ARS-TBGPEA collaborative research update

USDA Agricultural Research Service

March 16, 2016

Long-range goals

- Find out how to best manage Thunder Basin for multiple objectives
  - livestock production,
  - conservation of both short-grass and sagebrush ecosystems and associated species,
  - energy production

- Produce updated STMs, ESDs, decision support tools and/or best practices for public and private land managers.

TBGPEA-ARS Activities

Projects initiated 2014-2015

- Historical Wildfires Project
- Thunder Basin Research Initiative:
  - Nested Exclosure Project
  - Overlapping Bird Habitats Project

2016 plans

- Historical exclosure sampling
- Songbird responses to wildfire
- Assist with ongoing projects

Historical Wildfires Project

How does wildfire impact Thunder Basin ecosystems?

Historical Wildfires Project

WILDFIRE

1a. Reduction of shrubs: temporary or long-term?

1b. Change in forage available to livestock?

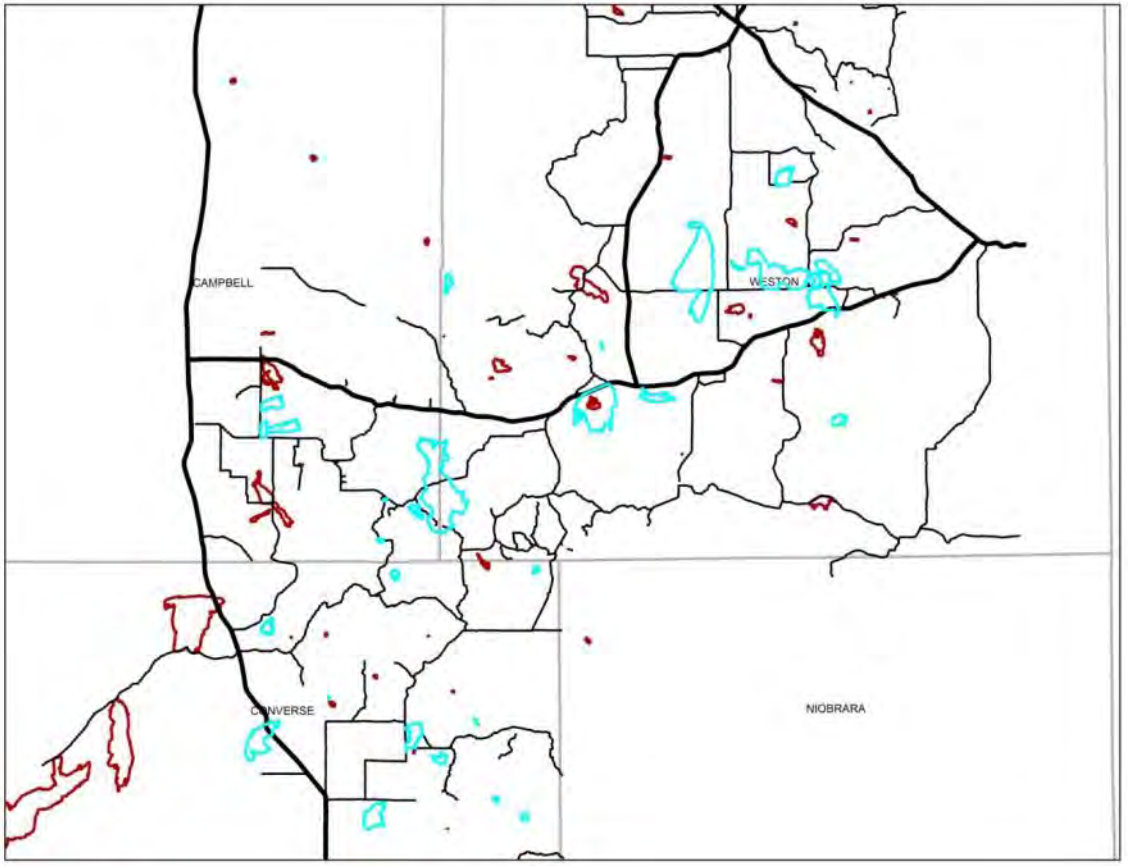
2. Brome invasion?

3. Soil erosion?

4. Change in bird habitats?

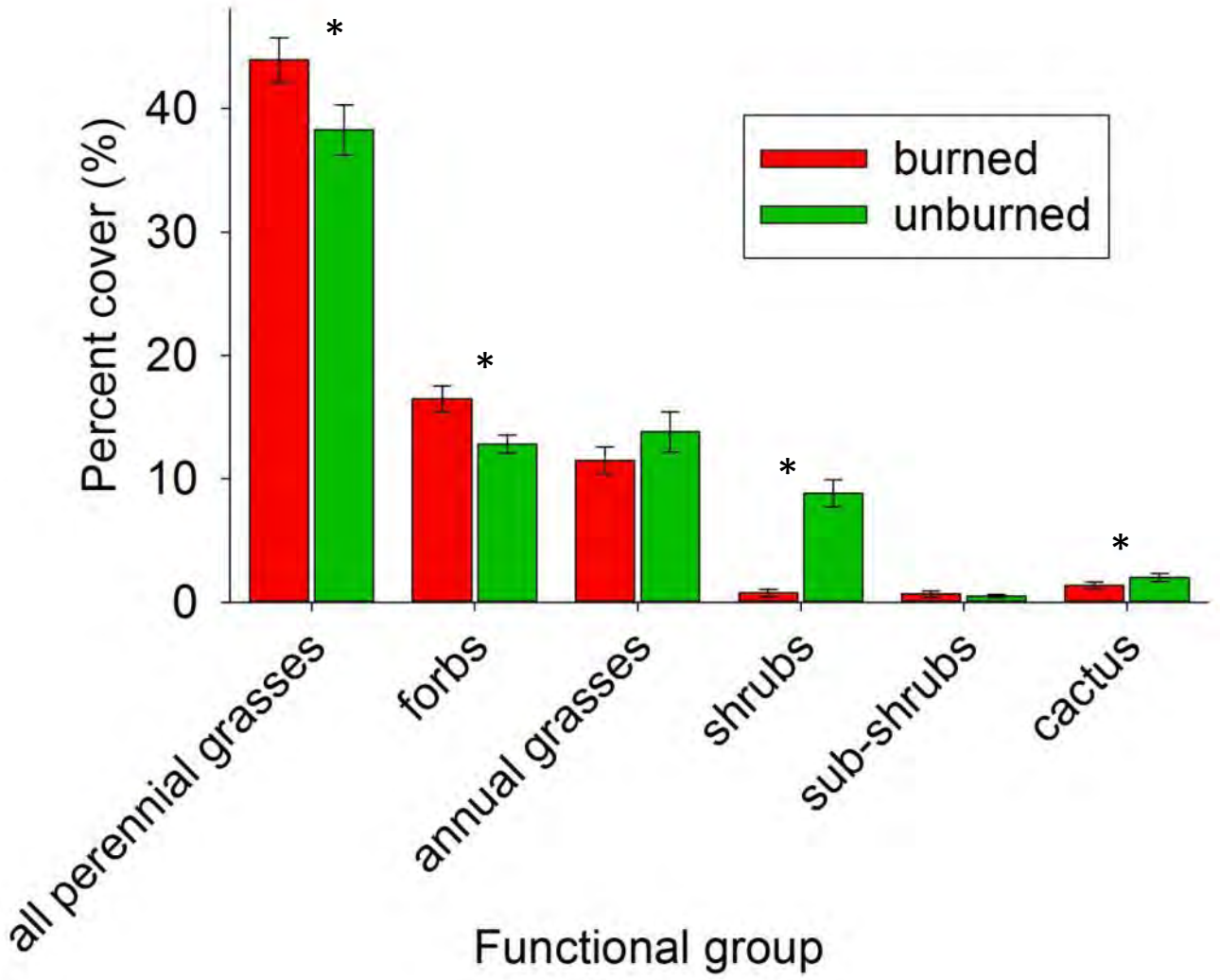
How does **wildfire** impact Thunder Basin ecosystems?

Comprehensive vegetation and soils data at 159 transects spanning 3 counties, 32 historical fires (1937-2012), and 7 different ecological sites.



1. Shrubs and forage

Wildfires increase grass and forb cover, reduce shrub and cactus cover



Long-term effects of wildfire?

Shrubs: long-term reduction

Perennial grasses: long-term increase

In oldest fires, shrub cover is replaced by perennial grass cover.

