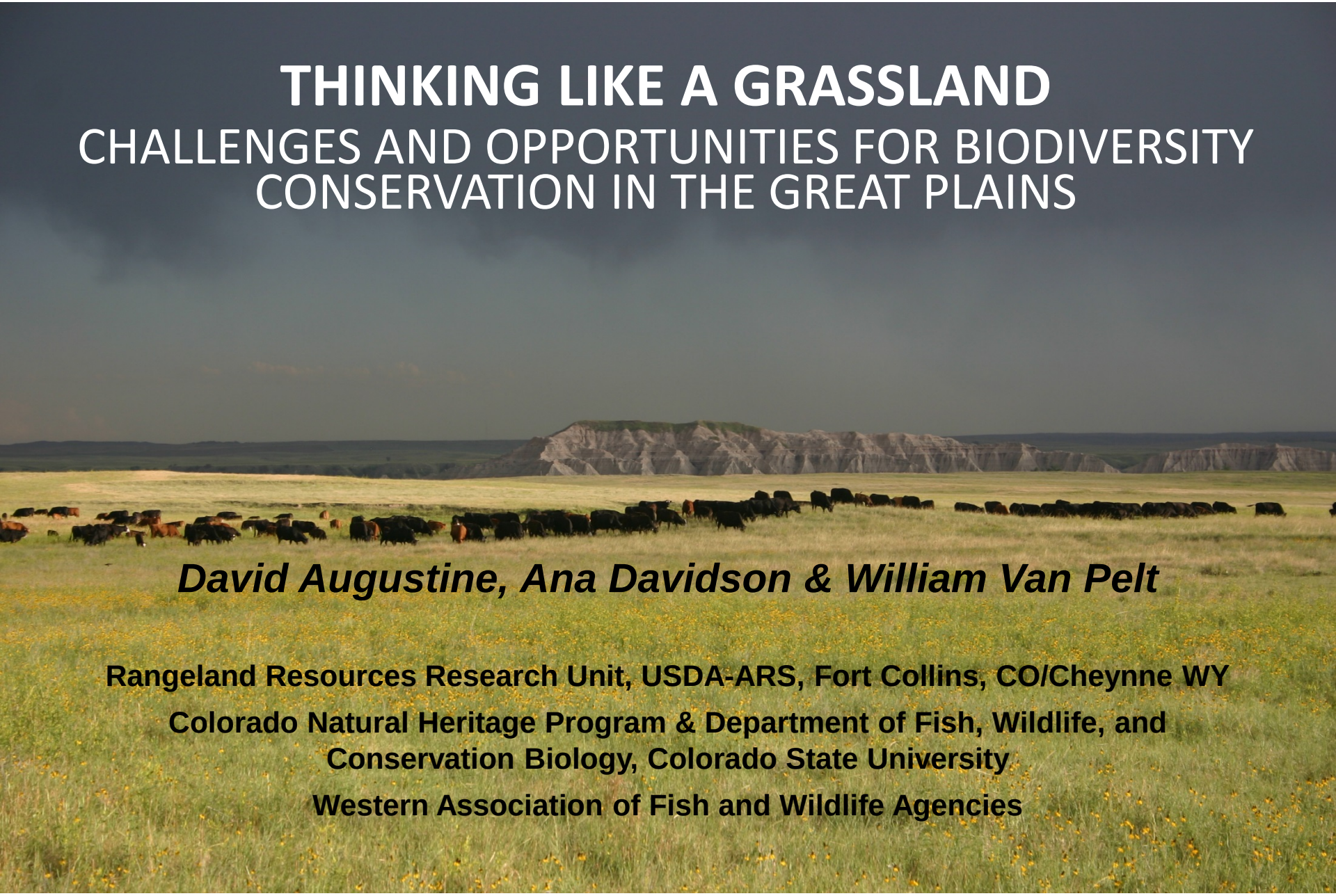


THINKING LIKE A GRASSLAND

CHALLENGES AND OPPORTUNITIES FOR BIODIVERSITY CONSERVATION IN THE GREAT PLAINS

David Augustine, Ana Davidson & William Van Pelt

Rangeland Resources Research Unit, USDA-ARS, Fort Collins, CO/Cheynne WY

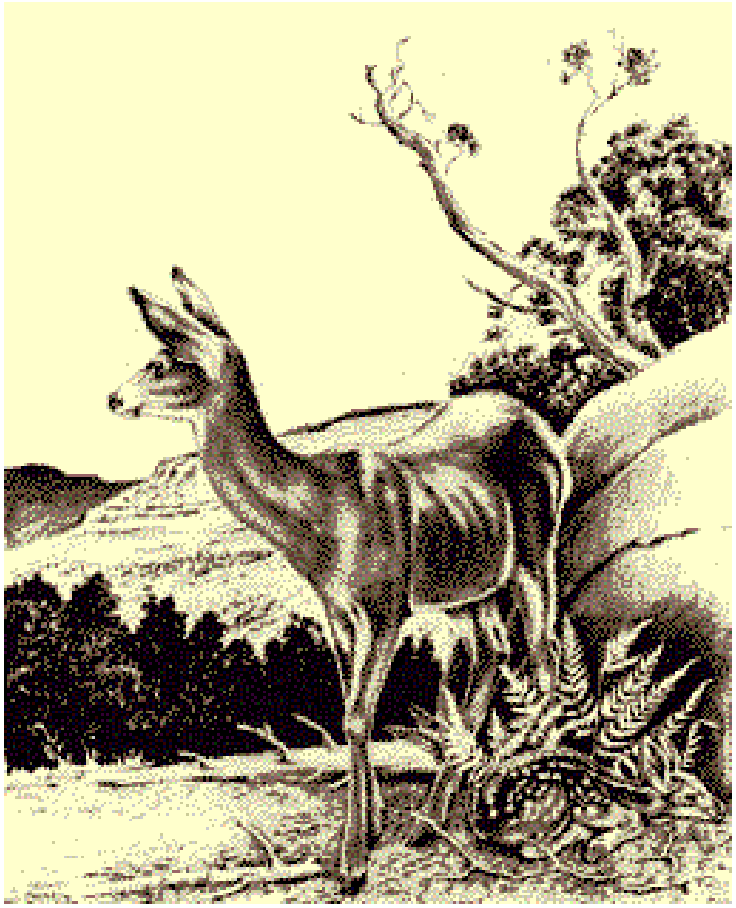
Colorado Natural Heritage Program & Department of Fish, Wildlife, and Conservation Biology, Colorado State University

Western Association of Fish and Wildlife Agencies

Thinking Like a Mountain

Aldo Leopold (A Sand County Almanac, 1949)

I have lived to see state after state extirpate its wolves. I have watched the face of many a newly wolfless mountain, and seen the south-facing slopes wrinkle with a maze of new deer trails… I now suspect that just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer.



