

# Sharp-tailed Grouse Breeding Habitat Selection & Survival

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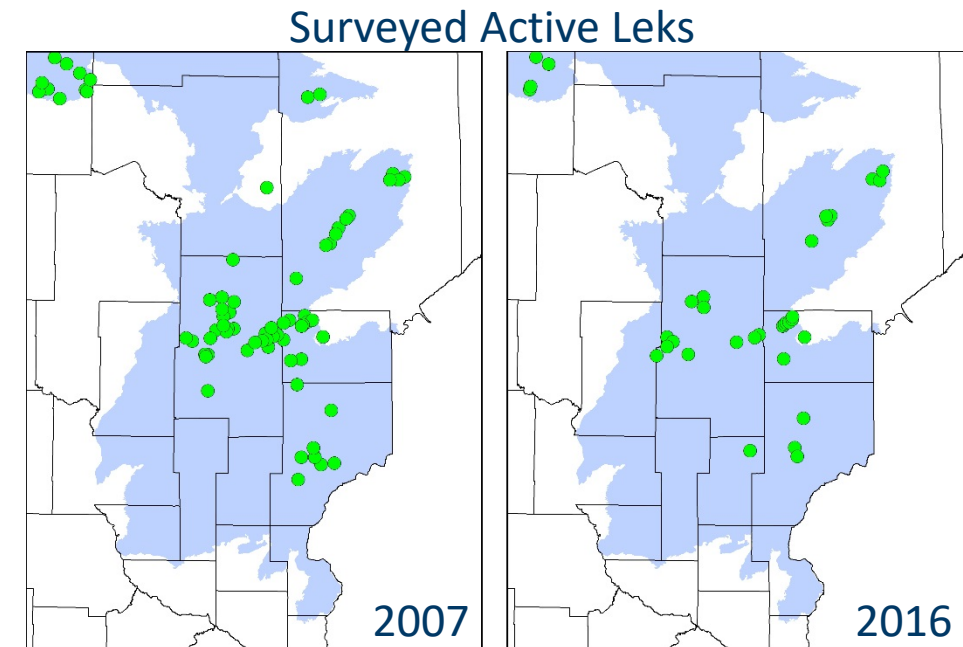
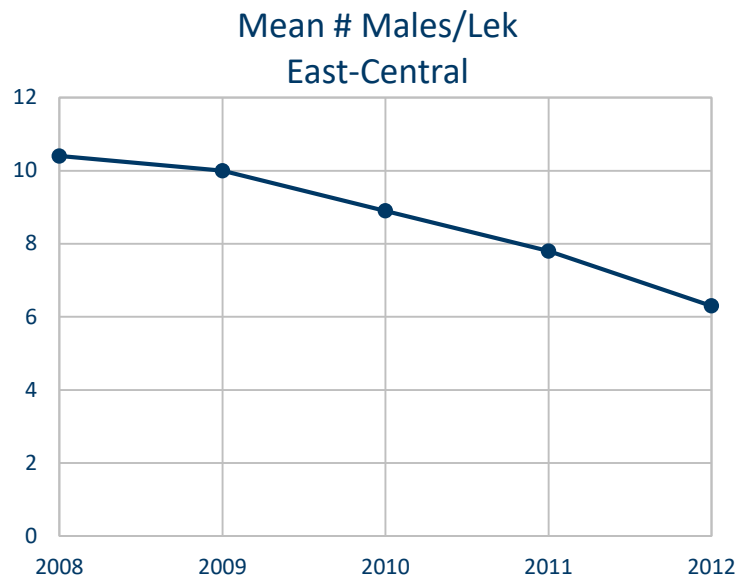


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NATURAL RESOURCES



# Background

- Habitat management was ongoing in the East-Central yet sharp-tailed grouse populations in the region did not seem to be responding.
- Number of males per lek was declining.
- Observations of lek sites becoming inactive.



# Research Objectives

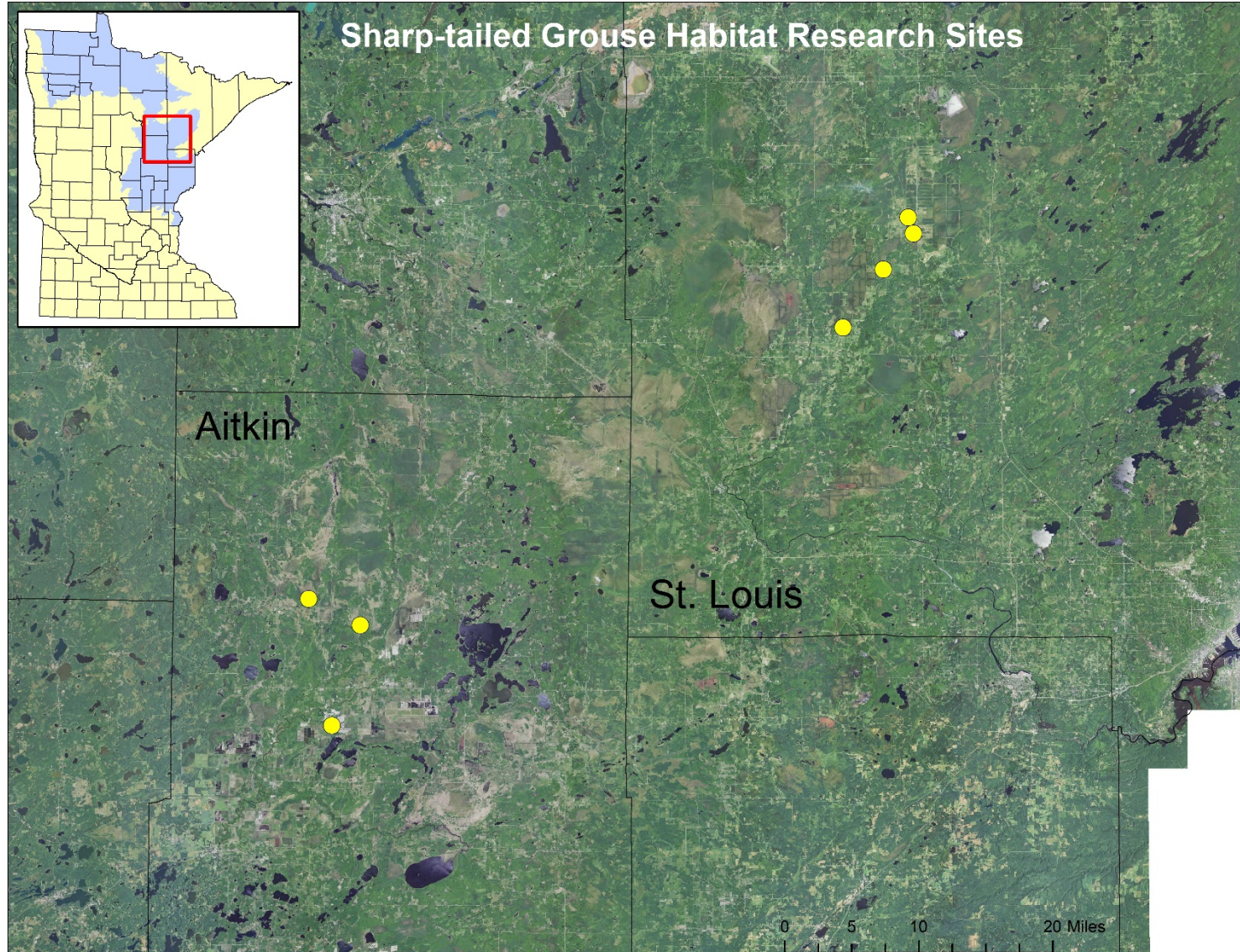
- 1) Evaluate breeding season habitat use by sharp-tailed grouse hens and broods.
- 2) Identify habitat characteristics that influence nest site selection and nesting success.
- 3) Link habitat management activities to habitat use, survival, and fitness.