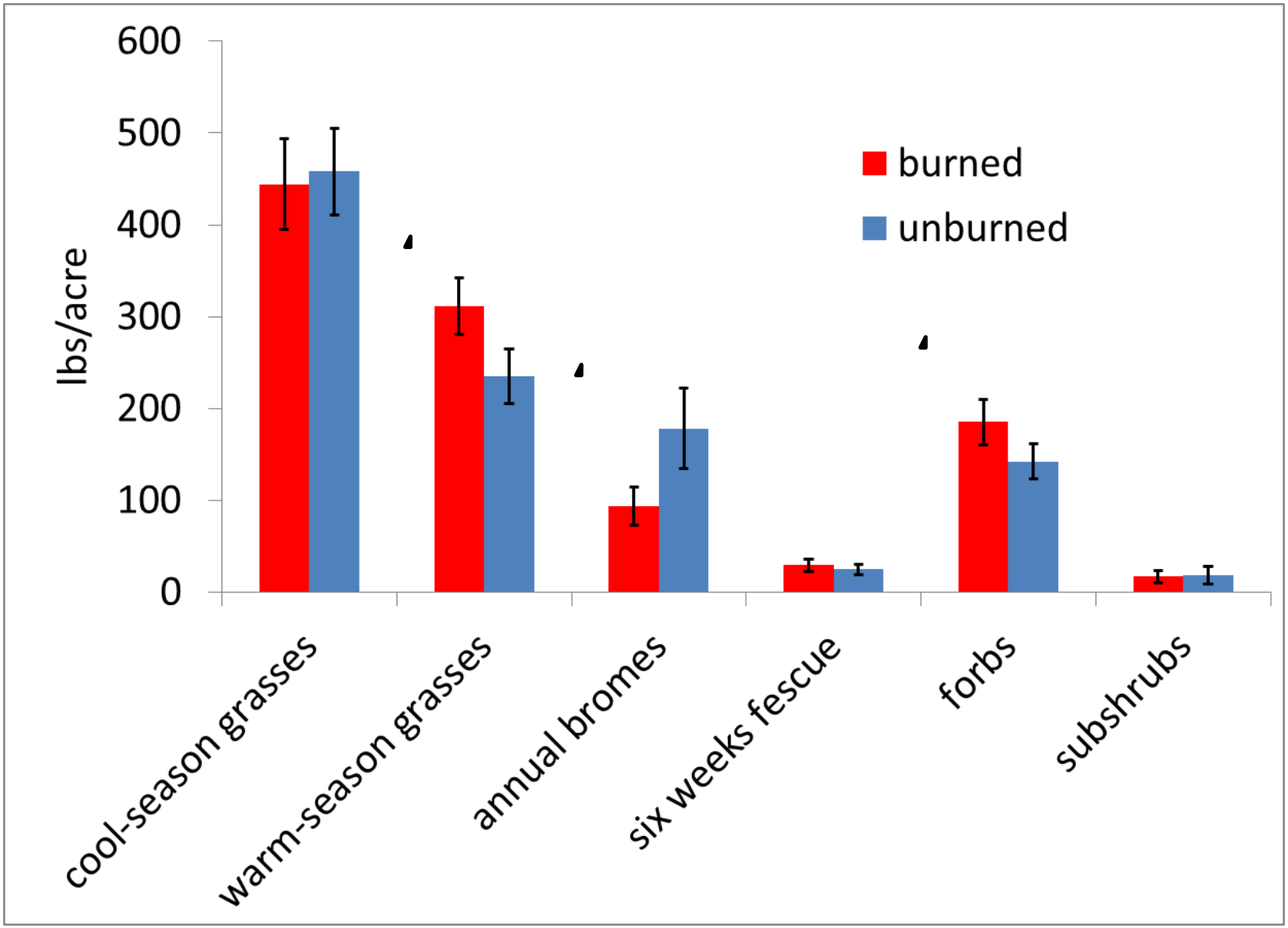
Cactus: fire reduces temporarily

Forbs: fire increases temporarily

What about biomass?

In 2015, we clipped herbaceous biomass at 110 transects. *Note: excludes shrub biomass and residual from 2014, doesn't account for differential utilization.*

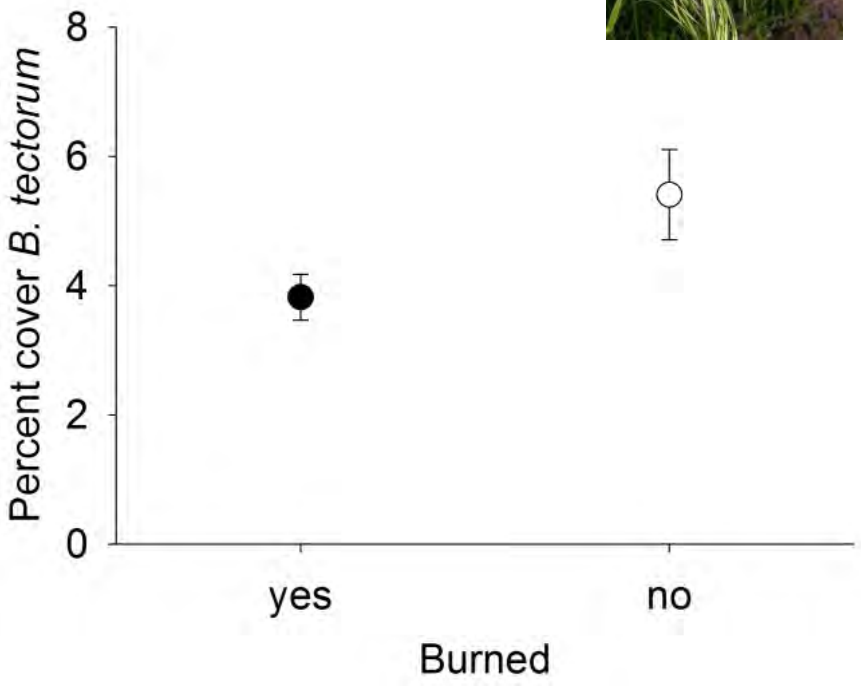
Biomass by functional group



2. Abundance of annual bromes

Wildfires did not cause brome invasion

Cheatgrass



Japanese brome

What do bromes care about?

1. **Soil.** Cheatgrass is found on sandier soils, while Japanese brome is found on more clayey soils.

2. **Site potential.** Both species are more likely to occur in grassier places with more plants.

3. **Microclimate**. Both species are more likely to occur on SE-facing slopes.

