

Effectiveness of Sagebrush Reduction Treatments for Greater Sage-Grouse in Wyoming Big Sagebrush Habitats



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Collaborators and Funding

Collaborators

Cody, Lander, and Worland Field Offices—Bureau of Land Management, Wyoming Game and Fish Department, Wyoming Wildlife and Natural Resource Trust

Funding Support

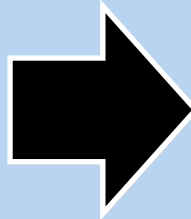
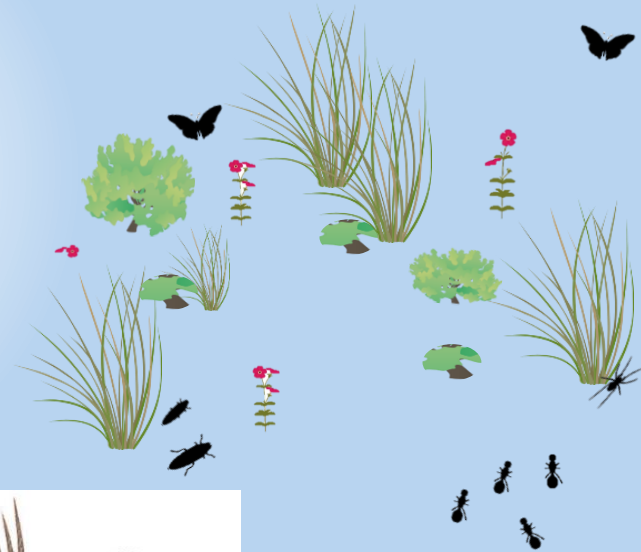
- Wyoming Game and Fish Department
- Wyoming Sage-grouse Conservation Fund – Bates Hole, Big Horn Basin, Southwest, South-Central and Wind River/Sweetwater River Local Sage-grouse Working Groups
- Wyoming Wildlife and Natural Resource Trust
- Wyoming Reclamation and Restoration Center
- Margaret and Sam Kelly Ornithological Research Fund



Habitat Management



Treatment



Effectiveness of Sagebrush Reduction Treatments for Sage-Grouse

UNTREATED



BURNED



MOWED



TREATED WITH HERBICIDE



Courtesy Emiline Ostlind

3 Studies in Wyoming Big Sagebrush

1. **Observational** (Bighorn Basin) – Mowing and Rx Burning
 - Structure of perennial grasses and Wyoming big sagebrush
 - Forb, insect, and soil parameters
2. **Correlational** (Core Areas in Wyoming Basins) – Chemical, Mechanical, Rx Burning, Wildfire
 - Male lek attendance
3. **Quasi-Experimental** (Central Wyoming) – Mowing and Tebuthiuron
 - Sage-grouse survival and habitat selection
 - Insect, forb, grass, and shrub response
 - Time to post-treatment recovery

1. Observational (Bighorn Basin)

Questions

- Canopy cover and height of perennial grasses and Wyoming big sagebrush
- Response of forb, insect, and soil parameters to treatment

Wildlife Society Bulletin 36(1):85–93; 2012; DOI: 10.1002/wsb.92

Original Article

Burning and Mowing Wyoming Big Sagebrush: Do Treated Sites Meet Minimum Guidelines for Greater Sage-Grouse Breeding Habitats?

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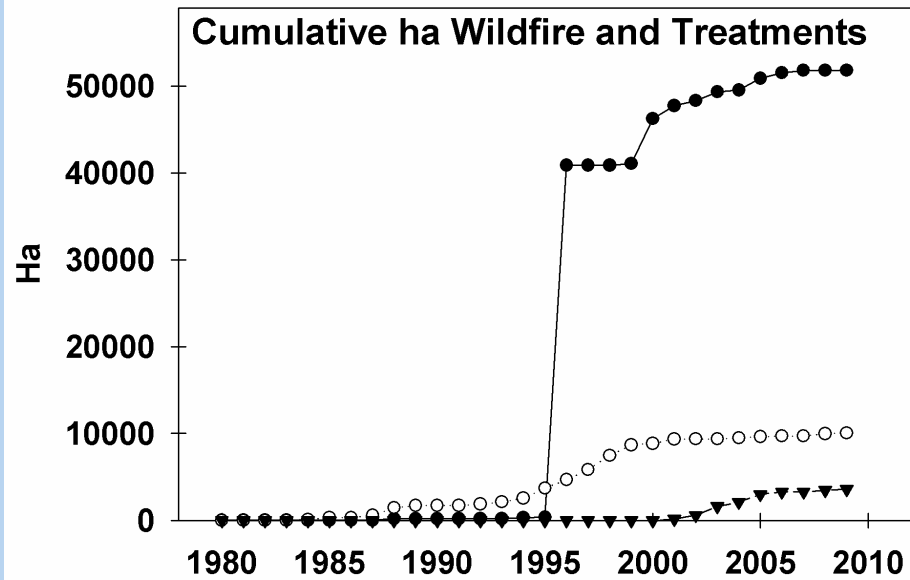
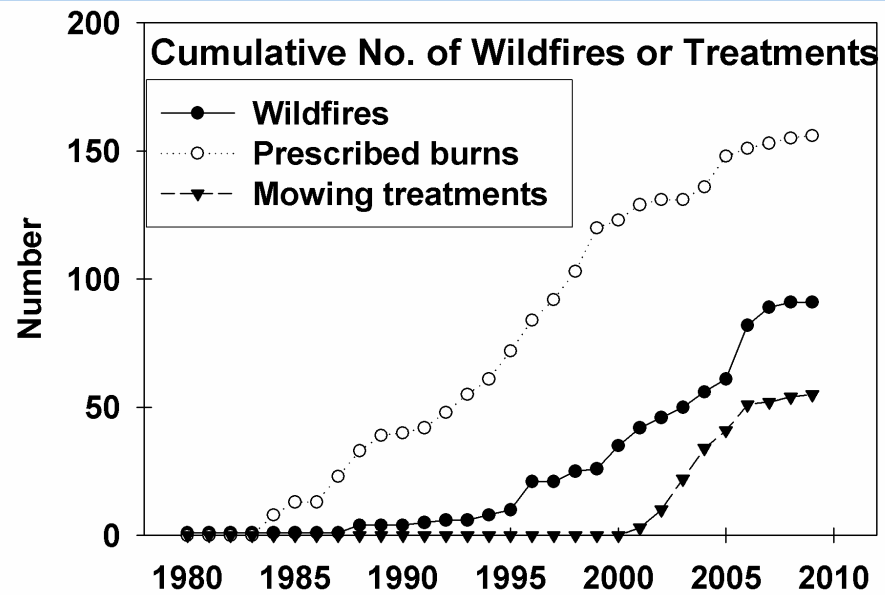