# Methods



# Study Area





# Sharptail Trapping





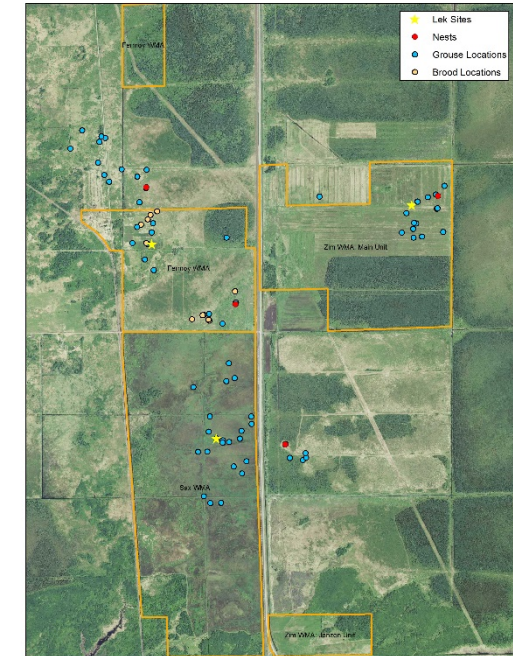
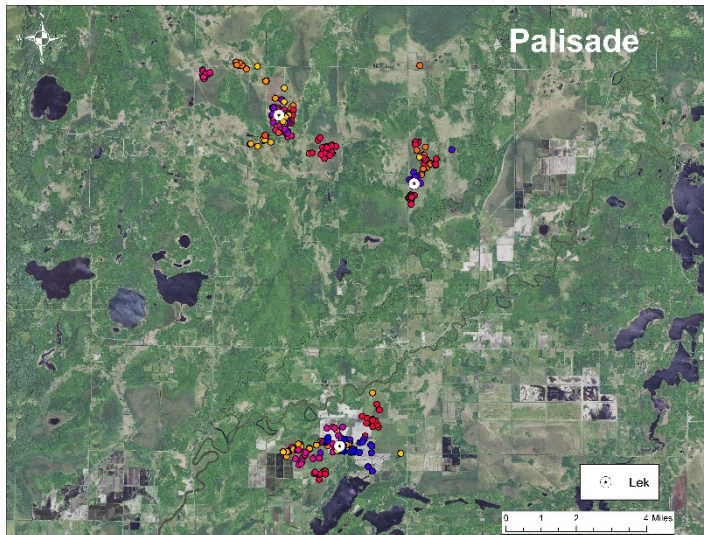
# Sharptail Radio-Collaring





# Sharptail Tracking

- Grouse were located a minimum of two times per week.
- Flushed hens and checked nests one time when incubating.
- When the hen left the nest site we went in to determine fate.
- Used hen behavior and flush counts to determine brood survival.





# Habitat Assessment

- Nest & Brood Sites
  - Overall habitat type
  - Overhead cover
  - Vegetation height (residual, understory, shrub)
  - Vegetation density (from 2 m and 15 m)
  - Soil Moisture (dry, saturated, standing water)
  - Number of tall perches
- Sampled two non-nest sites per nest.



- Univariate linear regression to assess lek attendance
- Program MARK for adult survival and nest success
  - Known Fates and Nest Survival modules
- Conditional logistic regression (matching nests and non-nest sites) to assess nest site selection
- Resource selection function to model habitat use vs. availability



# Results

# Trapping

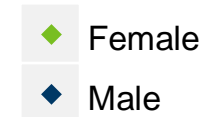
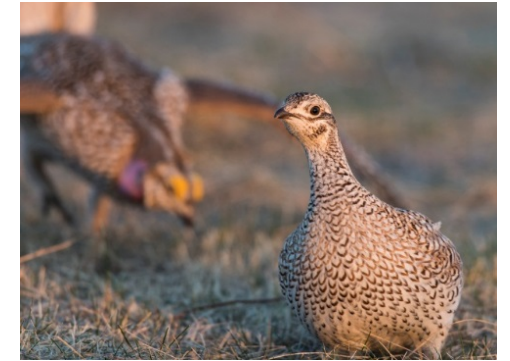
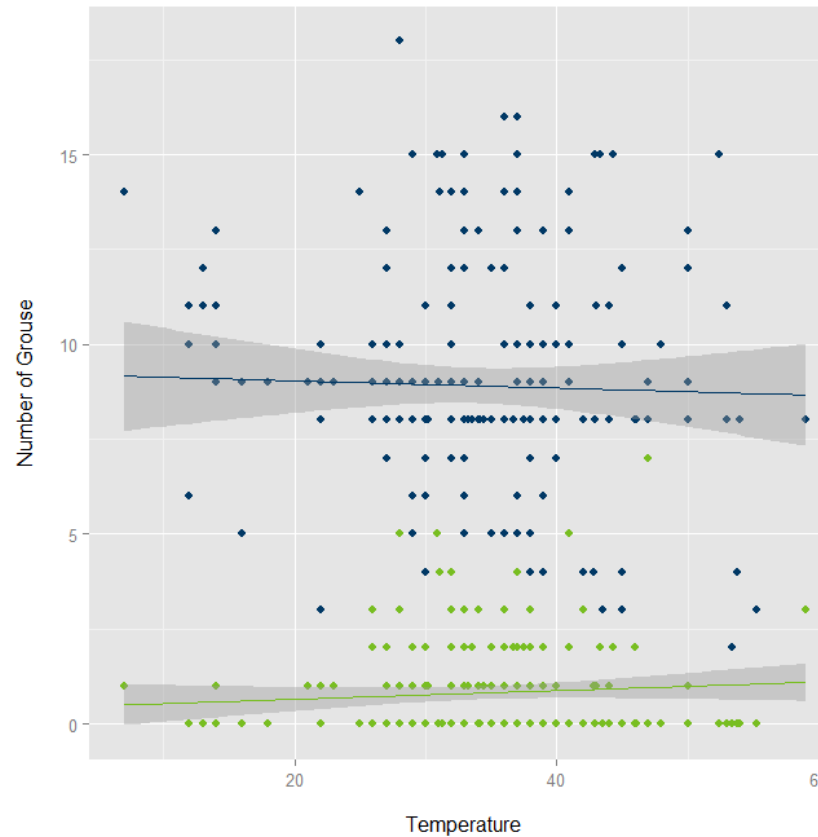
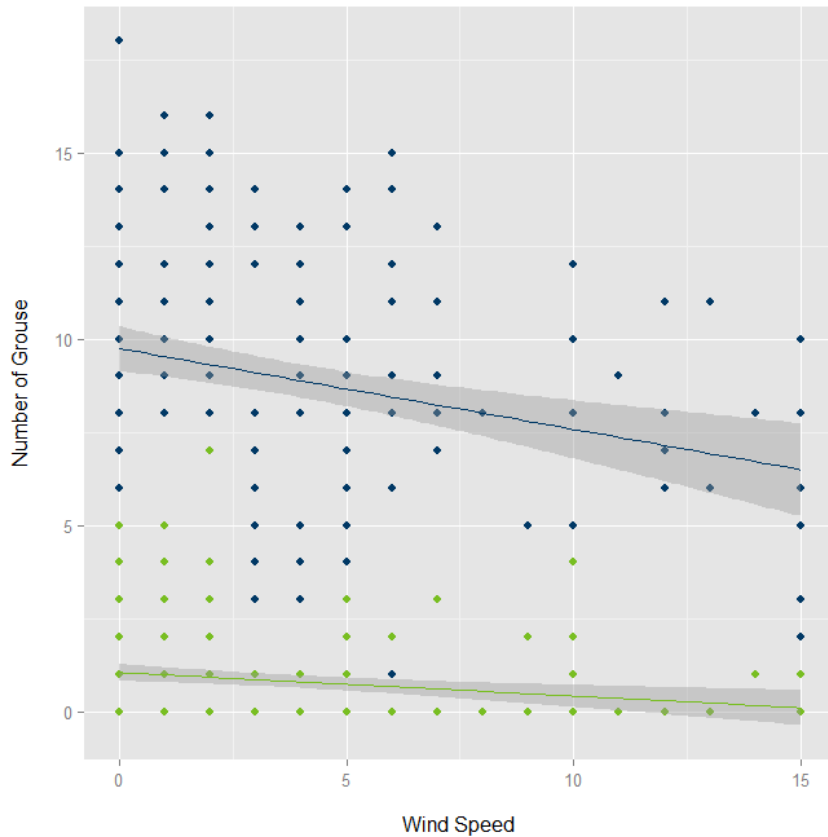
- 109 trap days over three years, typically at two sites each day
- Radio-collared 39 female and 20 male sharp-tailed grouse
- 15 grouse remained in the study over multiple years