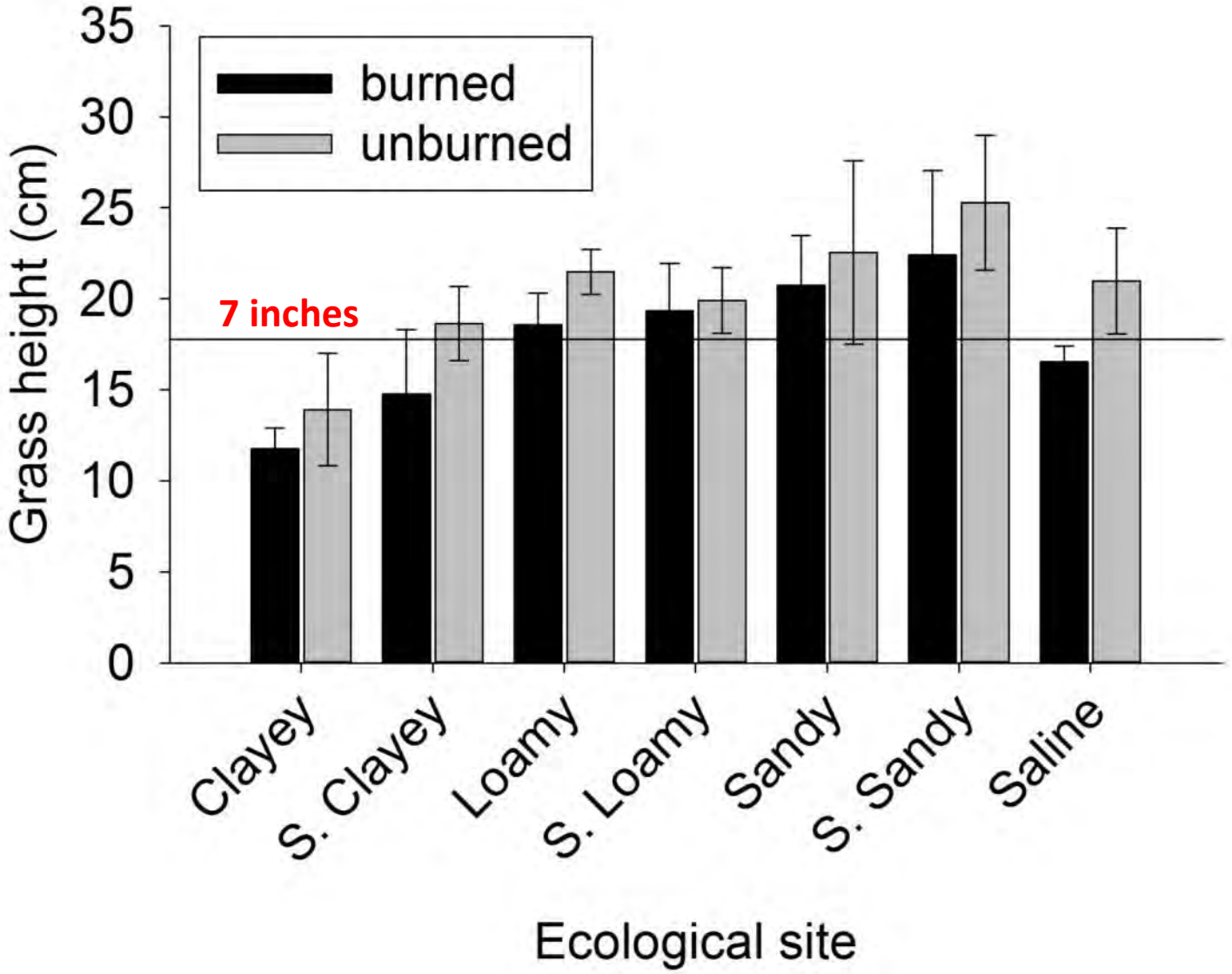
3. Soil stability and erosion

Historical fires do not cause soil erosion.

4. Bird habitat

- (Fire removes sagebrush)
- (Fire increases forb cover and biomass)
- No difference in forb diversity due to burns

Grass is shorter inside fires and on clayey or saline soils



Building a general picture of long-term wildfire effects in Thunder Basin

WILDFIRE

Long-term reduction of shrubs

Increase in cover and biomass of forbs and perennial grasses

No brome invasion

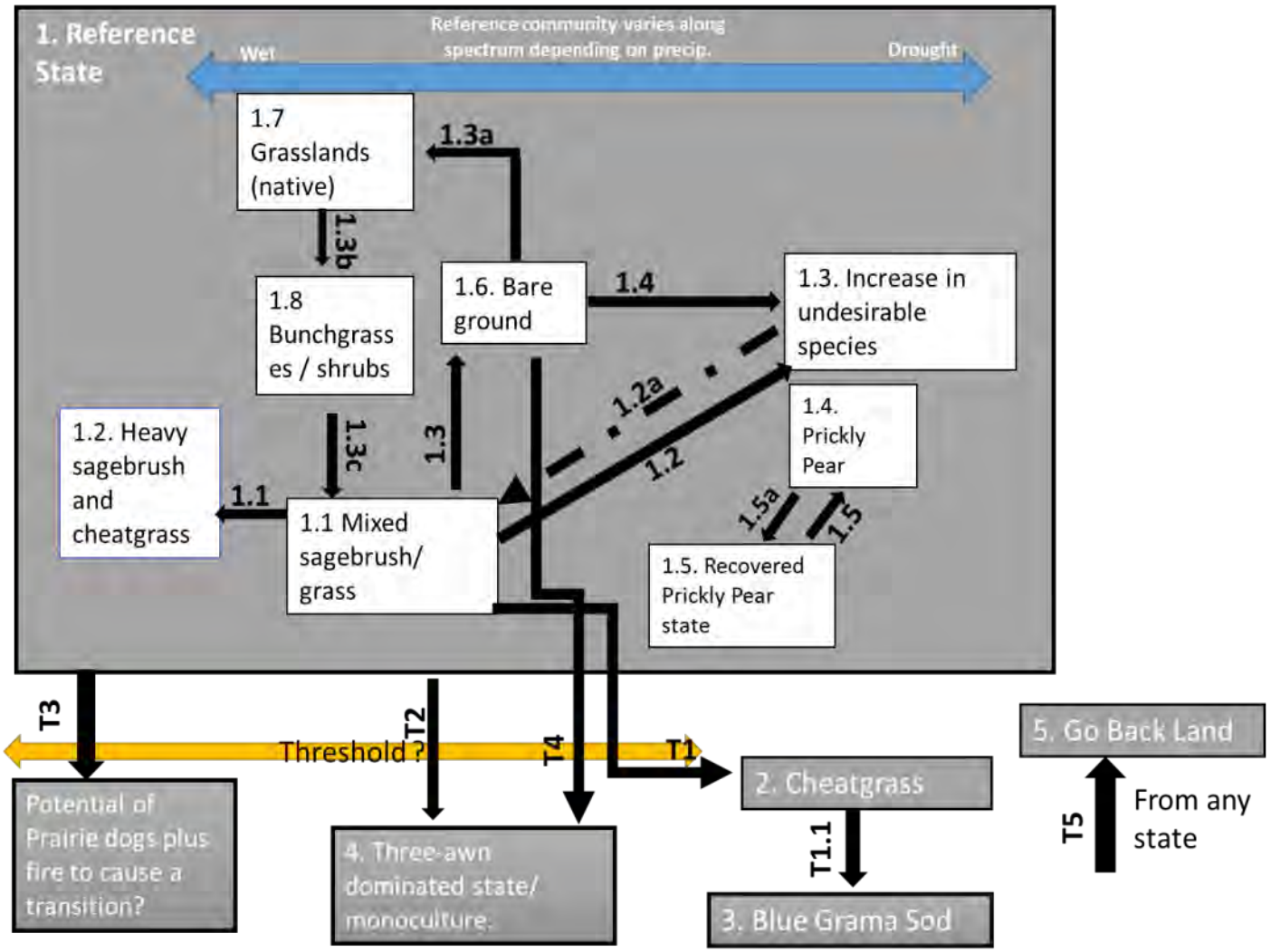
No soil erosion

Bird habitat: shorter structure; no shrubs; more forbs

Take home messages

- Fires can cause a conversion (on the order of 100 years or more) from sagebrush to mixed grass.
- Burned areas may provide important forage resources (e.g., forbs) that are less abundant elsewhere.
- Fires can help reduce cactus, at least temporarily.
- Fires are not associated with erosion or invasion.

Next steps: build fire into conceptual models of the ecosystem



Thunder Basin Research Initiative

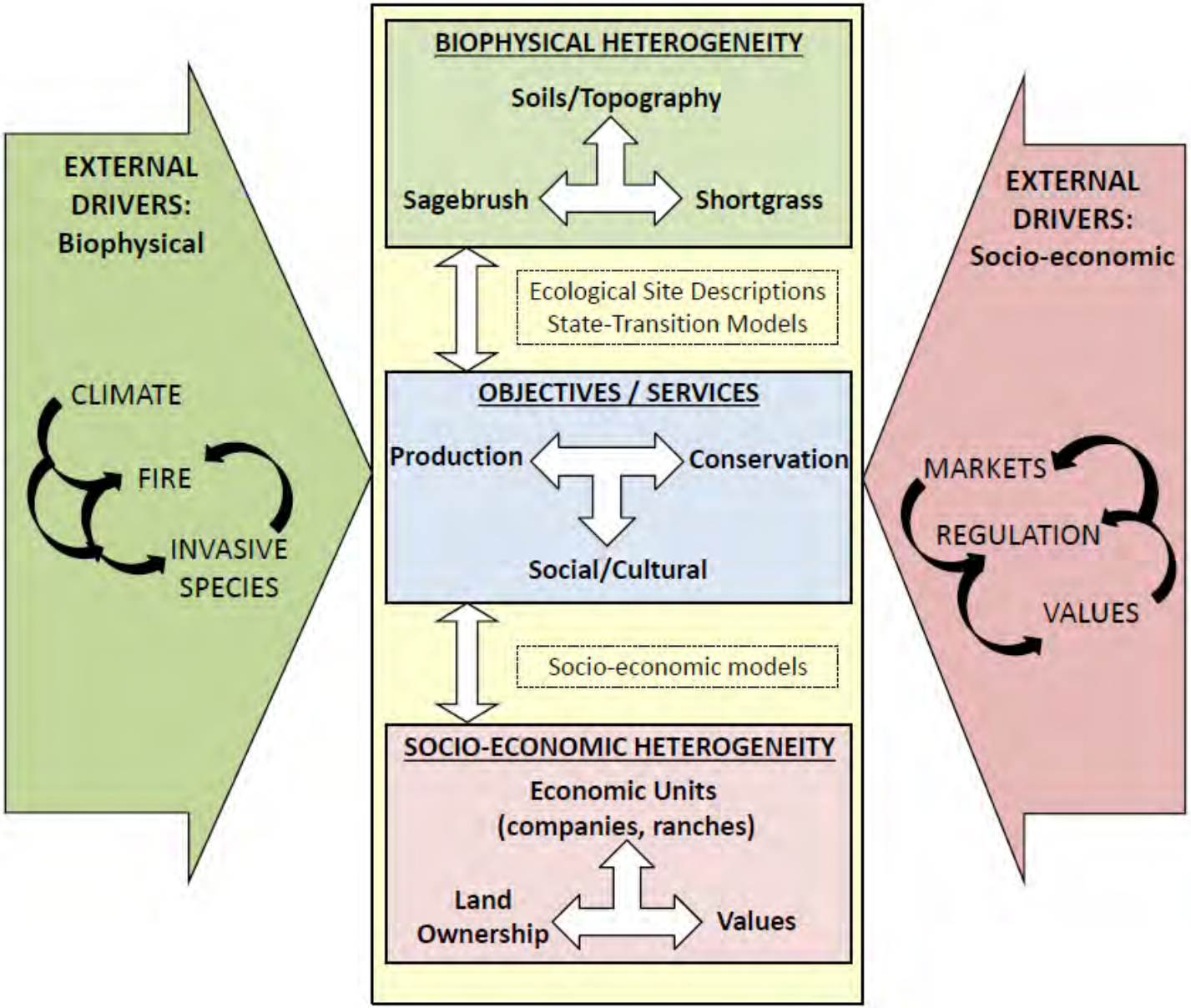
UW College of Agriculture and Natural Resources