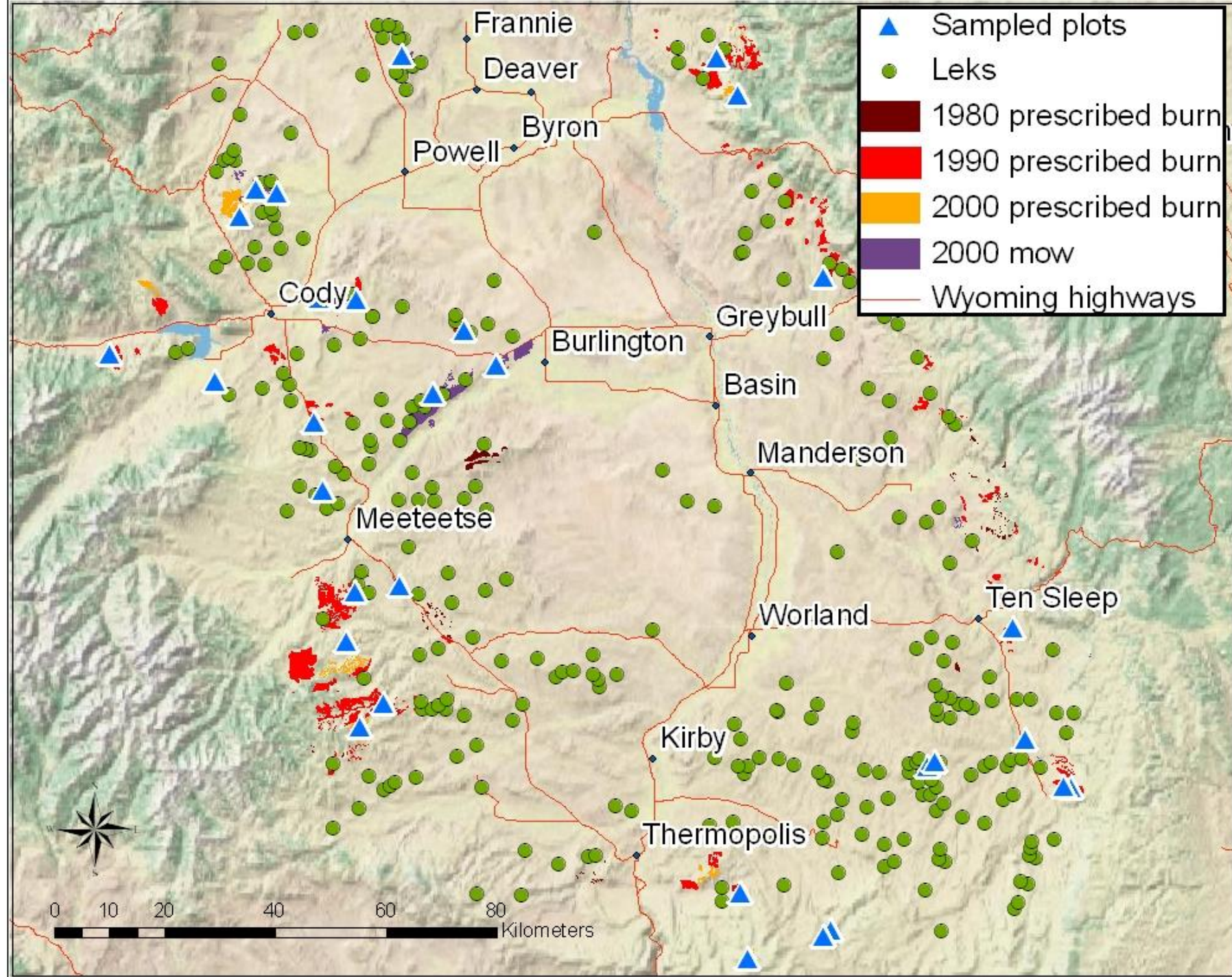
Environmental Management (2014) 53:813–822
DOI 10.1007/s00267-014-0246-6

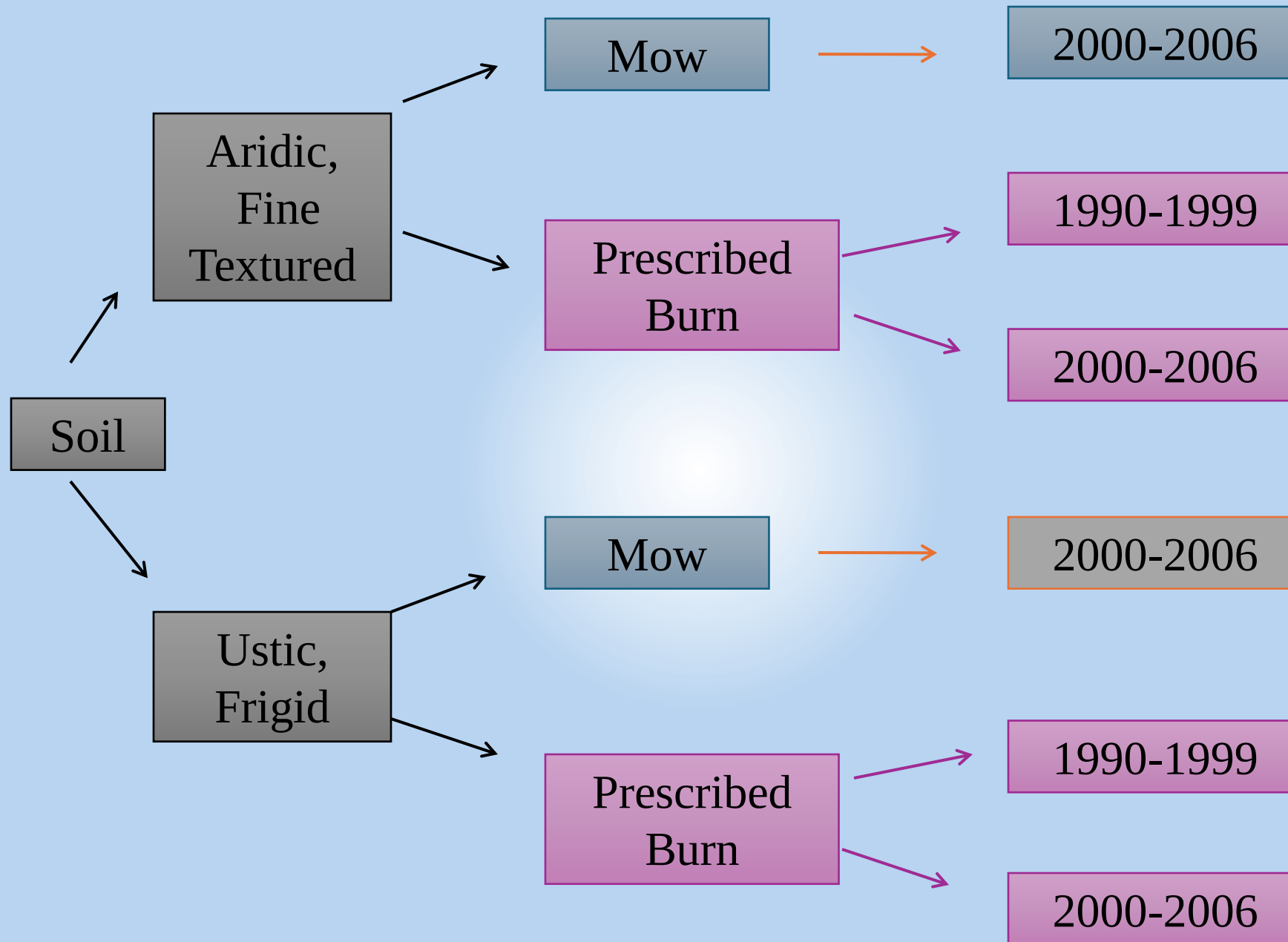
Forb, Insect, and Soil Response to Burning and Mowing Wyoming Big Sagebrush in Greater Sage-Grouse Breeding Habitat

Jennifer E. Hess · Jeffrey L. Beck

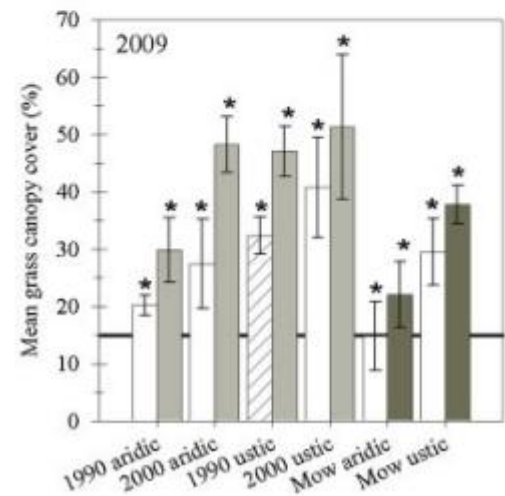
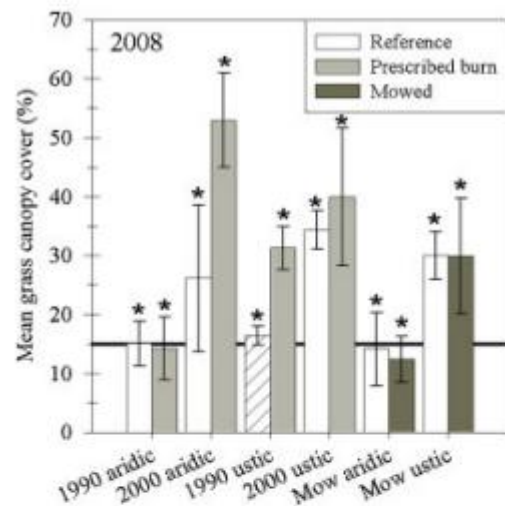
Bighorn Basin Sagebrush Treatments