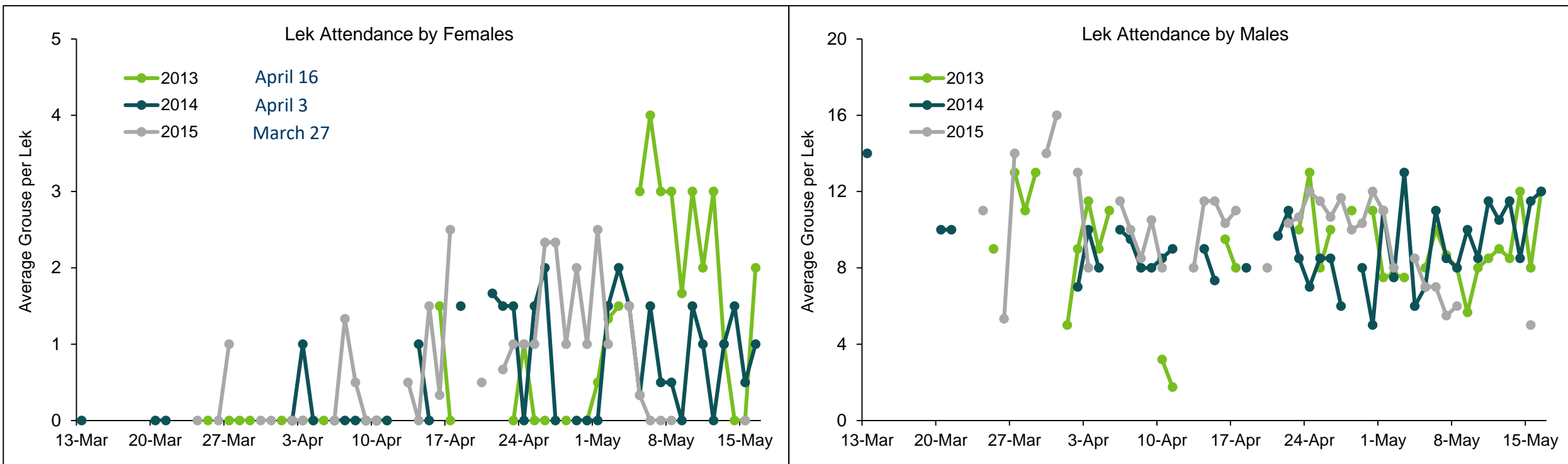
# Lek Attendance

- Attendance on leks was significantly related to wind speed
- However, not related to temperature



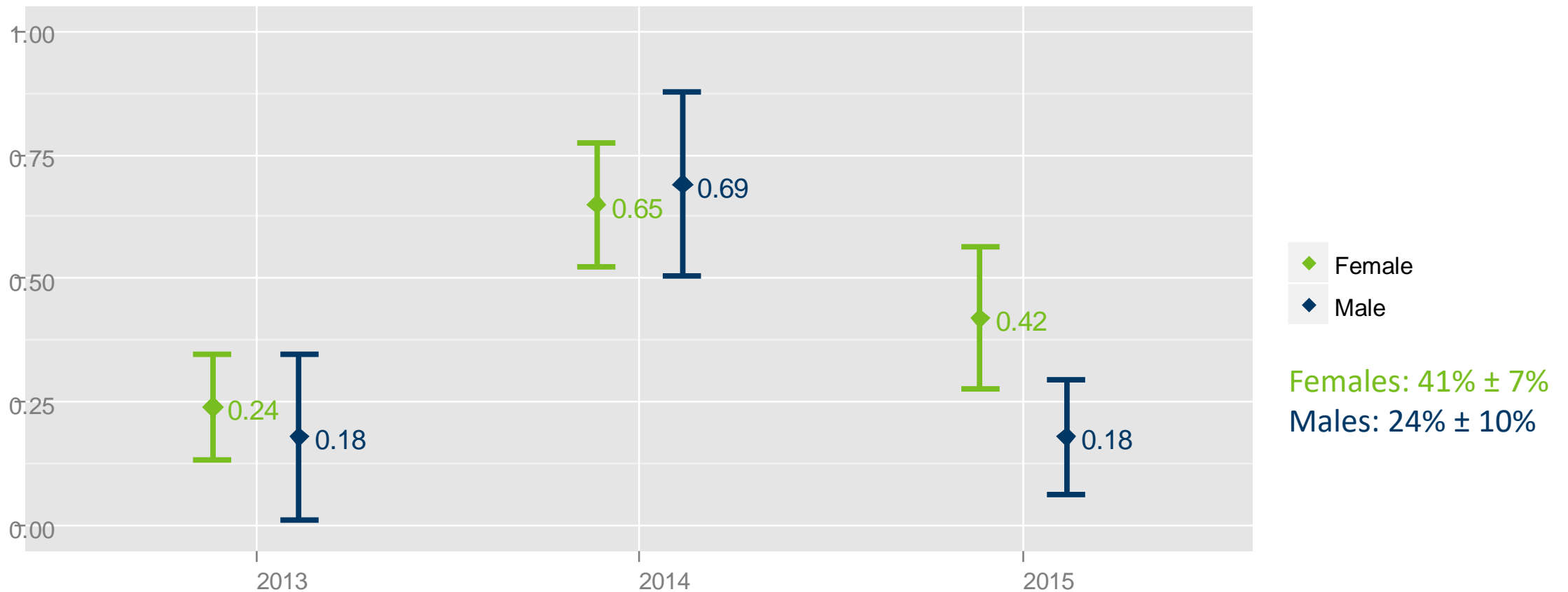
# Lek Attendance

- Female lek attendance was significantly related to date
  - Likely the result of conditions such as snow depth



# Adult Survival

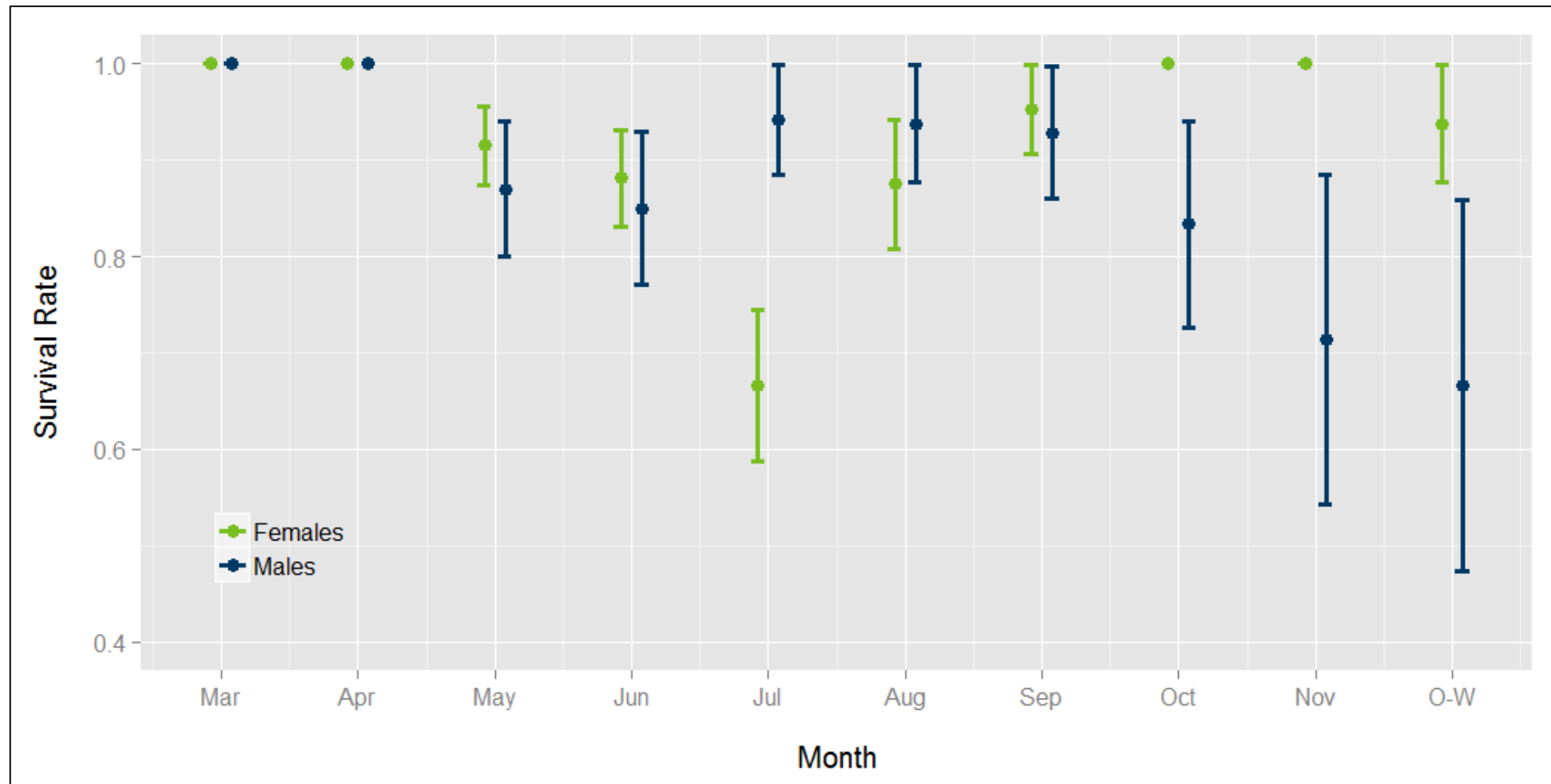
Annual Survival by Year



- Annual survival, un-hunted: 53% (Schroeder 1994)
- Annual survival, hunted: 17 to 42% ([Robel et al. 1972](#), [Moyle and Boag 1981](#), [Giesen 1987](#))