USDA Agricultural Research Service, Rangeland Resources Research Unit

Thunder Basin Grasslands Prairie Ecosystem Association and Regional Grazing Associations

Thunder Basin National Grassland, USDA-Forest Service

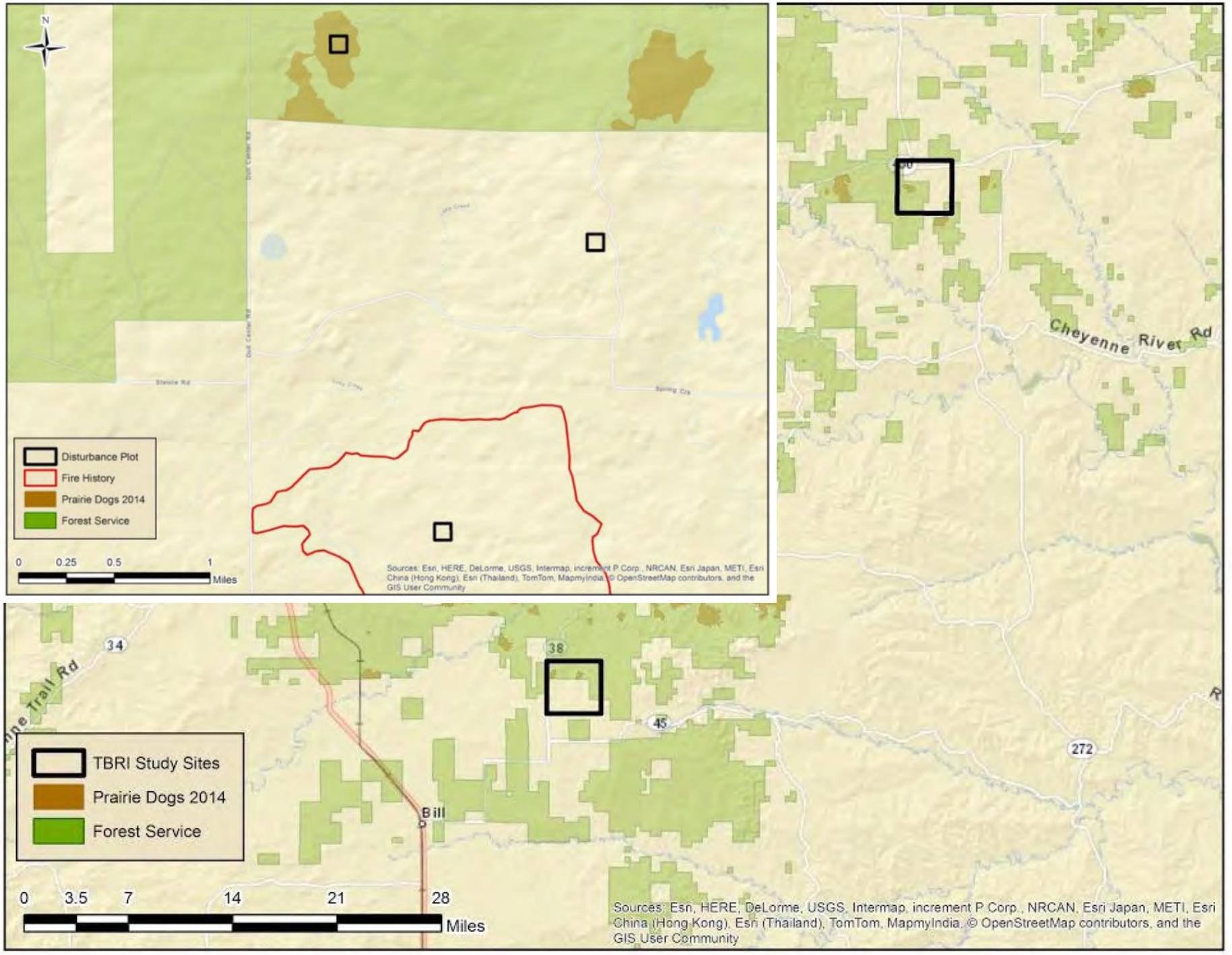
THUNDER BASIN RESEARCH INITIATIVE: How do we manage a large landscape for multiple ecosystem benefits in the face of external drivers?

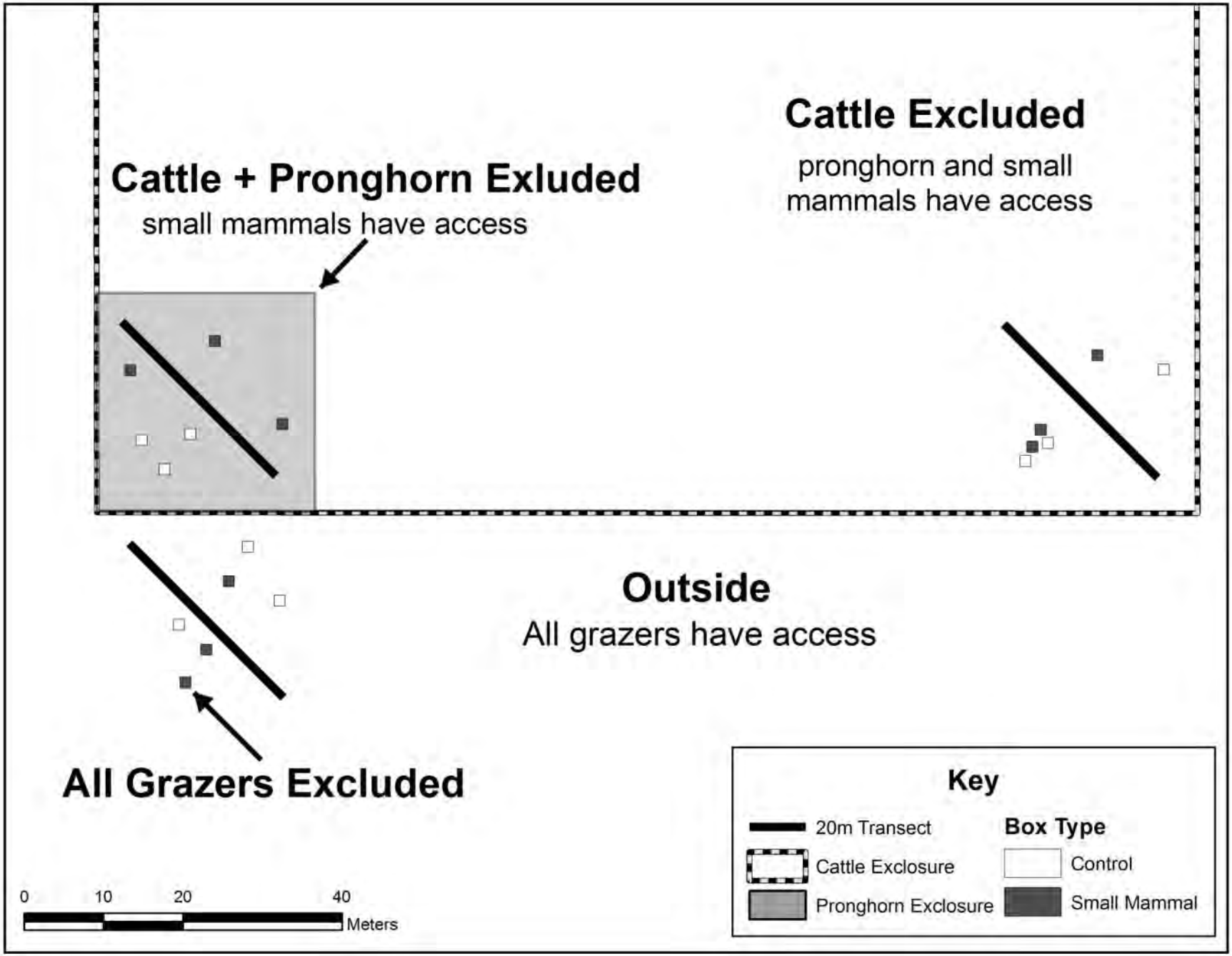


TBRI Project 1: Interactive Effects of Herbivory and Disturbance on Plant Communities