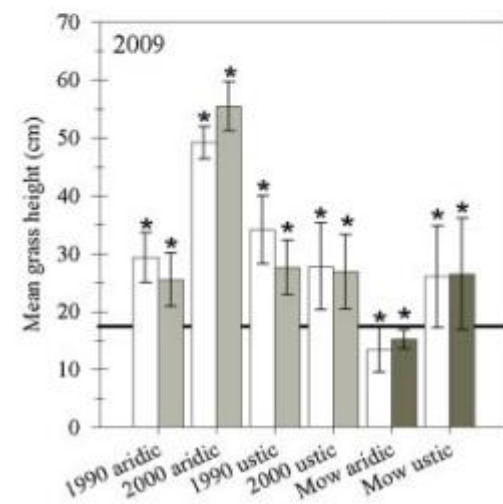
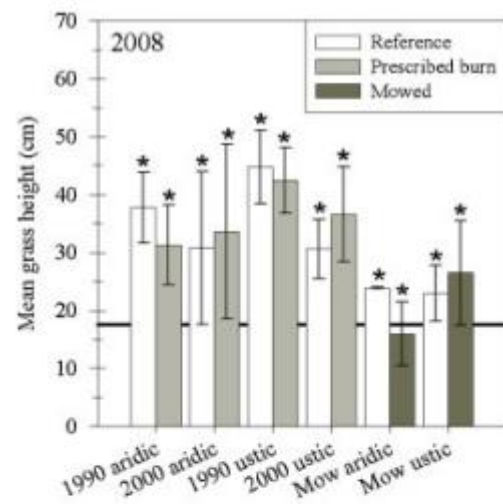




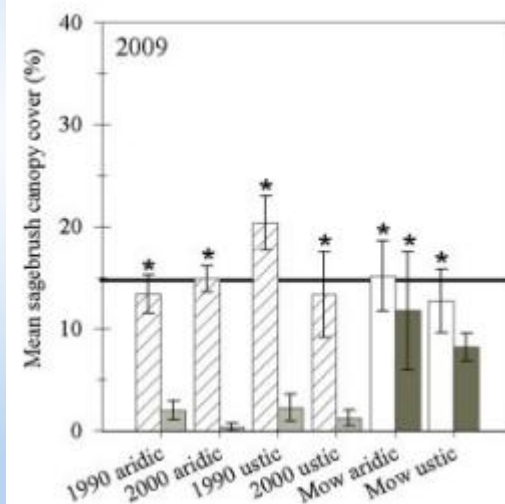
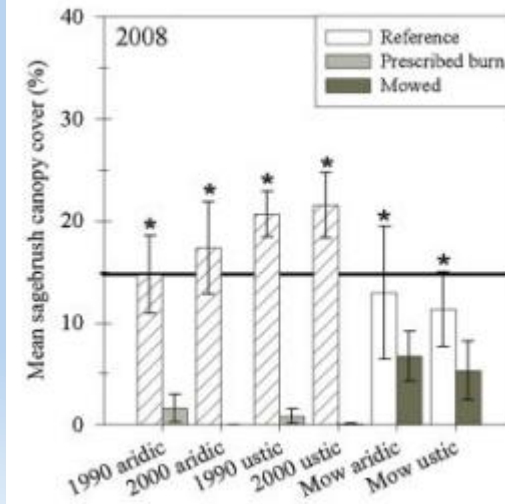




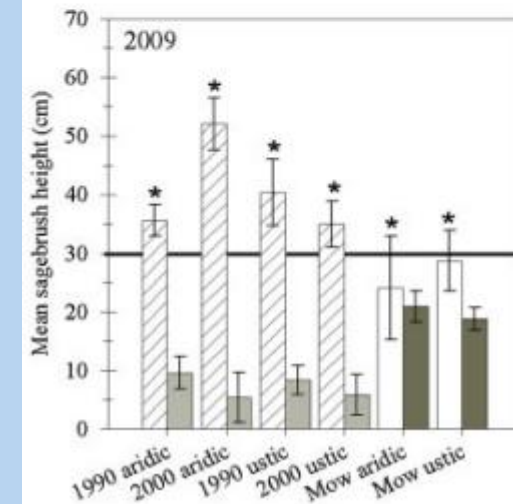
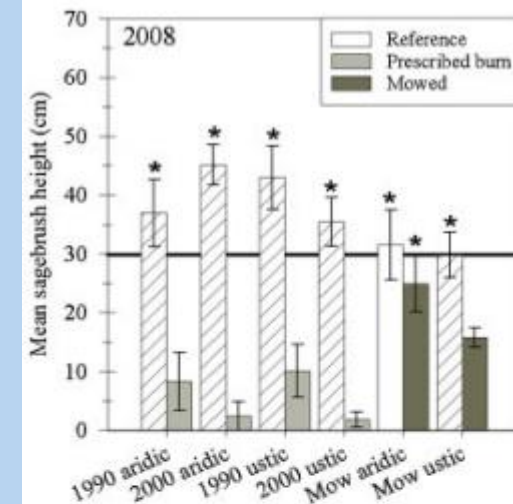
Perennial grass
canopy cover (%)



Perennial grass
height (cm)



Wyoming big
sagebrush canopy
cover (%)



Wyoming big
sagebrush
height (cm)

Forb, Insect, and Soil Parameters

- Only grasshopper abundance was enhanced at burned sites compared with reference sites in 2008
- Mowing did not promote an increase in sage-grouse nesting or early brood-rearing habitat attributes compared with reference sites
- In some cases, prescribed burning showed positive results compared with mowing such as greater forb crude protein, ant, beetle, and grasshopper abundance, and total soil C and N

Conclusions - Observational Study

Canopy cover and height of perennial grasses and Wyoming big sagebrush

- Perennial grass canopy cover met or exceeded guidelines for arid sage-grouse breeding habitat at sites burned 10-to-20-years ago on cool, moist soils
- Wyoming big sagebrush canopy cover and height DID NOT meet guidelines for arid sage-grouse breeding habitat as much as 9 years after mowing and 19 years after burning



Response of forb, insect, and soil parameters to treatment

- Forb, insect, and soil parameters were largely unaffected by treatments, especially mowing



2. Correlational (Core Areas in Wyoming Basins)

Question

- How has male sage-grouse lek attendance been influenced by sagebrush treatments in Wyoming?

Restoration Ecology
THE JOURNAL OF THE SOCIETY FOR ECOLOGICAL RESTORATION

RESEARCH ARTICLE

Sagebrush treatments influence annual population change for greater sage-grouse

Kurt T. Smith^{1,2}, Jeffrey L. Beck¹

Study Area

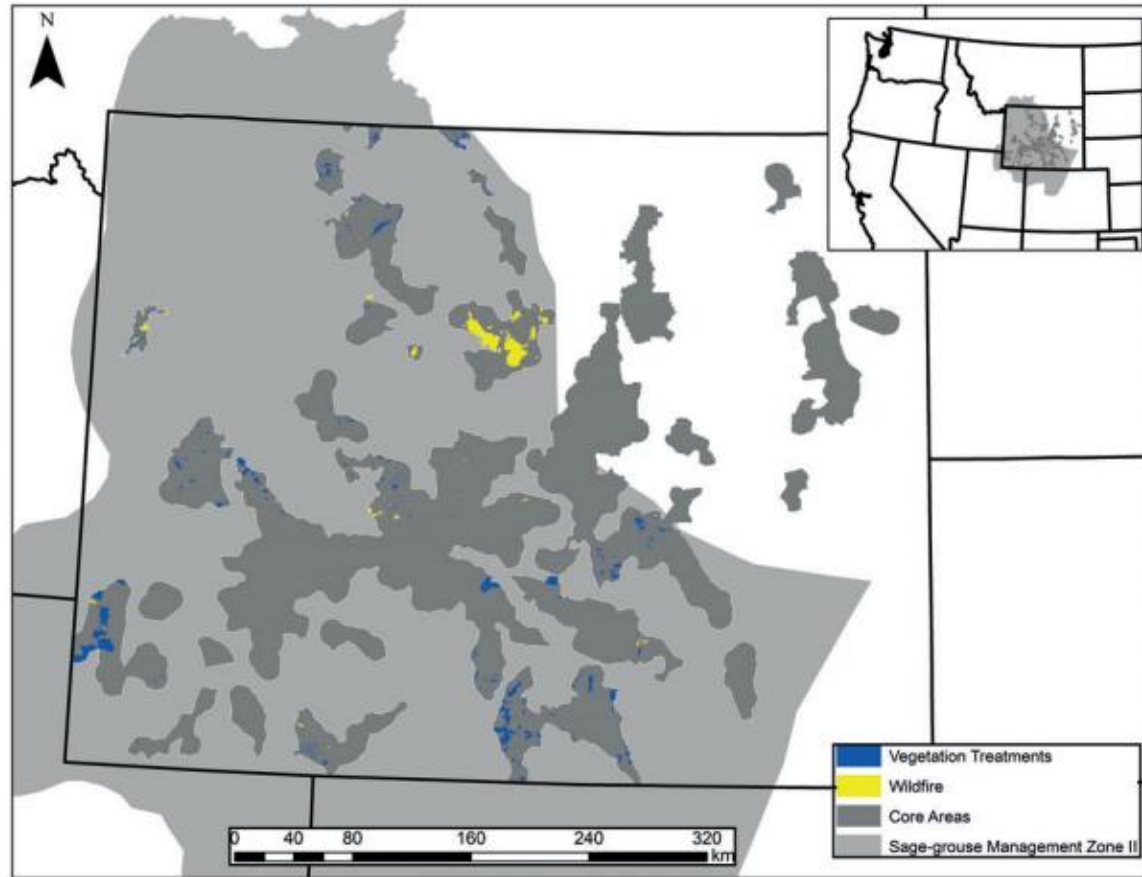


Figure 1. Map of the study area depicting vegetation treatments and wildfires occurring from 1994 to 2012 in Wyoming's Core Areas within Sage-Grouse Management Zone II, Wyoming, United States.

