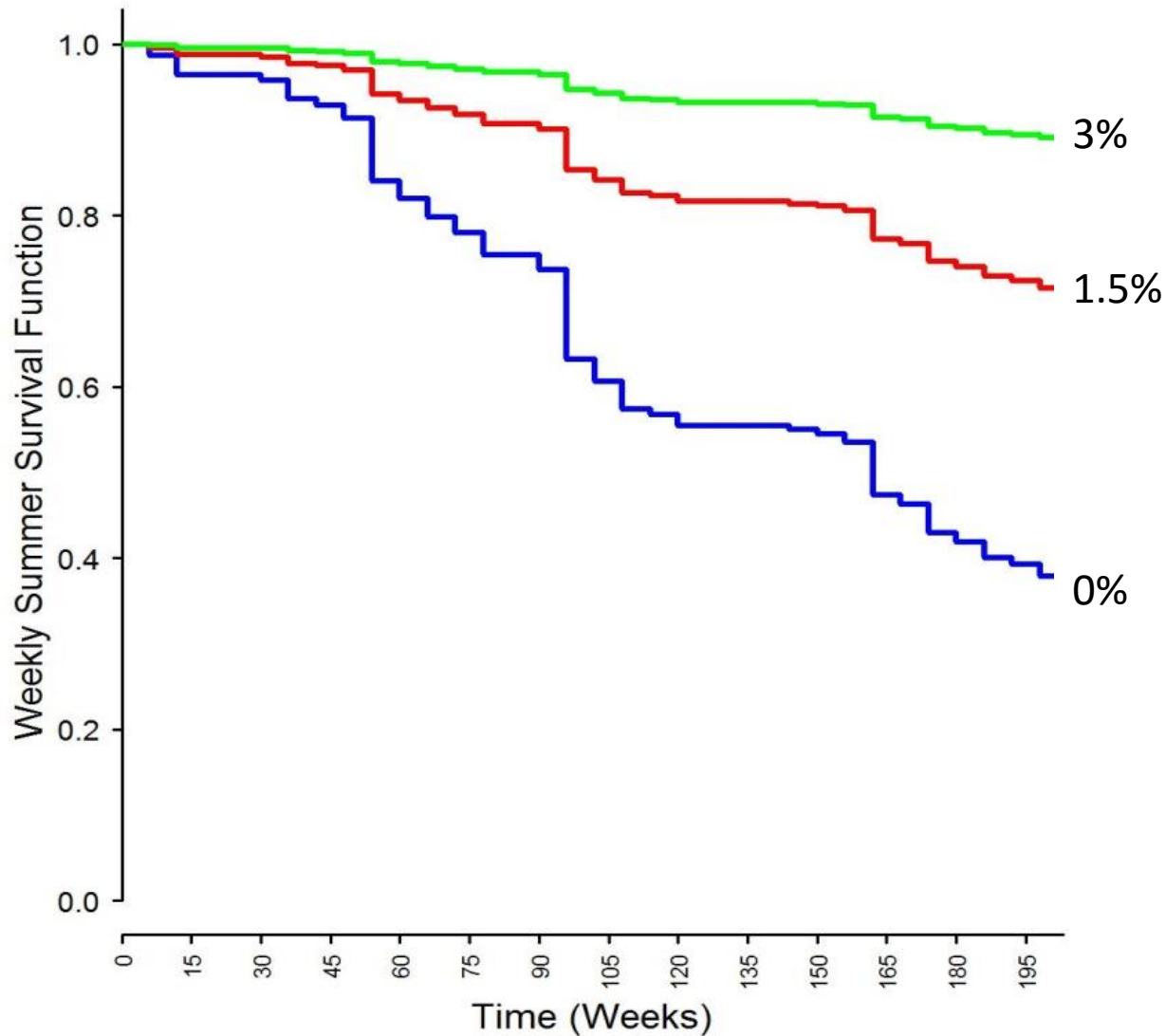
TPI (-)

Distance to Capture Lek  
(+)

Percentage of  
Disturbance (+)