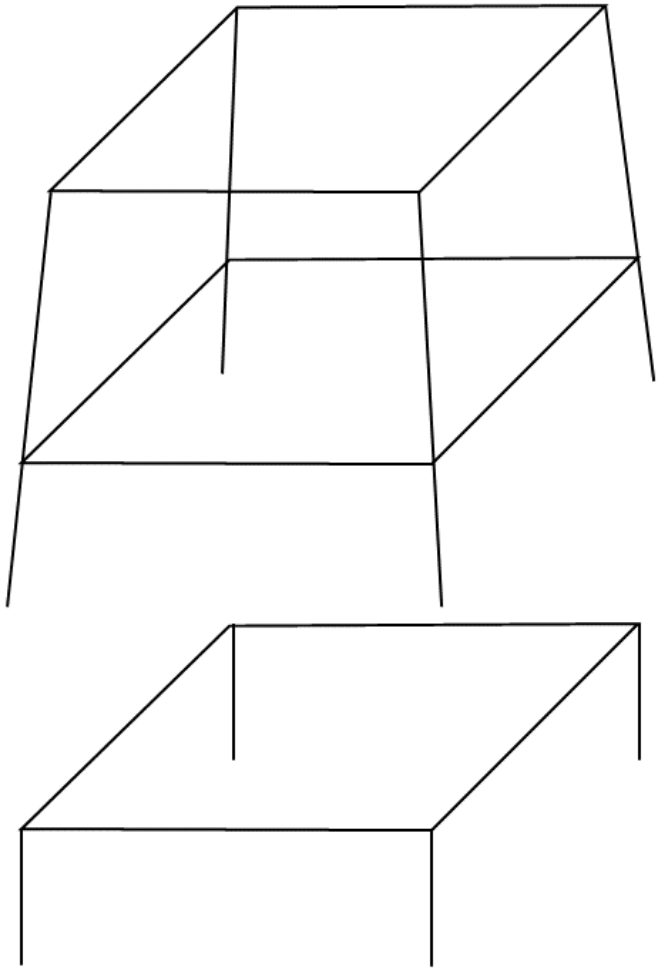
Research Objective

Assess impacts of cattle, wild ungulate, and small mammal herbivory on plant communities, wildlife habitat structure, and livestock production across three types of disturbance: none, historical burn, or prairie dog colony


Disturbance Plot
Fire History
Prairie Dogs 2014
Forest Service
0 0.25 0.5 1
Miles
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Cheyenne River Rd
34
38
45
272
Bill
TBRI Study Sites
Prairie Dogs 2014
Forest Service
0 3.5 7 14 21 28
Miles
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community


Cattle + Pronghorn Exluded
small mammals have access
Cattle Excluded
pronghorn and small mammals have access
Outside
All grazers have access
All Grazers Excluded
0
10
20
40
Meters
Key
20m Transect
Cattle Exclosure
Pronghorn Exclosure
Box Type
Control
Small Mammal

Small mammal exclosures



Baseline Data

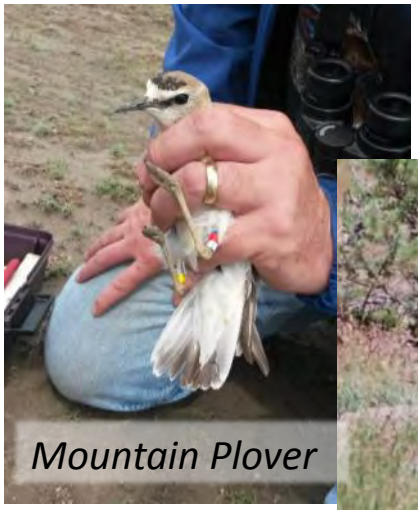
- 2015 – (aka, Year 0) Data Complete
  - Site and exclosure selection and establishment
  - Plant species richness, cover, and composition
  - Herbaceous biomass
  - Vegetation structure (visual obstruction)
  - Shrub cover, density, and browsing
  - Soils descriptions and stability
- Prepping for data collection in 2016 and 2017