Treatments and Wildfire from 1994–2012

~ 4.2% of 50,957 km²

- 12% Chemical
- 9% Mechanical
- 48% Prescribed fire
- 31% Wildfire

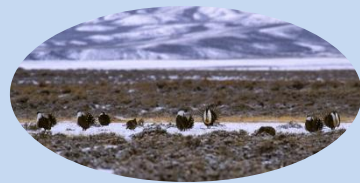
Analysis framework

Intrinsic annual rate of change



N = maximum male lek count
at lek i , during year t

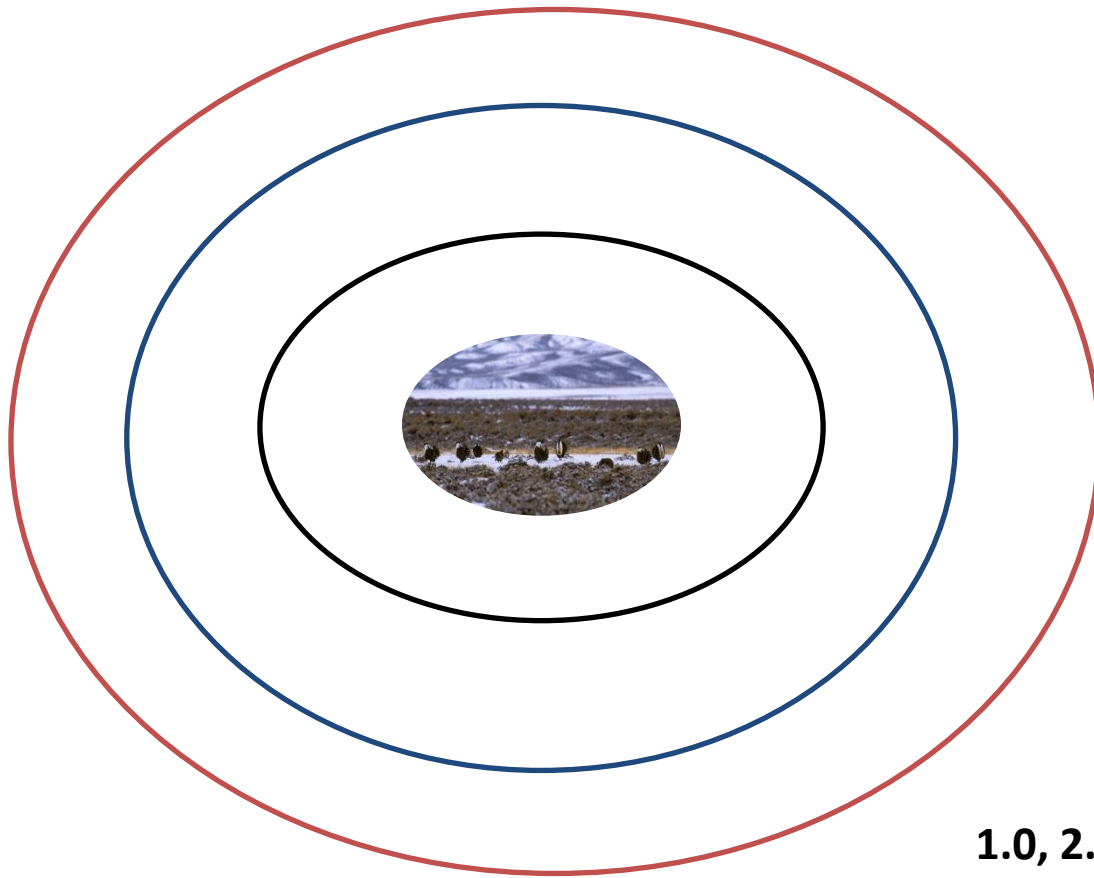
$$r_{it} = \ln[N_{it}] - \ln[N_{it-1}]$$



$$r \approx 0$$

- Chemical
- Mechanical
- Prescribed fire
- Cumulative

Scales and Time Lags



**Leks are the center of the
sage-grouse universe**

1.0, 2.5, 5.0, 6.4, 8.4, and 10.0 km radii scales

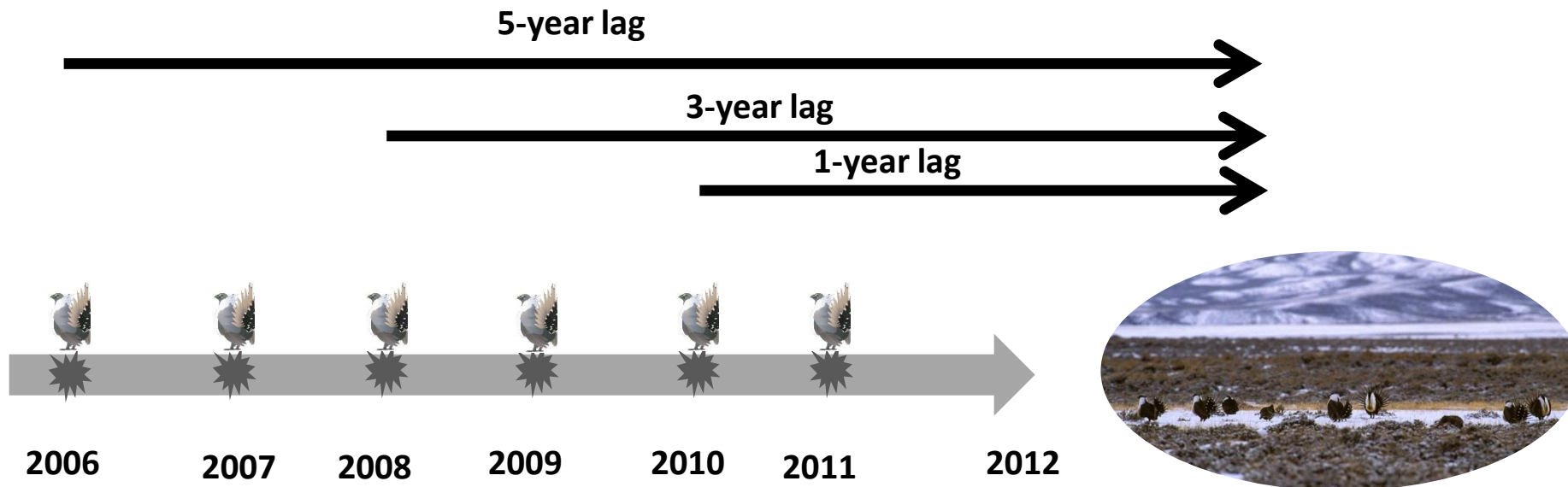
Scales and Time Lags



Treatments



Wildfire



Results and Conclusions - Correlational Study

- Three-year lag-Mechanical_{1.0km}



- Ten-year lag
 - Prescribed fire_{2.5 km}
 - Chemical_{10.0km}



- Wildfire was a consistent negative influence on male lek attendance
- No interaction with treatments and treatment size or elevation



3. Quasi-Experimental (Central Wyoming)

Questions

- Before and after effects of treatment on sage-grouse survival and habitat selection
- Before and after effects of treatment on vegetation and grouse foods (forbs and insects)
- Post-treatment recovery