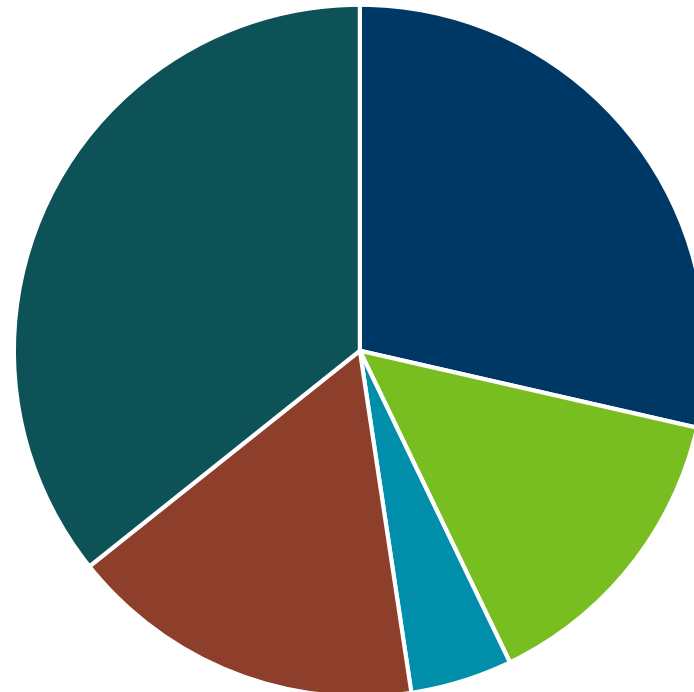
## Monthly Survival



# Causes of Mortality

- Avian predators most common (n = 12)
- Mammalian predators (n=6)
- Hunter harvest (n=2)
- Not-depredated (n=7)
  - Health? Weather?
- Many unknowns (n=15)
  - No carcass present
  - Dead for too long

Causes of Mortality



- Avian
- Mammalian
- Hunter Harvest
- Not-Depredated
- Unknown



# Nesting Stats

- Located 44 nests over three years, including 4 known re-nests
- 27% of hens re-nested after nest depredation or loss
- Clutch size ranged from 7 to 14, with an average of 11
- Average hatch date (excluding re-nests) was June 24<sup>th</sup>
- 88% of eggs in successful nests hatched
  - Unhatched eggs were in various stages of development





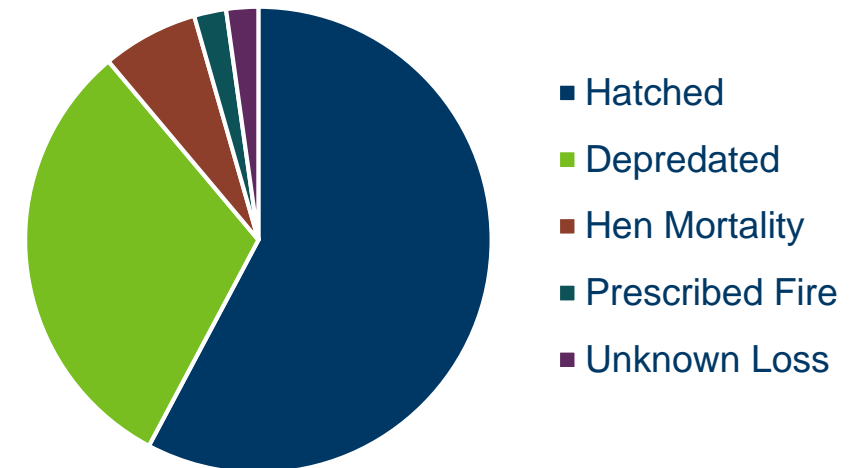
# Nest Success

- Apparent nest success ( $\geq 1$  egg hatched): 59%
- Nest survival:  $42\% \pm 9\%$ 
  - Nest survival significantly differed by year



Year	Total Nests	Hatched Nests	Apparent Success	Daily Survival Rate	Nest Success
2013	19	14	0.74	$0.985 \pm 0.003$	$0.60 \pm 0.07$
2014	14	8	0.57	$0.974 \pm 0.005$	$0.40 \pm 0.09$
2015	11	4	0.36	$0.955 \pm 0.01$	$0.20 \pm 0.08$

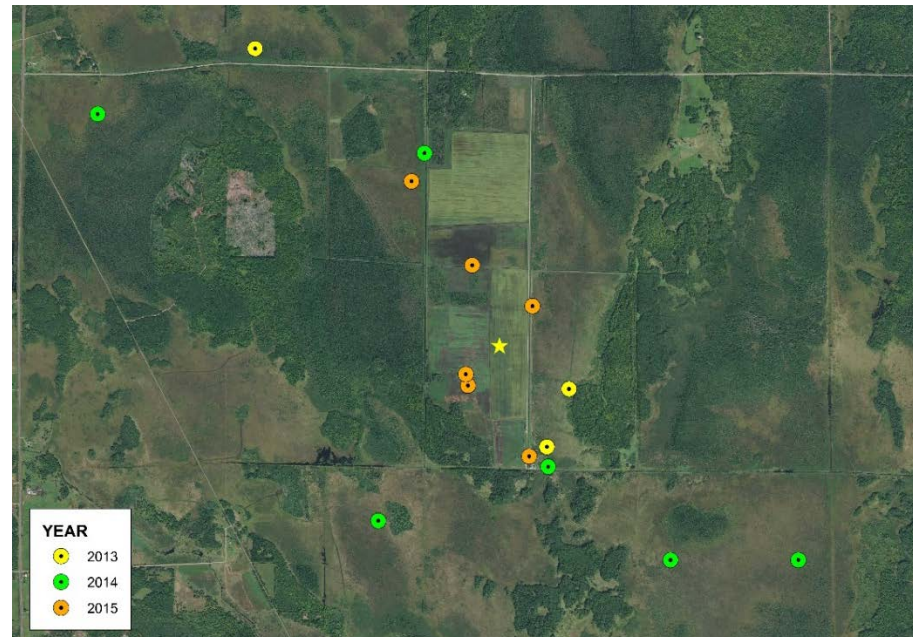
Nest Fate



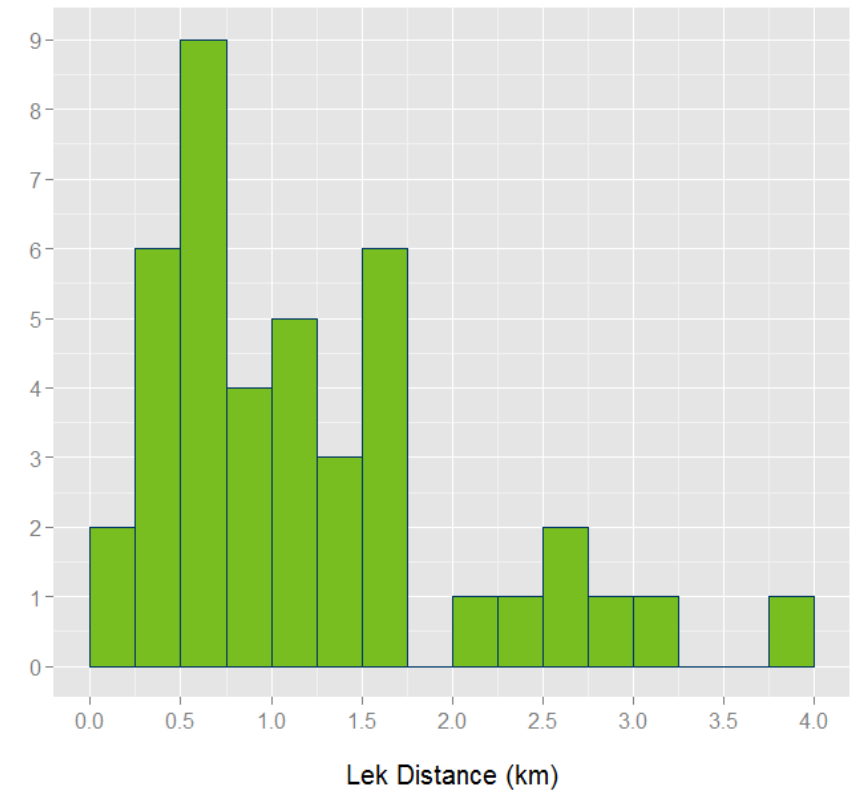
- Nest success rates from 50 to 72% ([Sisson 1976](#) , [Marks and Marks 1987](#) , [Meints 1991](#))