TBRI Project 2:
Landscape management for multiple bird guilds

Bird Guilds in Thunder Basin

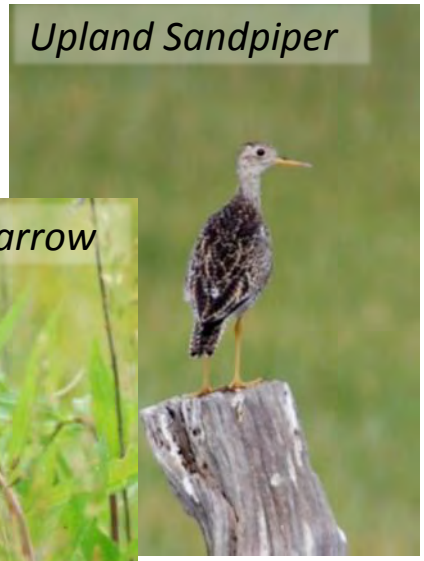
SAGEBRUSH

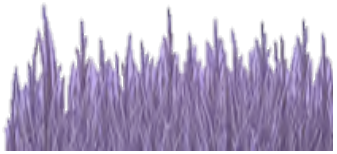
Not pictured: Sagebrush Sparrow



SHORTGRASS

Not pictured: McCown's Longspur



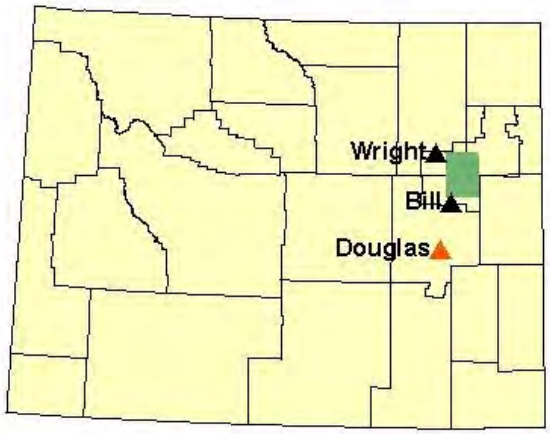


MIXED-GRASS

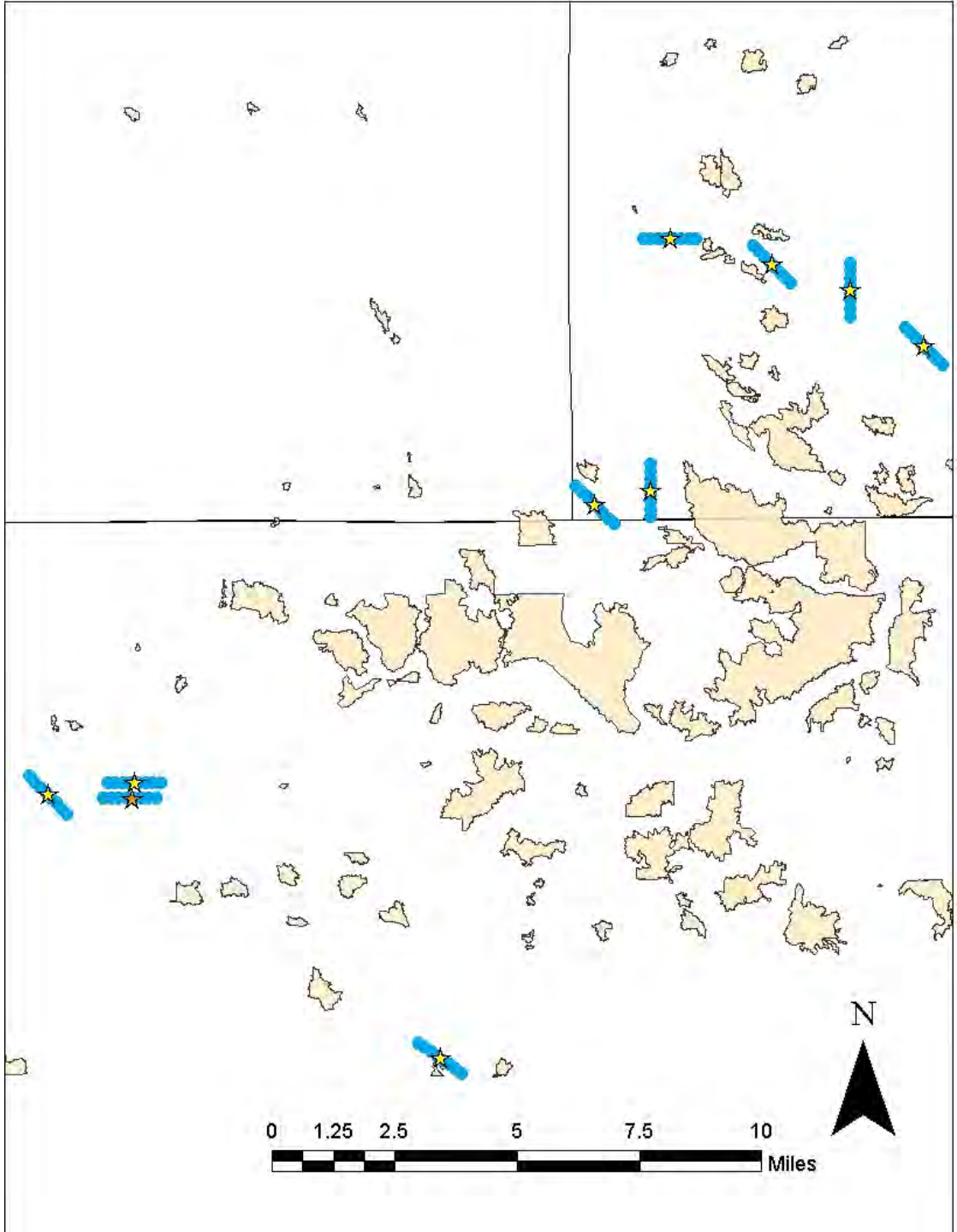
Research Questions

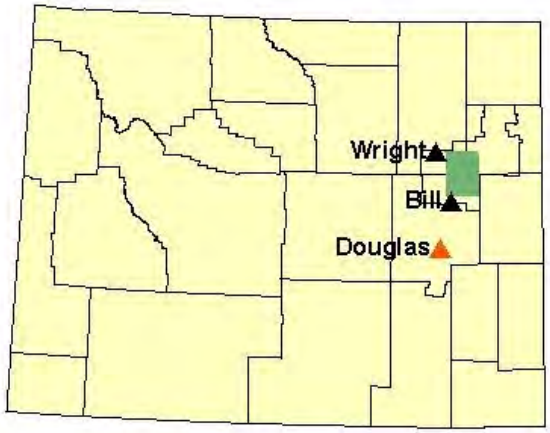
1) How do different birds respond to different types of **habitat patches**?

2) Is there an **optimal configuration** of habitat patches to maximize desirable habitat for all species?



- **10 transects on sage grouse leks**
  - ***8 points per transect***
- **10 transects** on prairie dog colonies
- **41 transects** along edges





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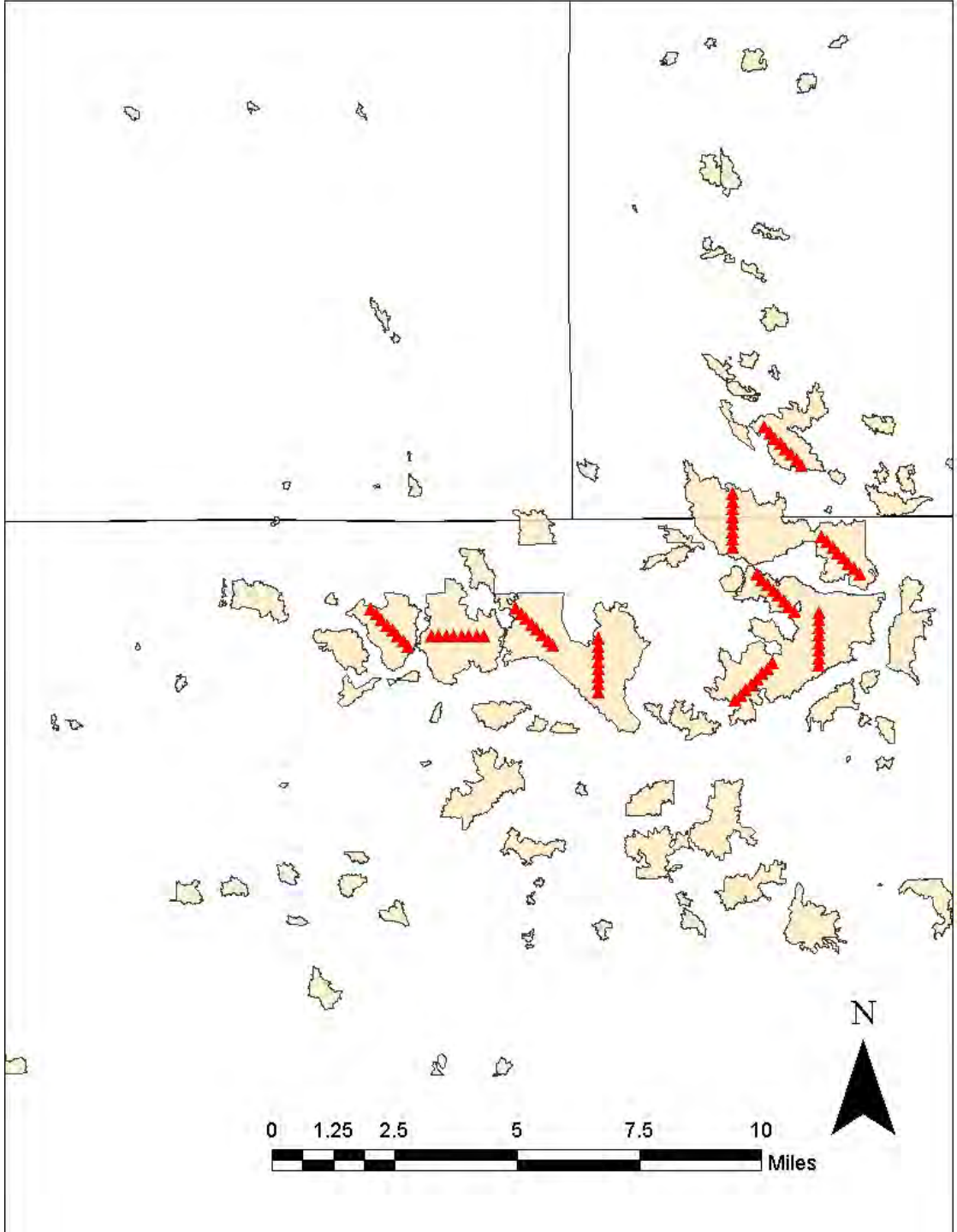