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MONOGRAPH

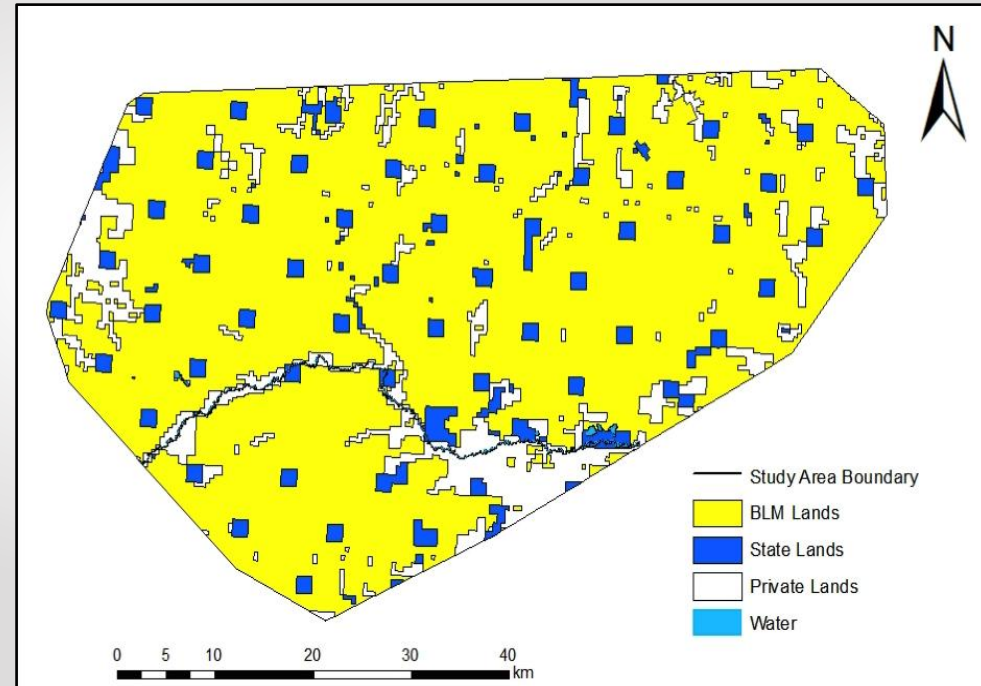
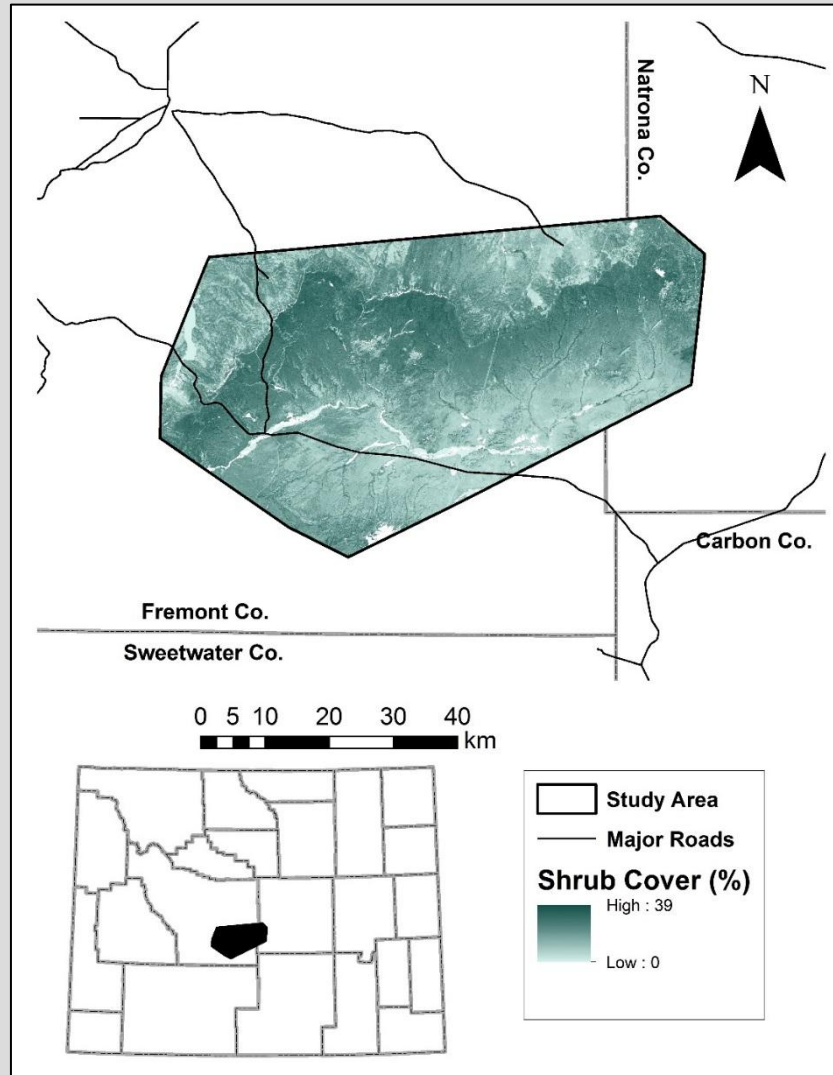
WILDLIFE
MONOGRAPHS

THE
WILDLIFE
SOCIETY

Response of greater sage-grouse to sagebrush reduction treatments in Wyoming big sagebrush

Kurt T. Smith¹  | Jason R. Levan¹ | Anna D. Chalfoun²  |
Thomas J. Christiansen^{3*} | Stanley R. Harter⁴ | Sue Oberlie^{5*} |
Jeffrey L. Beck¹ 