# Nest Sites

- Average distance from lek: 1.2 km
- Ranged from 60 m to 3.8 km
- No nest site fidelity year to year or when reneating



Histogram of Lek Distances





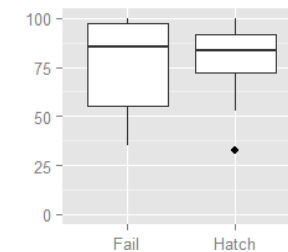
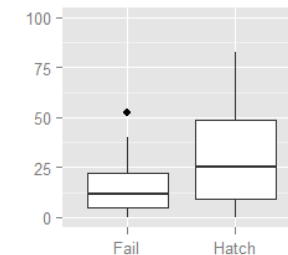
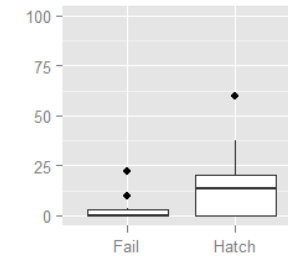
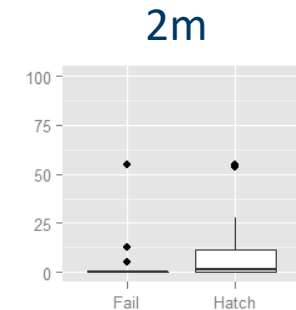
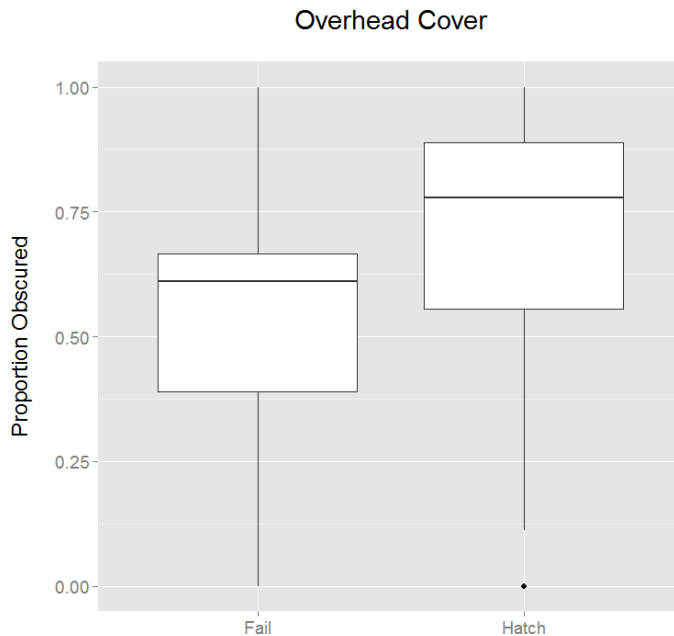
# Nesting Habitat



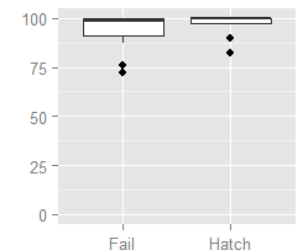
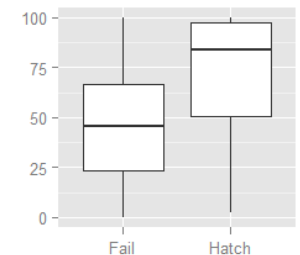
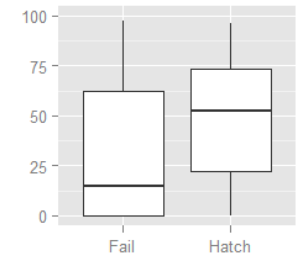
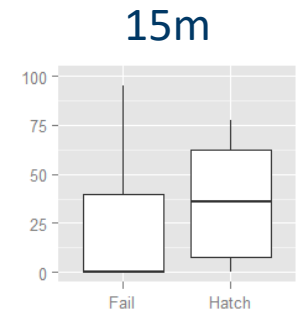


# Nesting Habitat

- Habitat measures were not strongly related to nest success
- However successful nests tended to have more cover than unsuccessful nests



## Vegetation Density

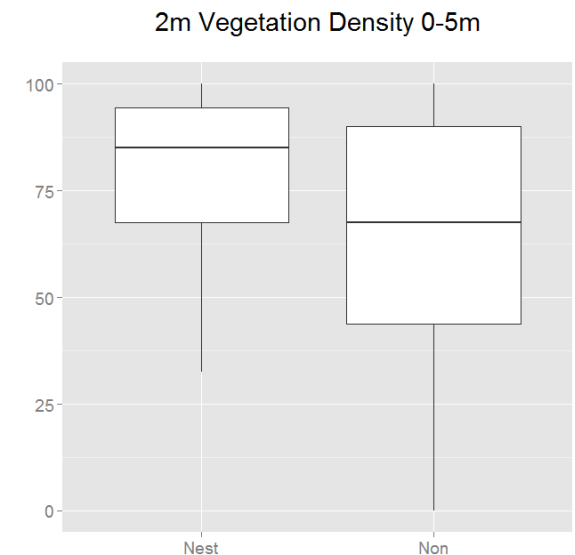
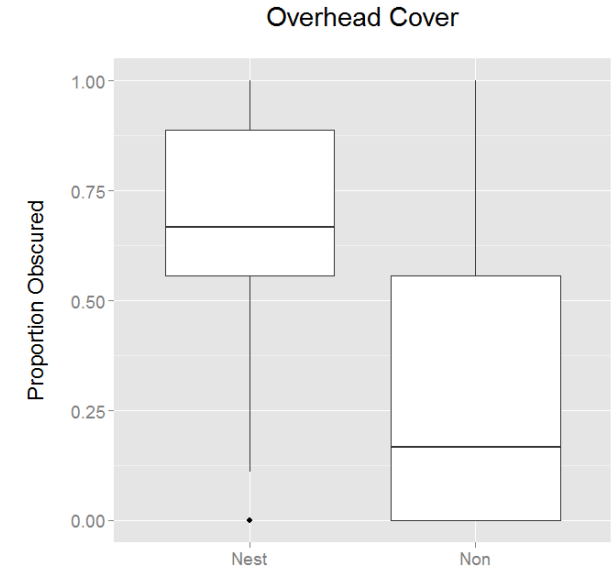




# Nest Site Selection

The top model explaining nest site selection included:

- Overhead cover (+)
- Vegetation density 0-0.5 m from 2m (+)
- Presence/absence of shrub at the nest (+)
- Vegetation density 0.5-1.0 m from 15 m (-)
- Number of perches (-)
- Soil moisture level (-)



# Brood Survival

- 26 hatched nests
- 11 broods surviving over three years
  - Approx. 50 days post-hatch



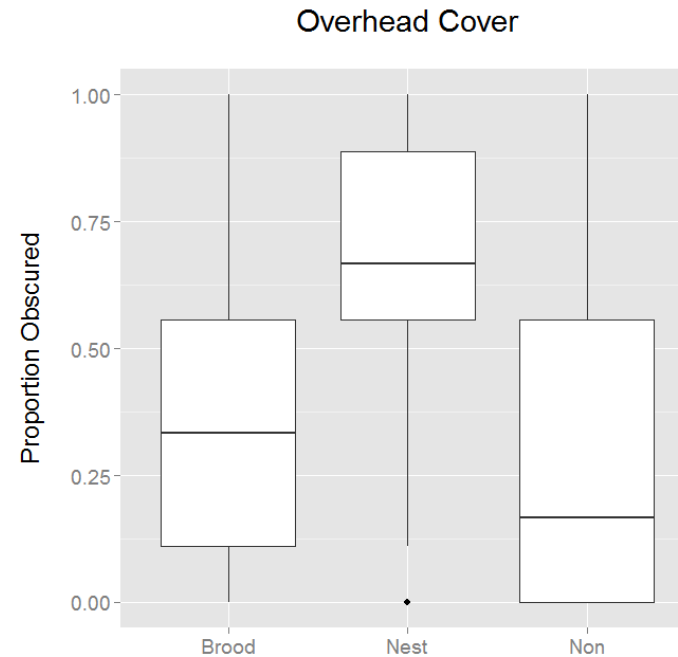
Year	Nests	Hen Mortality while Brooding	Nests with Surviving Brood	HY Birds (August)	% Survival of Hatched Eggs	HY Birds Per ALL Hens	HY Birds Per Nesting Hens
2013	19	6	3 (16%)	13	12%	0.68	0.72
2014	14	1	5 (38%)	16	20%	1.07	1.23
2015	11	0	3 (27%)	18	46%	1.13	1.80