# Results – Female Survival; Risk Lower within Facility

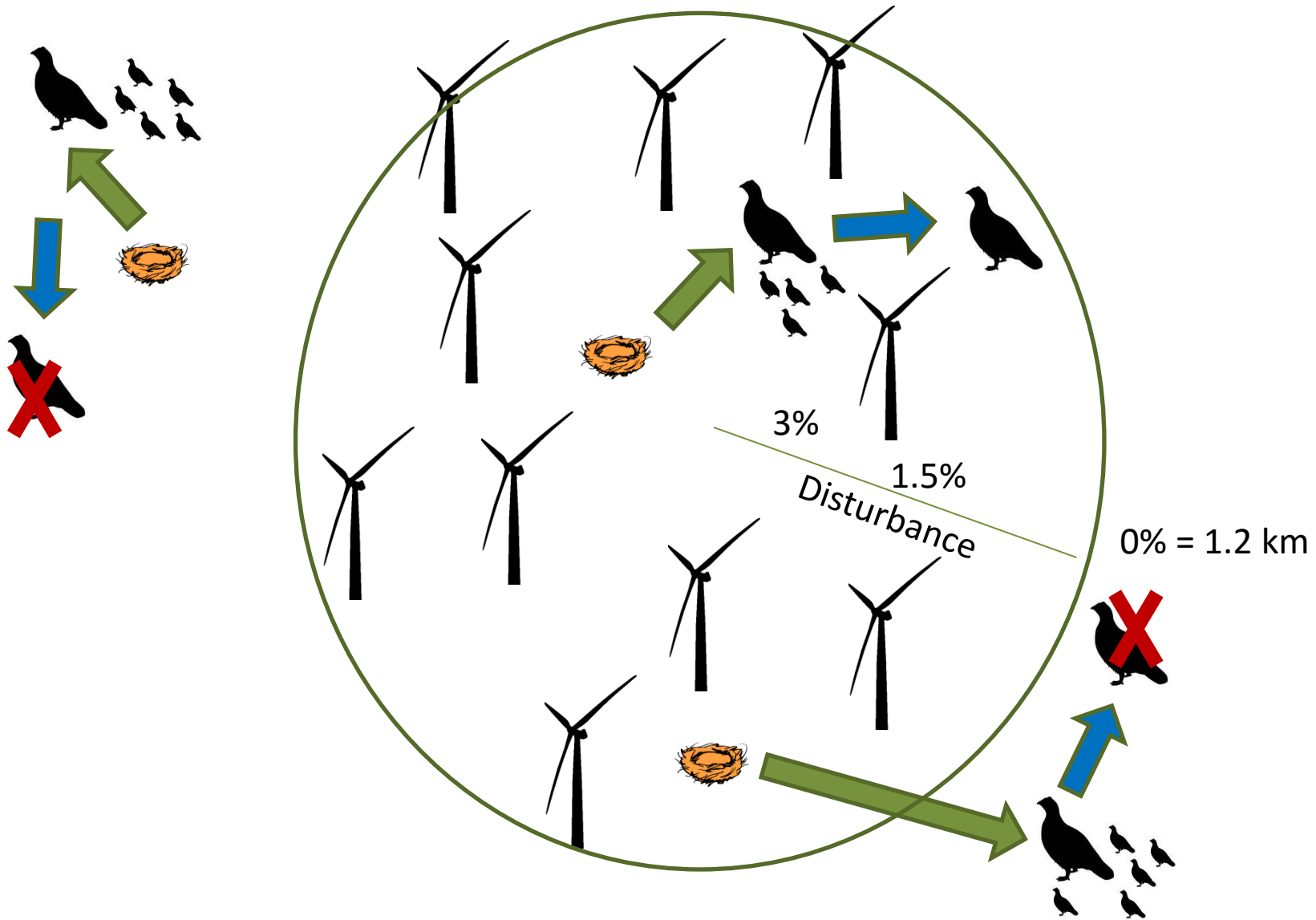


# Discussion – Survival

- Lek of capture important for brood survival
  - “Bad neighborhood” not located near turbines
- Similarities to greater prairie-chicken
  - No turbine effect on nest survival
  - Positive effect on female survival



# Conclusion





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