Study Area



Study Design



**Phase 1:
Pre-Treatment Monitoring
(2011–2013)**

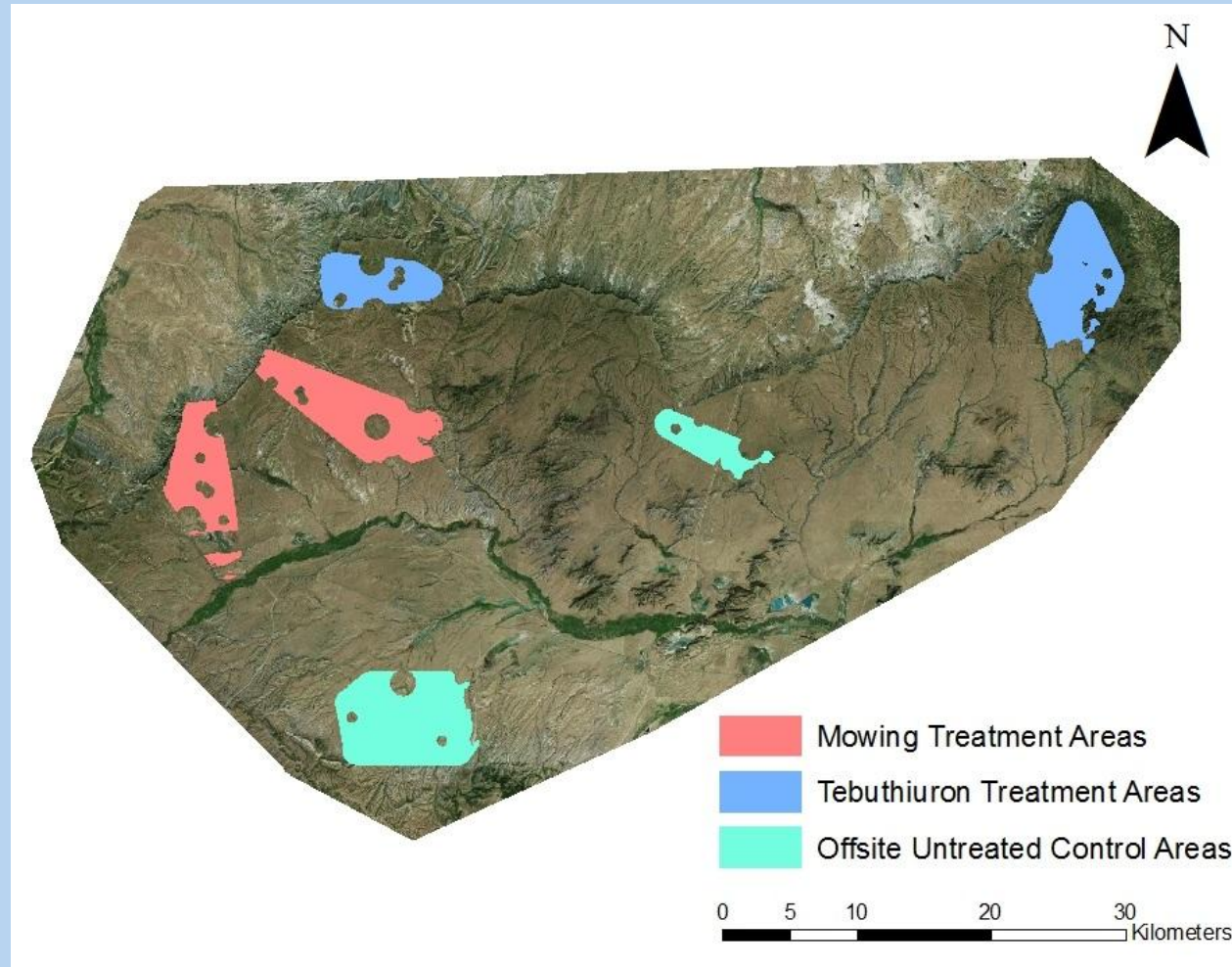


**Phase 2:
Treatment Implementation
(Winter and Spring 2014)**

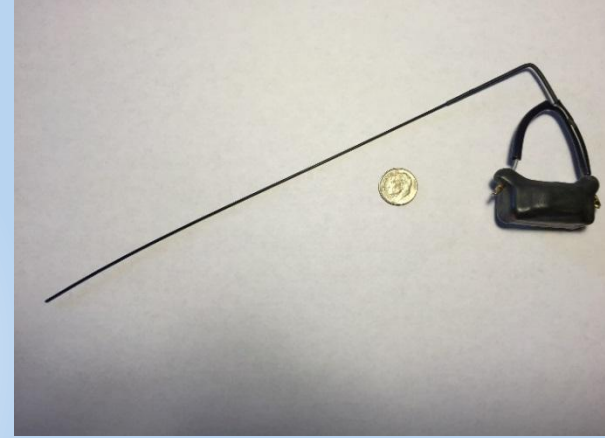


**Phase 3:
Post-Treatment Monitoring
(2014–2019)**

Phase 2: Treatment Implementation



Field Methods



Nesting Habitat Selection



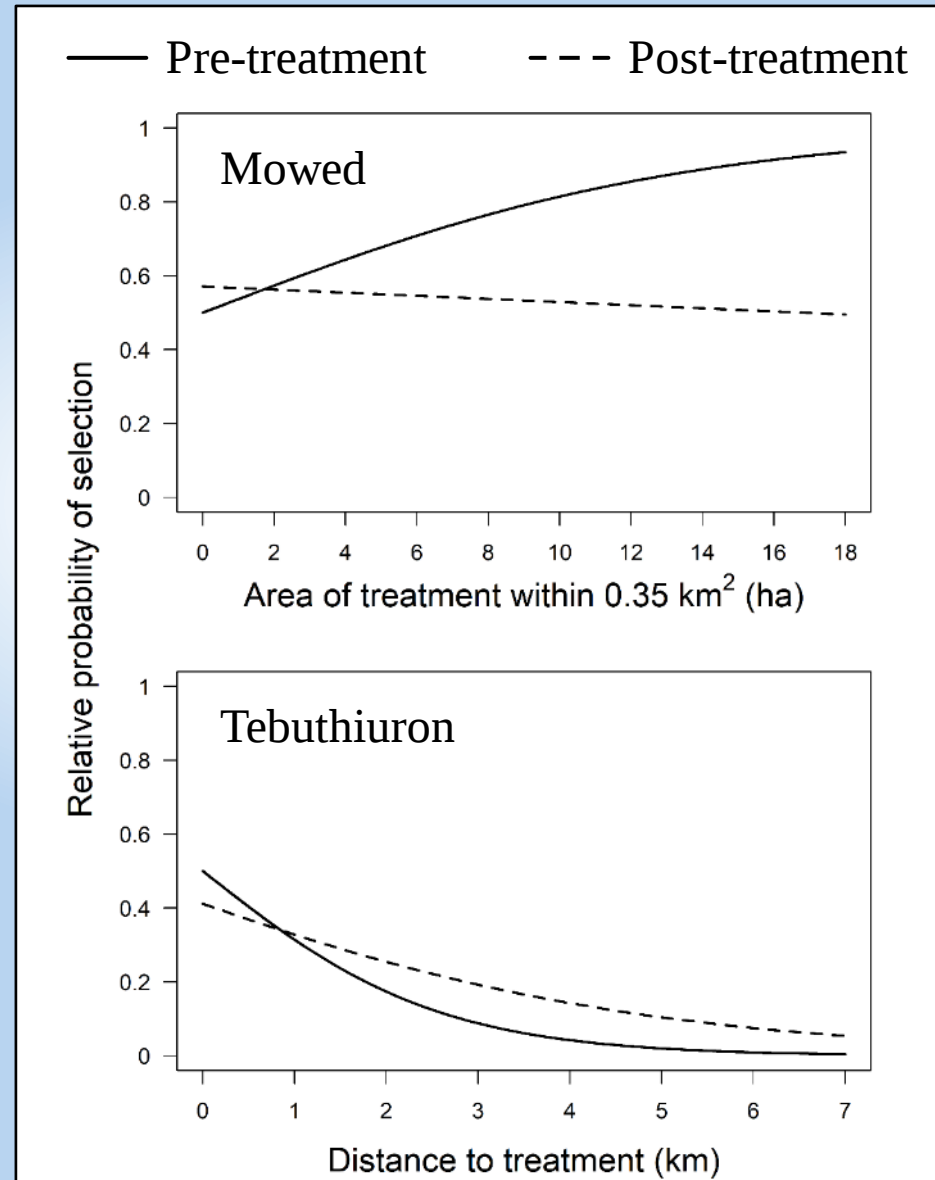
Mowed

✗ Time Period ✗



Tebuthiuron

✗ Time Period ✗



Brood-Rearing Habitat Selection



Mowed



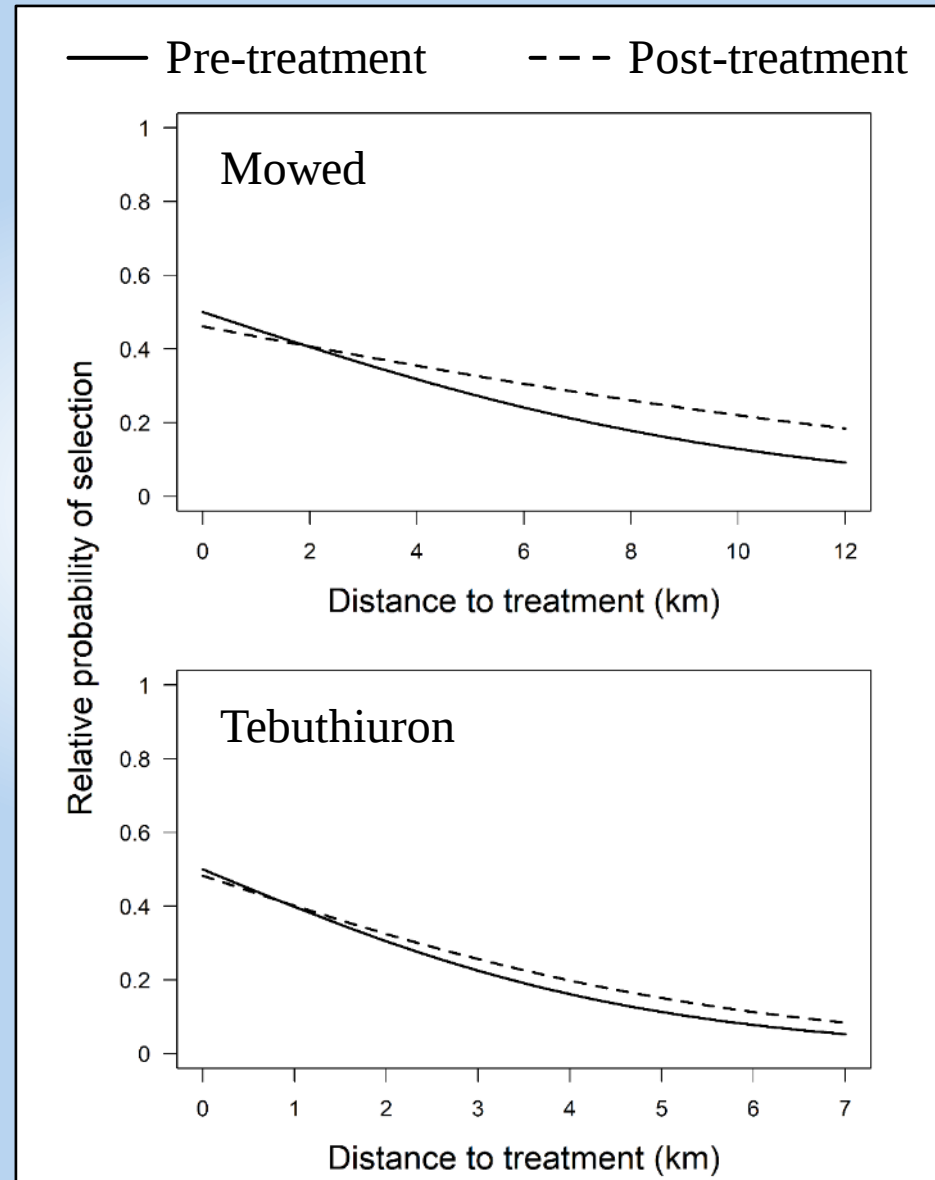