- 26% survival from hatch to 1 year of age ([Sisson 1976](#))

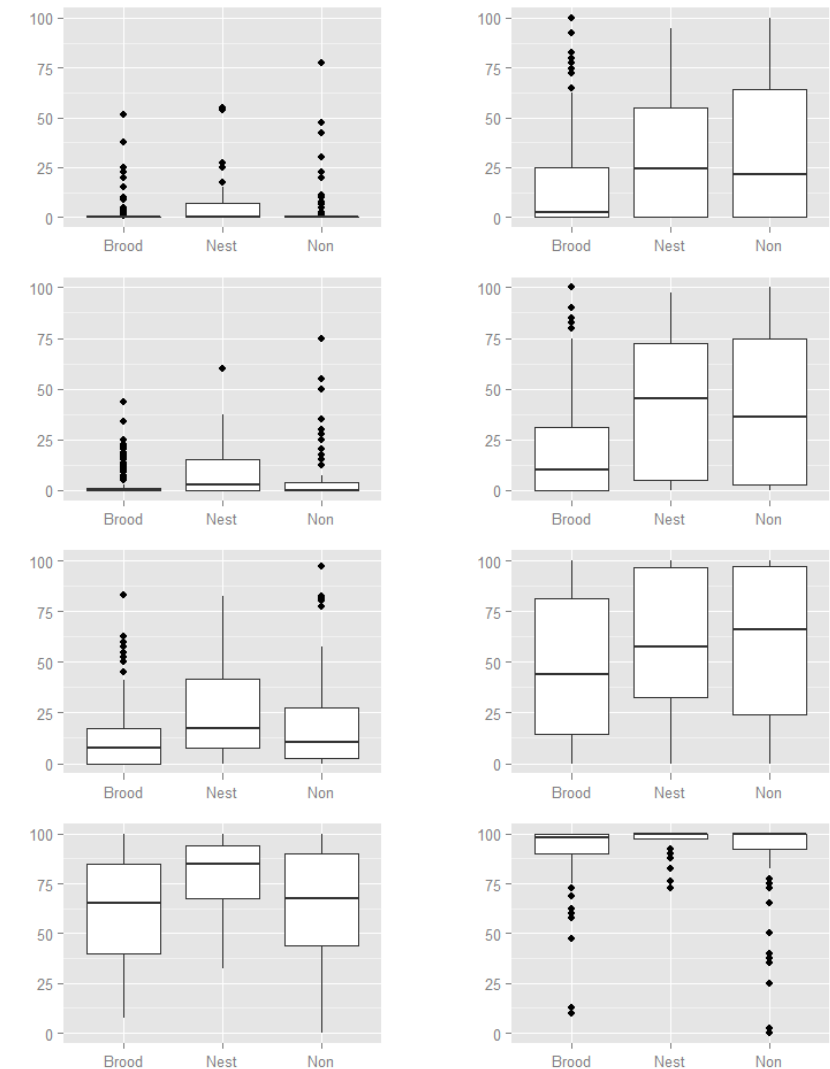


# Brood-Rearing Habitat

- Brood-rearing sites were more similar to random non-nest sites
- Brood sites tended to more open than other hen locations (less shrub)
  - Hayfields
  - Grassy Openings