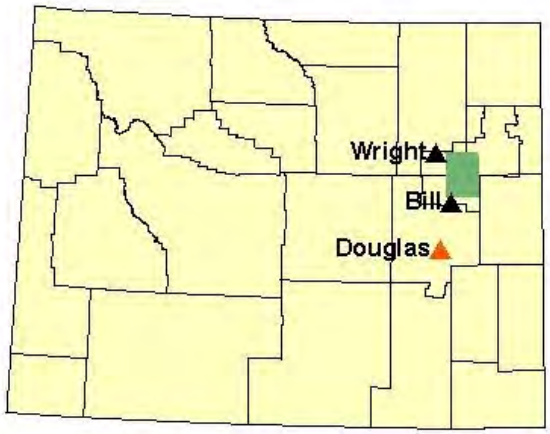

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- **10 transects** on prairie dog colonies
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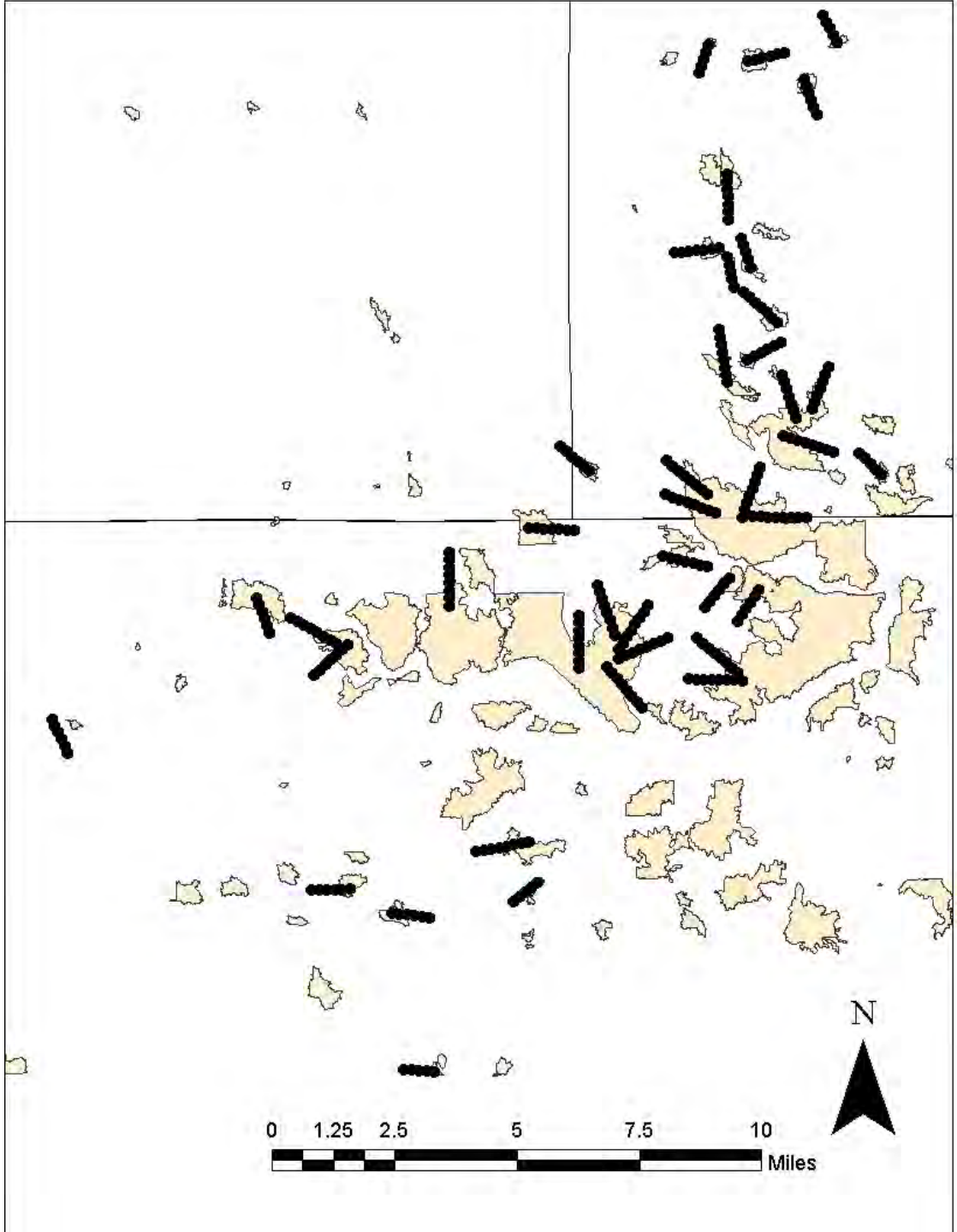
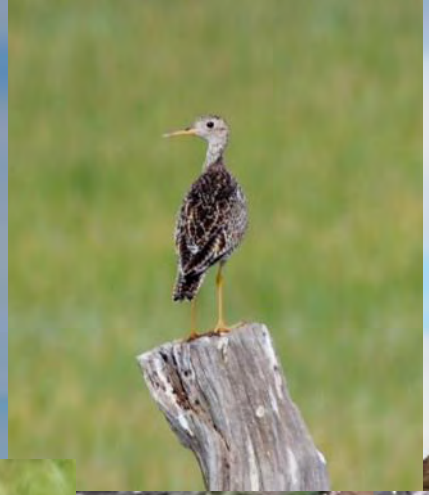
- **41 transects** across edges
  - 5-8 points per transect












Grassland/Sagebrush Bird Communities: Results

OVERALL:

Western meadowlarks, horned larks, and lark buntings most common species observed (~64% total observations)

PRAIRIE DOG COLONY TRANSECTS:

horned larks (48% of observations), meadowlarks (17% observations) and mountain plovers (8% of observations)

-Over 100 mountain plover observations

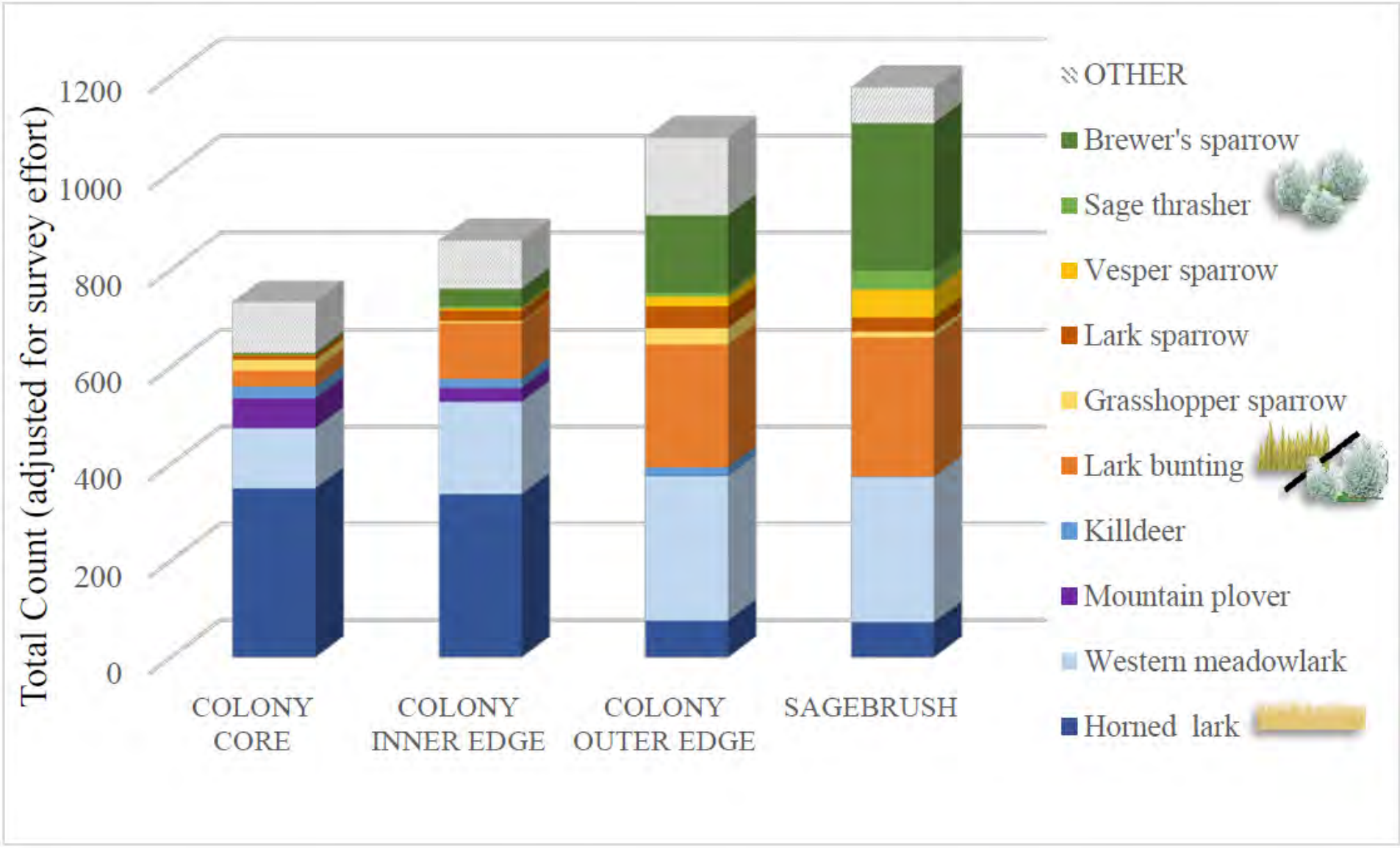
- 79% observed on colonies >320 ha

LEK TRANSECTS:

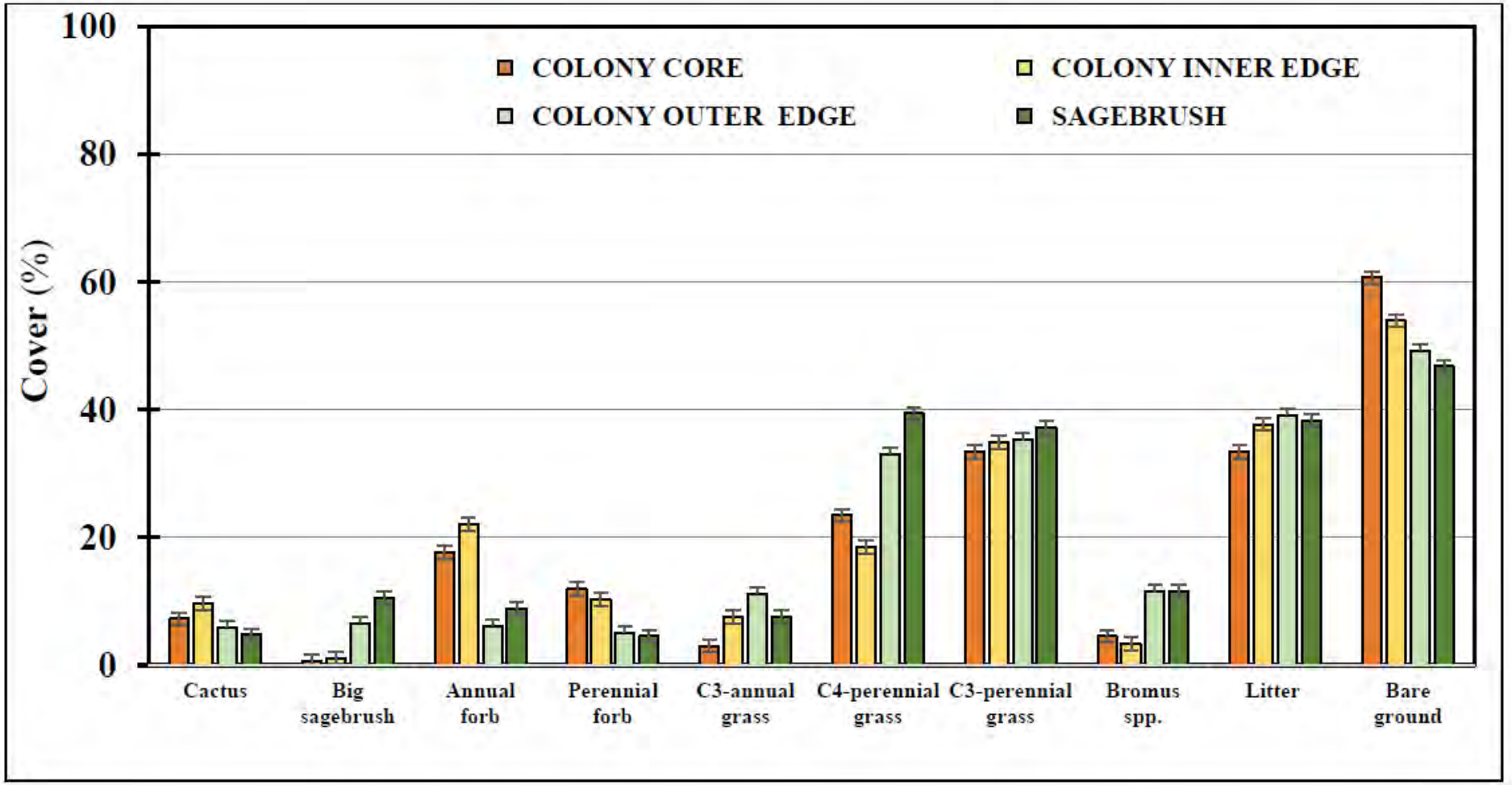
Brewer's sparrows (26%), meadowlarks (25%) and lark buntings (24%) were most common

-Sage thrashers were less common, but recorded 64 observations

Species Observations Corrected for Survey Effort



Vegetation cover inside and outside of prairie dog towns



Grassland/Sagebrush Bird Communities: Next Steps

- Collect point count and vegetation data 2016-2017
- Analyze effects of local and landscape variables on single species and multi-species abundance
- Combine results from analyses to determine “ideal” configuration of habitat patches to manage for multiple guilds

TBGPEA-ARS crew objectives: 2016 field season

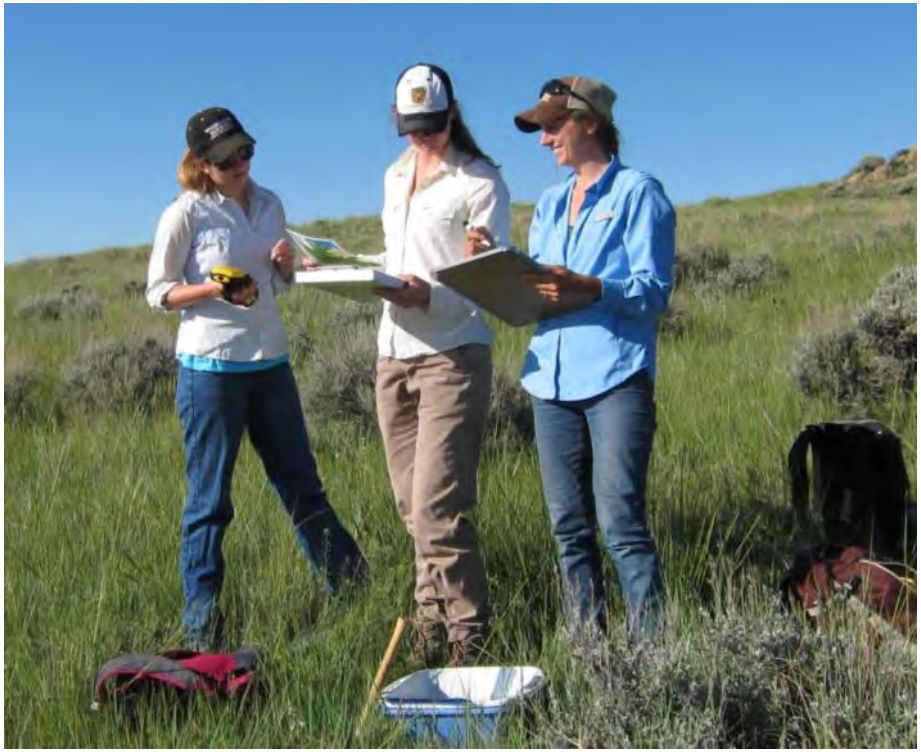
1. **Impacts of long-term rest on plant communities**: sample inside and outside of historical cattle exclosures maintained by USFS and TBGPEA.

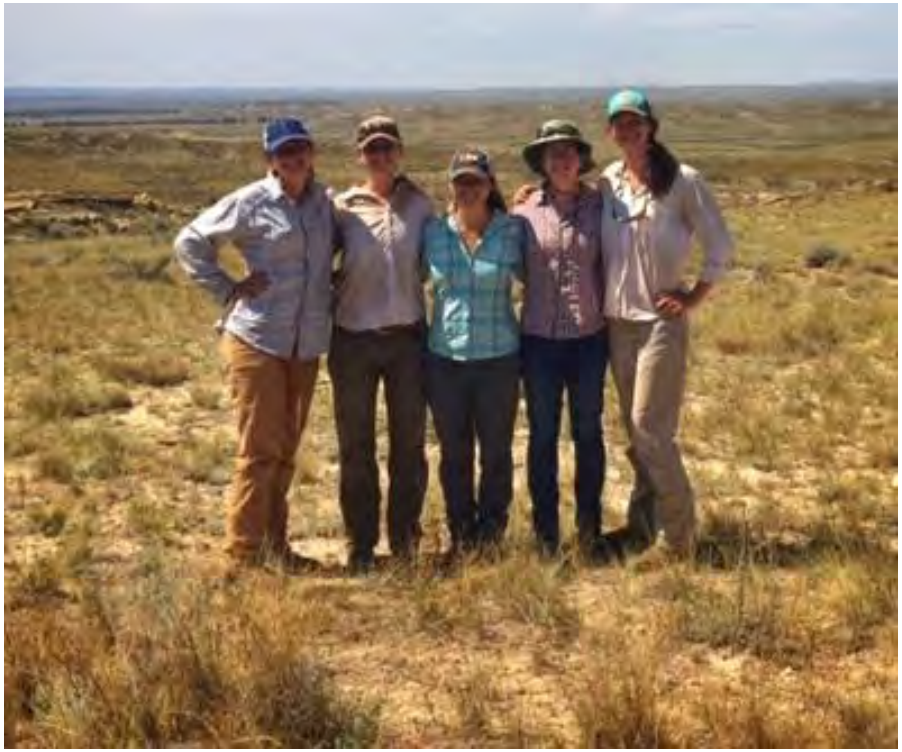
2. **Impacts of wildfire on songbirds**: sample songbirds inside and outside of historical wildfires.

3. Assist with data collection for **ongoing projects**, including TBGPEA vegetation transects, nested exclosure project, and overlapping bird habitats project.

Many thanks to:

- **TBGPEA and local landowners**
- **Co-authors:** Derek Scasta, Courtney Duchardt, Lauren Connell, David Augustine, Jeff Beck
- **Field Crew:** Skye Greenler, Katie Surak, Sarah Newton, Lara Grevstad, Megan Gordon, Lauren Connell, Nick Dufek, Kevin Mueller
- **Sampling designs:** Billy Armstrong
- **Collaborators:** USDA-ARS, UWyo, USFS





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