Time Period ✖



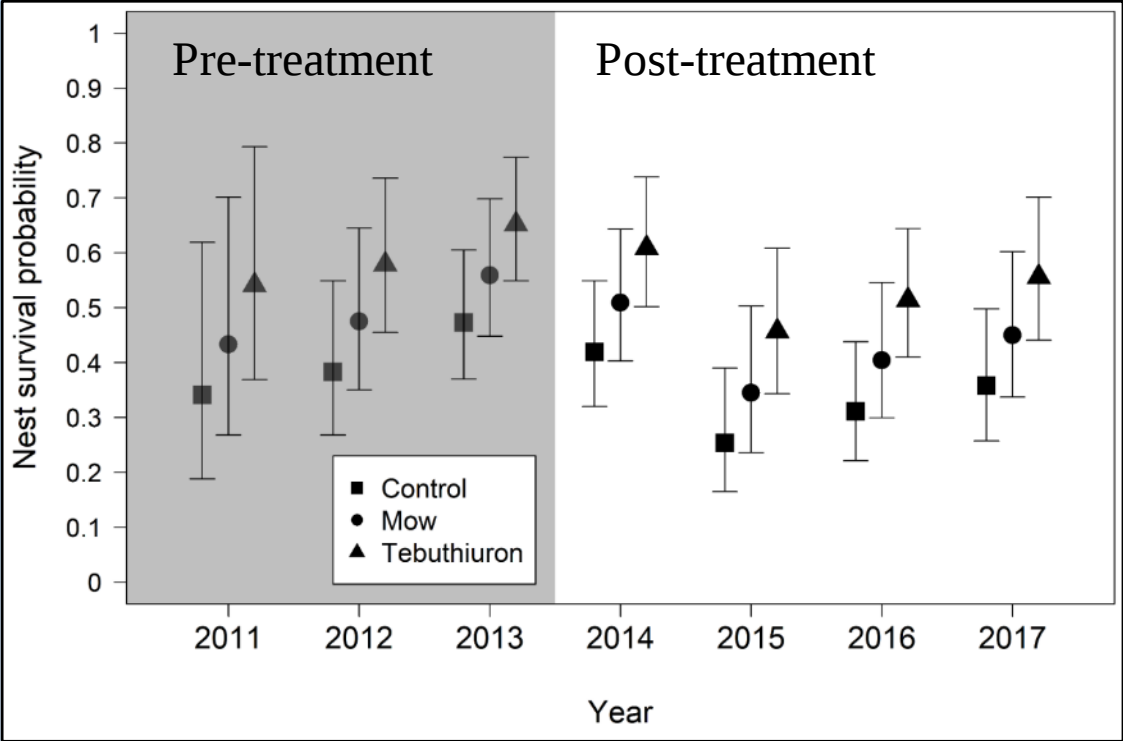
Tebuthiuron



Time Period ✖

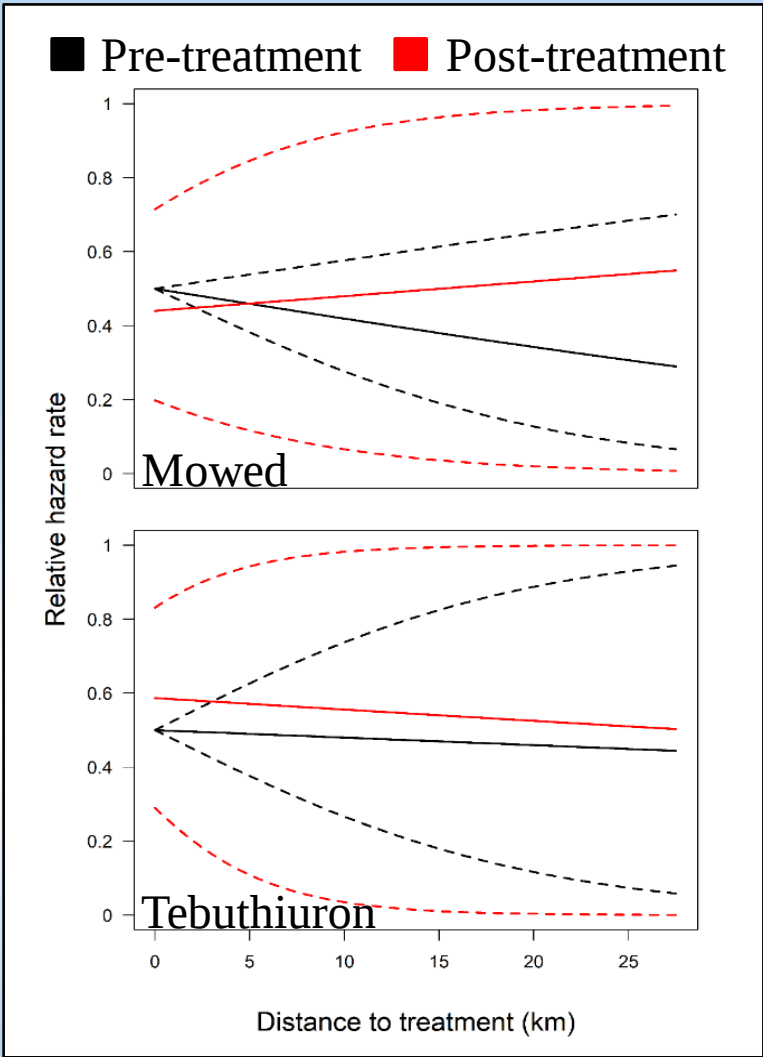


Nest Mortality Risk

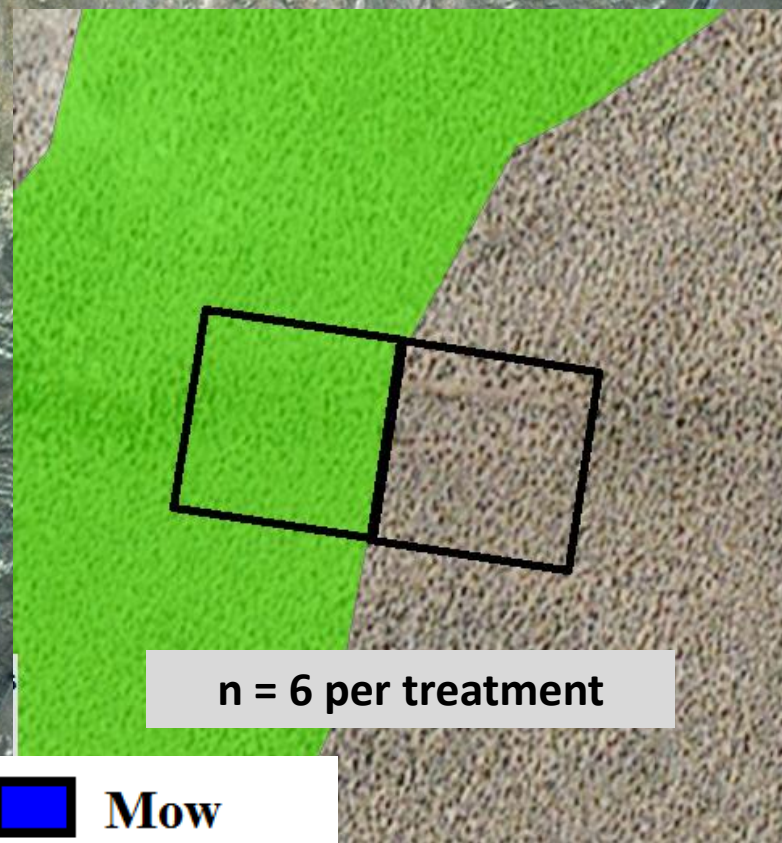


Treatment Effect	Findings		
Mowed vs. reference	Time Period ✖		✖
Tebuthiuron vs. reference	Time Period ✖		✖
Tebuthiuron vs. mowed	Time Period ✖	 	✖

Brood Mortality Risk

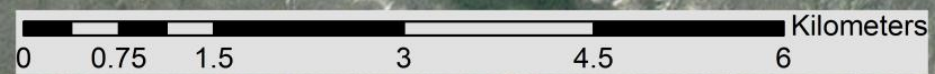


Treatment Effect	Findings		
Distance to mowed treatment	Time Period ✖		✖
Distance to tebuthiuron treatment	Time Period ✖		✖