2m Vegetation Density 15m



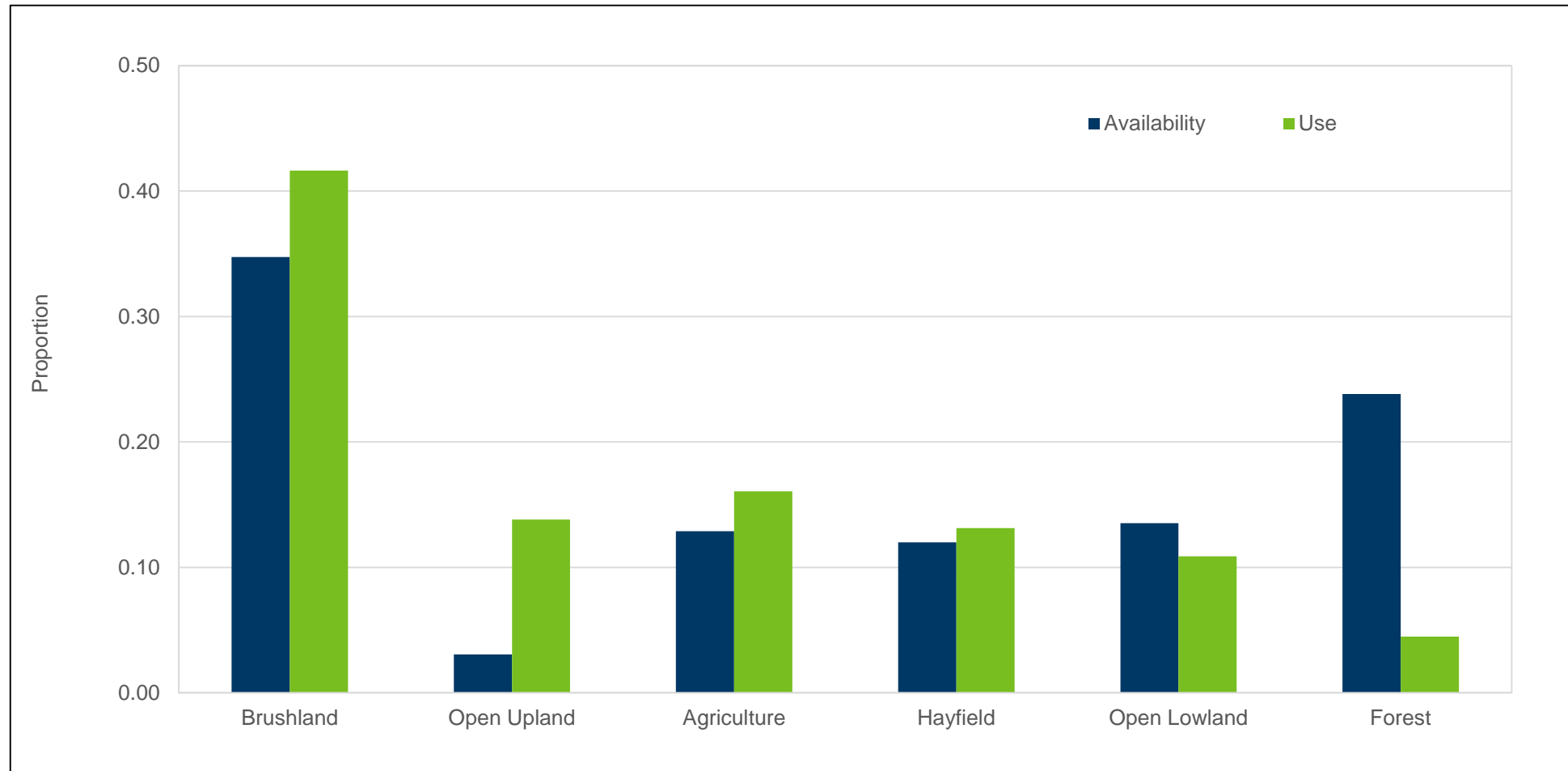


# Brood-Rearing Habitat



# Habitat Availability vs. Use

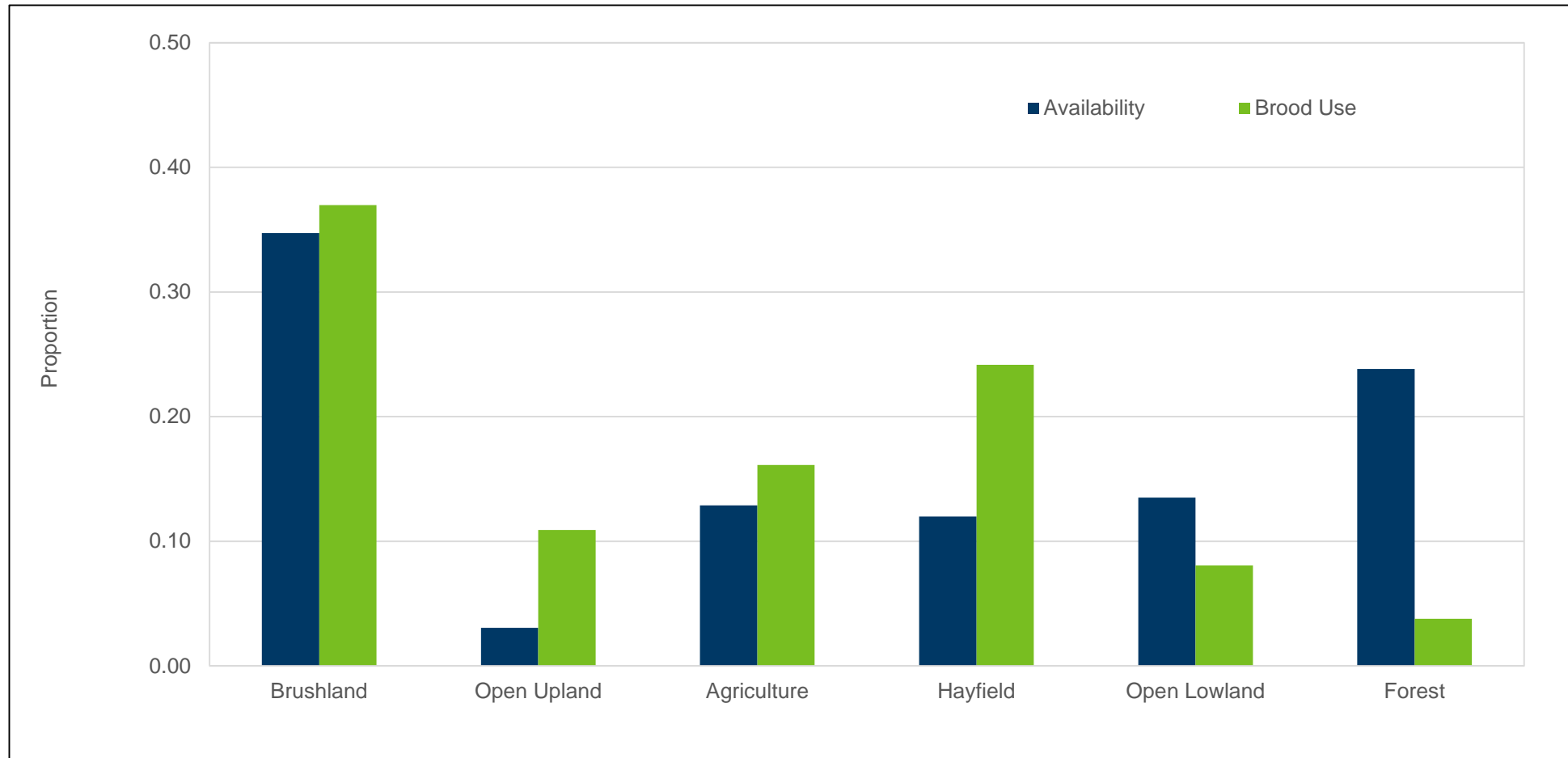
- Hen locations





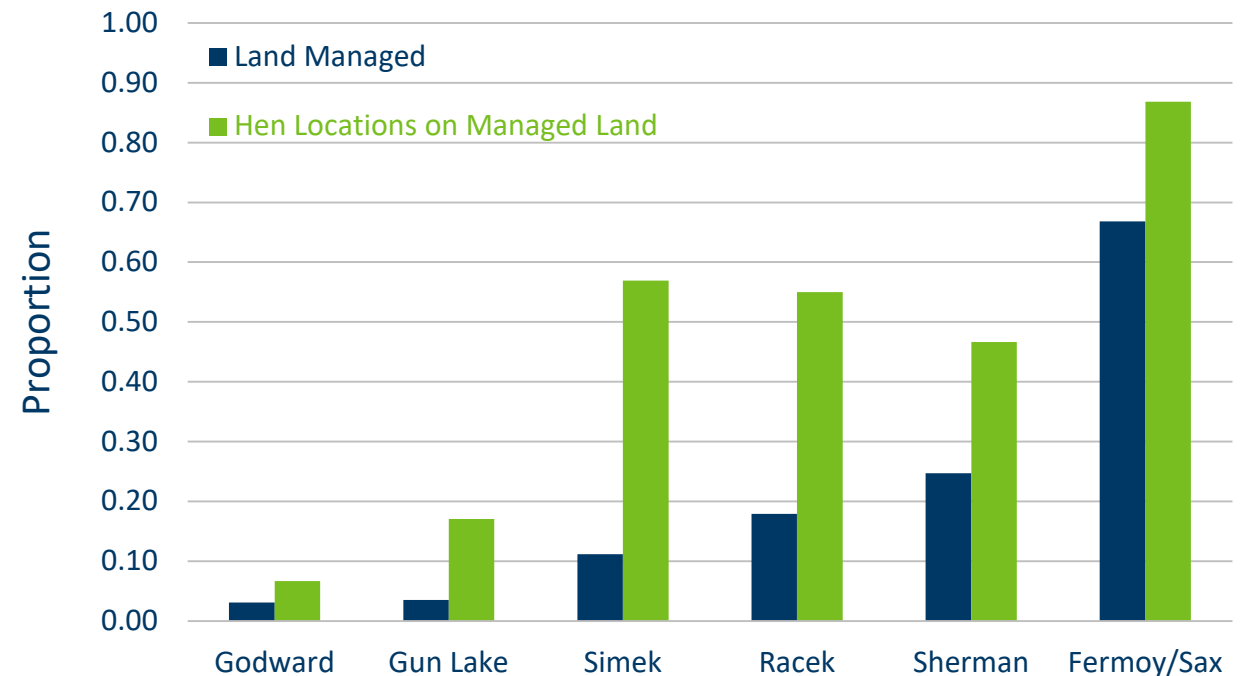
# Habitat Availability vs. Use

- Hens with broods



# Habitat Use

- Grouse locations (n = 1,087) ranged from 0 – 4.1 km from the lek
- 36% were on public lands
- 24% were on lands with habitat management within past 10 years



# Conclusions

- Sharp-tailed grouse use a variety of habitats for nesting
- Brood habitat needs may be more specific than nesting habitat
  - Open grass tended to be preferred by hens with broods
- Sharptails are using lands with habitat management





# Acknowledgements

- Initial Project Design: Wes Bailey and Mike Larson
- Field Technicians: John McLaughlin, Briana Schnelle, Vinnie Johnson
- Many volunteers and DNR staff assisted with trapping!
- Numerous landowners provided land access.
- Photo Credits: Steve Oehlenschlager



# Fall Management Project

- Examining sharp-tailed grouse response to fall management
  - Prescribed fire
  - Mowing
- Use fecal pellet surveys to detect grouse presence
- Vegetation surveys focused on structure



# Fall Management Project

- Sites were treated from 2015 – 2018
  - 16 mows
  - 12 prescribed fires
  - 21 controls
- Sampling (grouse pellets & vegetation)
  - Pre-treatment
  - 1 week, 1 month, 1 year, and 3 years post-treatment



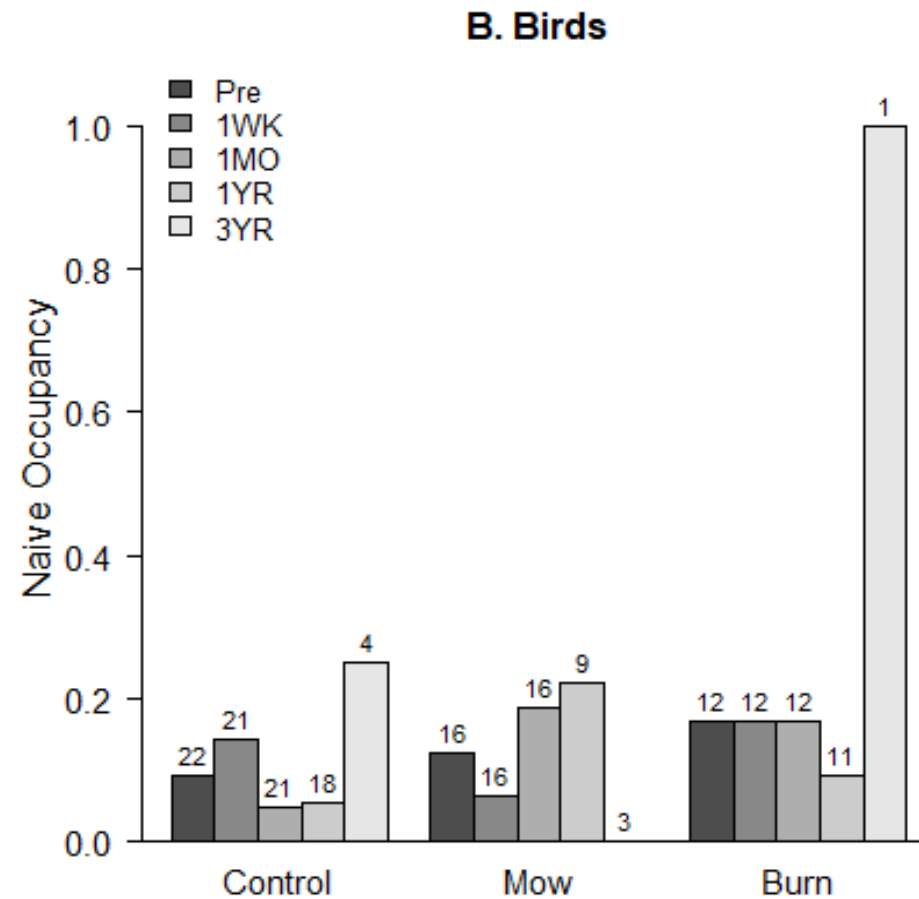
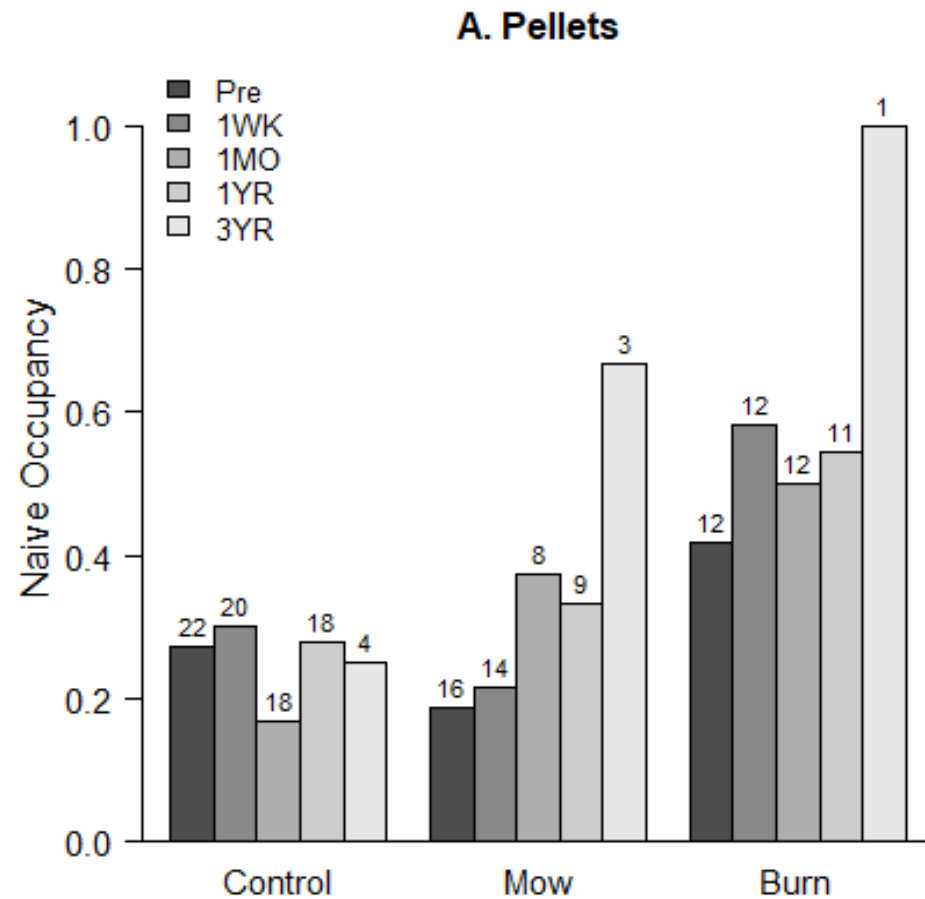


# Preliminary Results

- Sharptail use of treated sites is greatest  $\geq 1$  year after management
  - Both prescribed fire and mowing
  - However, not statistically significant
- Vegetation surveys
  - Shrub height is reduced 1 year following mowing treatments
  - Forb cover increases 1 year following burn treatments

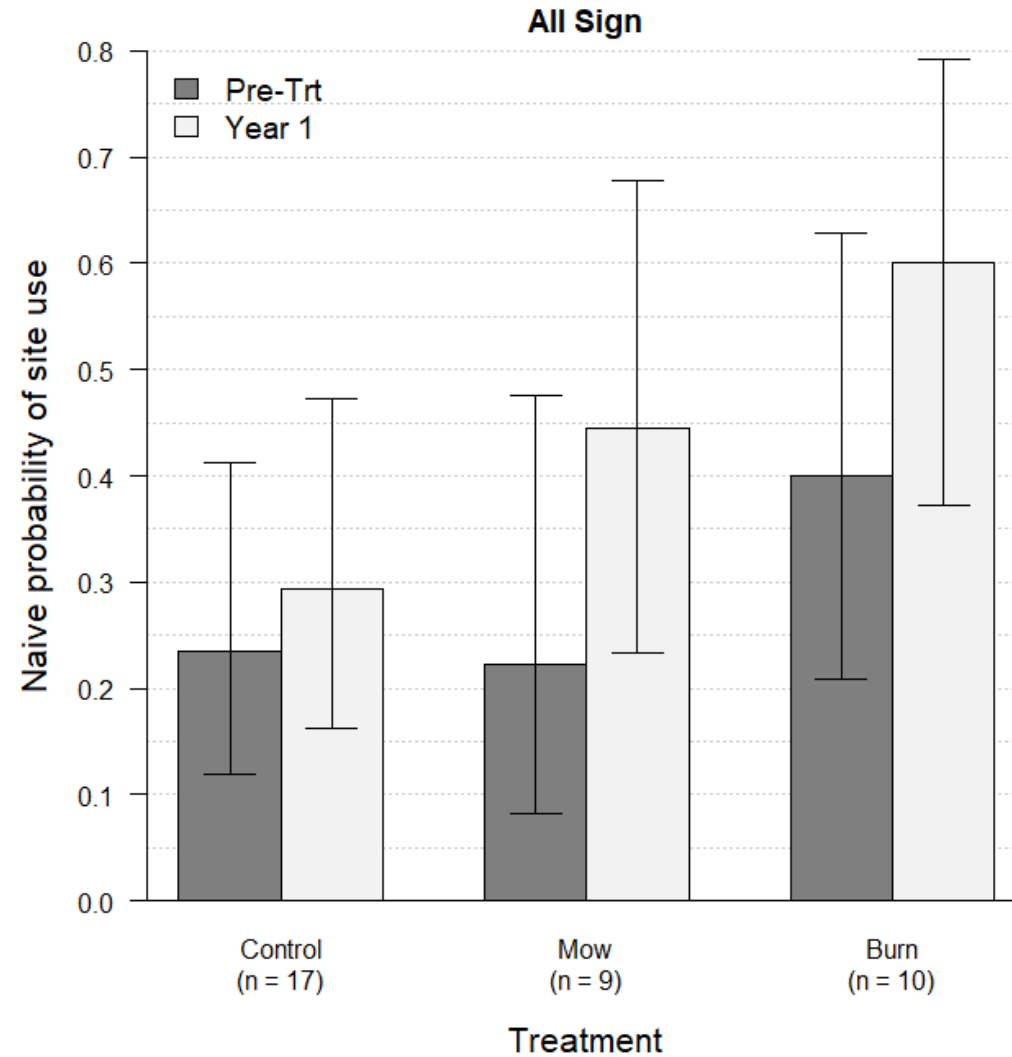


# Preliminary Results





# Preliminary Results



# Fall Management Project

- Additional surveys will be conducted this fall (1 year and 3 year post)
- Improve statistical estimation of differences in occupancy, detection, and vegetation metrics
  - High variability in grouse response and vegetation
  - Sample size limitations





# Questions?

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