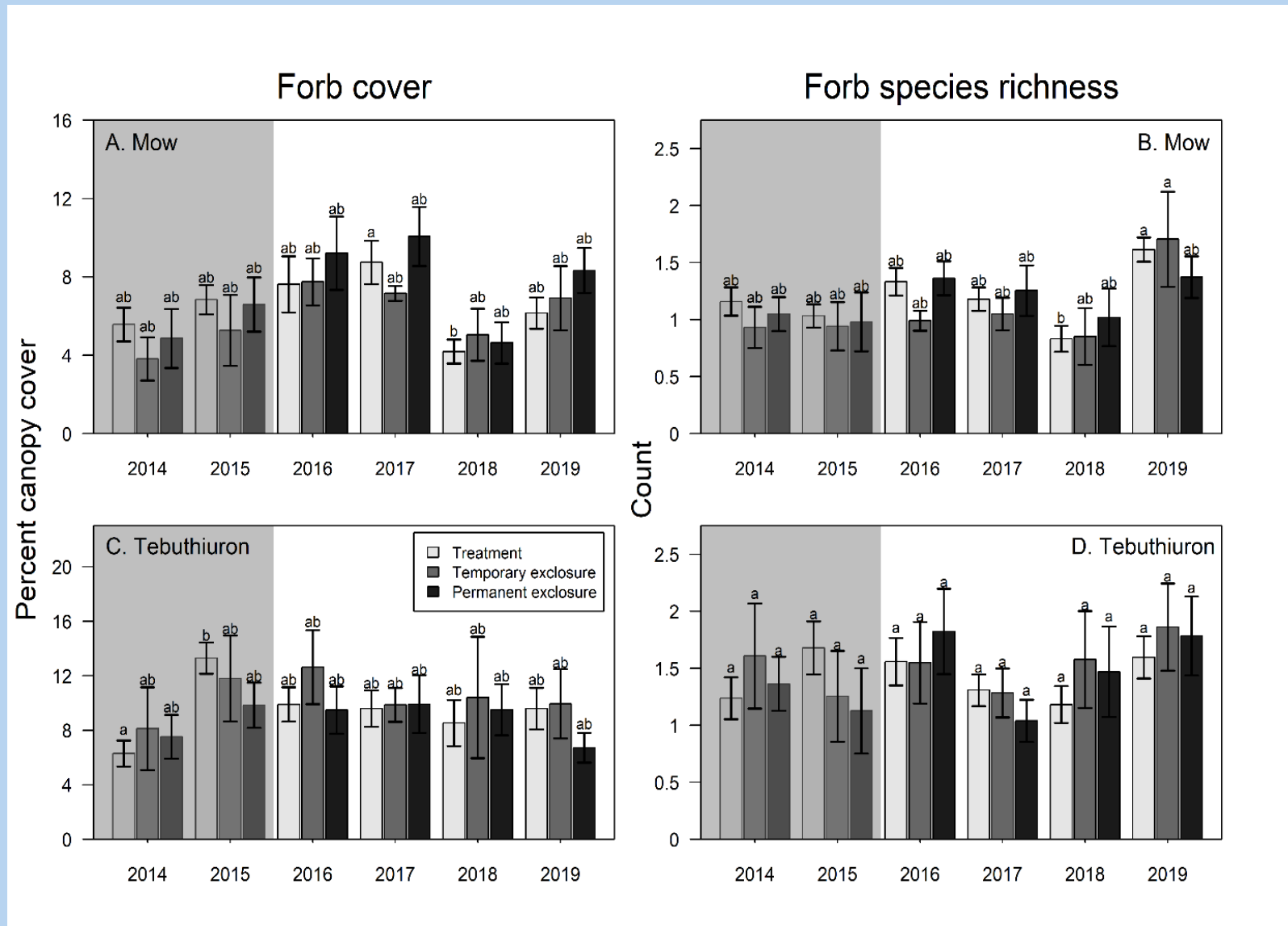


n = 6 per treatment

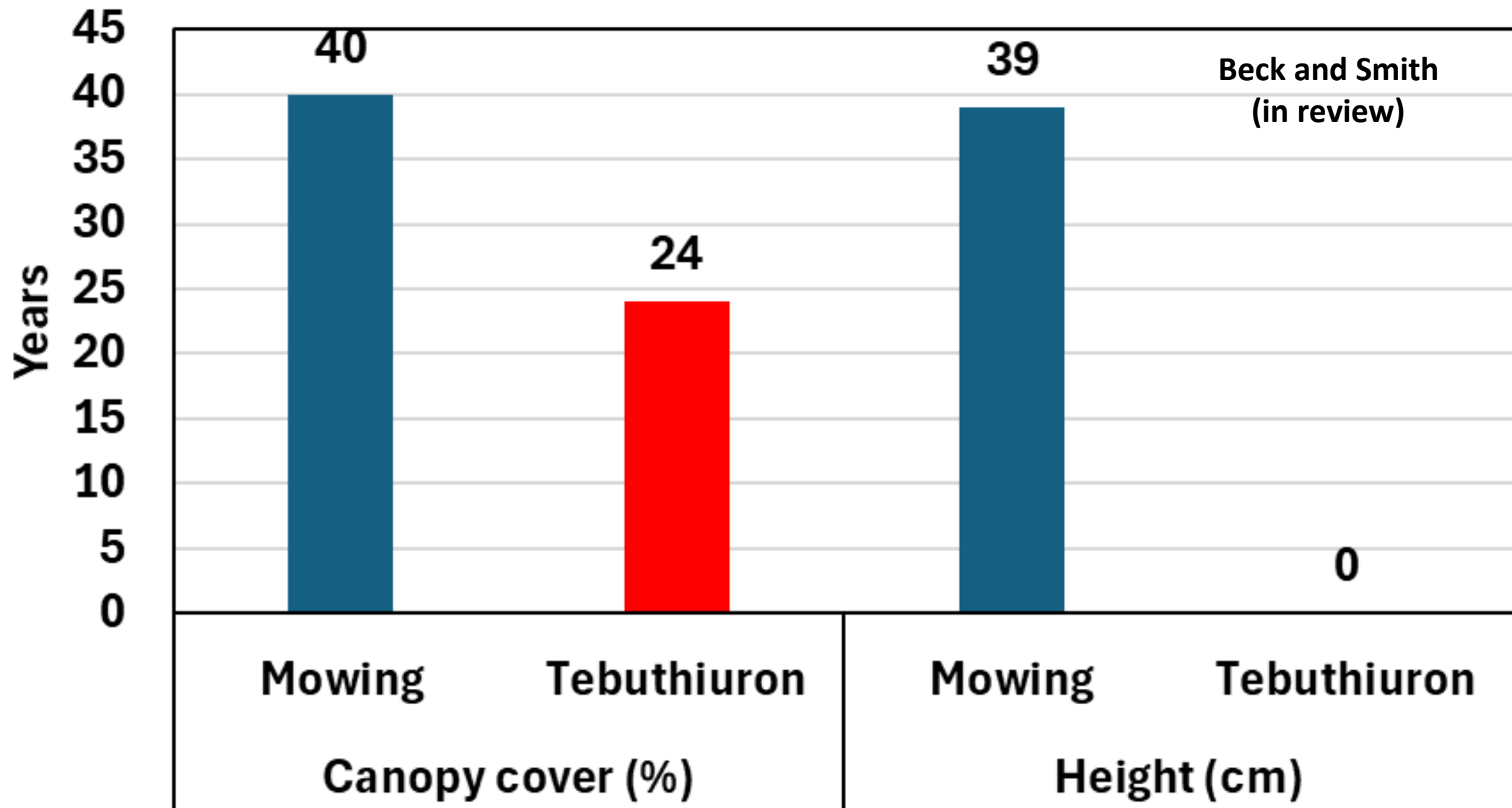
-  Mow
-  Spike
-  Reference



Results: vegetation response to treatments at exclosures



Years for Wyoming Big Sagebrush in Treatment Plots to Equal Reference Plots in Exclosures



Conclusions – Quasi-Experimental Study

Before- and after-treatment effects on sage-grouse survival and habitat selection

- Habitat selection
- Survival

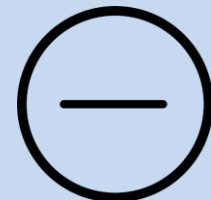


Before- and after-treatment effects of treatment on vegetation and grouse foods (forbs and insects)



Post-treatment recovery

- Canopy cover and height of Wyoming big sagebrush



Are Sagebrush Reduction Treatments in Wyoming Big Sagebrush Effective for Sage-Grouse?

In general, they are not effective

Neutral

- Nest and brood habitat selection
- Nest and brood survival
- Forb and insect mass

Positive

- Grass cover response to prescribed burning in 10-20-year-old burns on cool, moist soils
- Chemical treatment within 10 km of leks may lead to positive lek counts after 11 years

Negative

- Slow recovery of sagebrush canopy cover (mowing and tebuthiuron) and height (mowing)



Questions