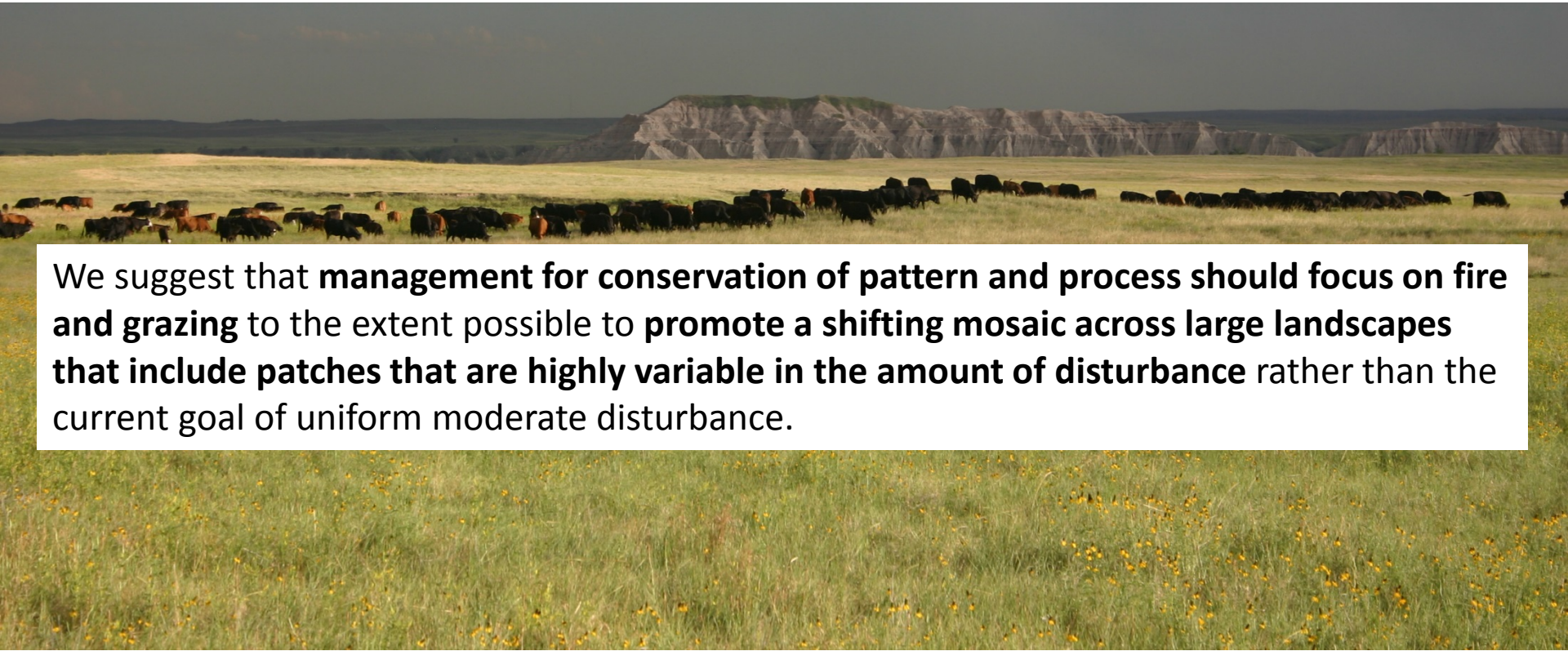
THINKING LIKE A GRASSLAND

Grasslands live in mortal fear of losing ecological processes that sustain grass dominance

Conservation of Pattern and Process: Developing an Alternative Paradigm of Rangeland Management

Samuel D. Fuhlendorf,[1] David M. Engle,[2,3] R. Dwayne Elmore,[4] Ryan F. Limb,[5] and Terrence G. Bidwell[2]

Authors are [1]Sarkeys Distinguished Professor, [2]Professor, and [4]Assistant Professor, Department of Natural Resource Ecology and Management, and [3]Director, Water Research and Extension Center, Oklahoma State University, Stillwater, OK 74078, USA; and [5]Assistant Professor, Eastern Oregon Agricultural Research Center and Department of Rangeland Ecology and Management, Oregon State University, La Grande, OR 97850, USA.



We suggest that **management for conservation of pattern and process should focus on fire and grazing** to the extent possible to **promote a shifting mosaic across large landscapes that include patches that are highly variable in the amount of disturbance** rather than the current goal of uniform moderate disturbance.

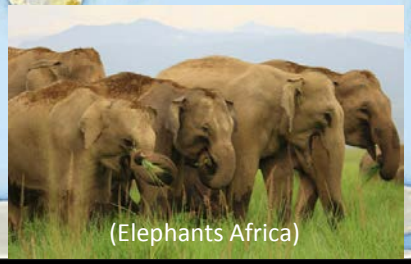
Grasslands are influenced by **2** key functional groups of mammalian herbivores:


(Bison, North America)


(Mongolian Wild Horse, Asia)

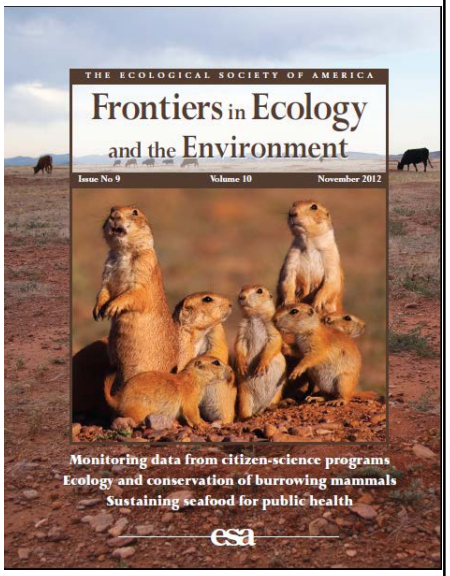

(Red Kangaroo, Australia)


(Guanaco, South America)


(Elephants Africa)

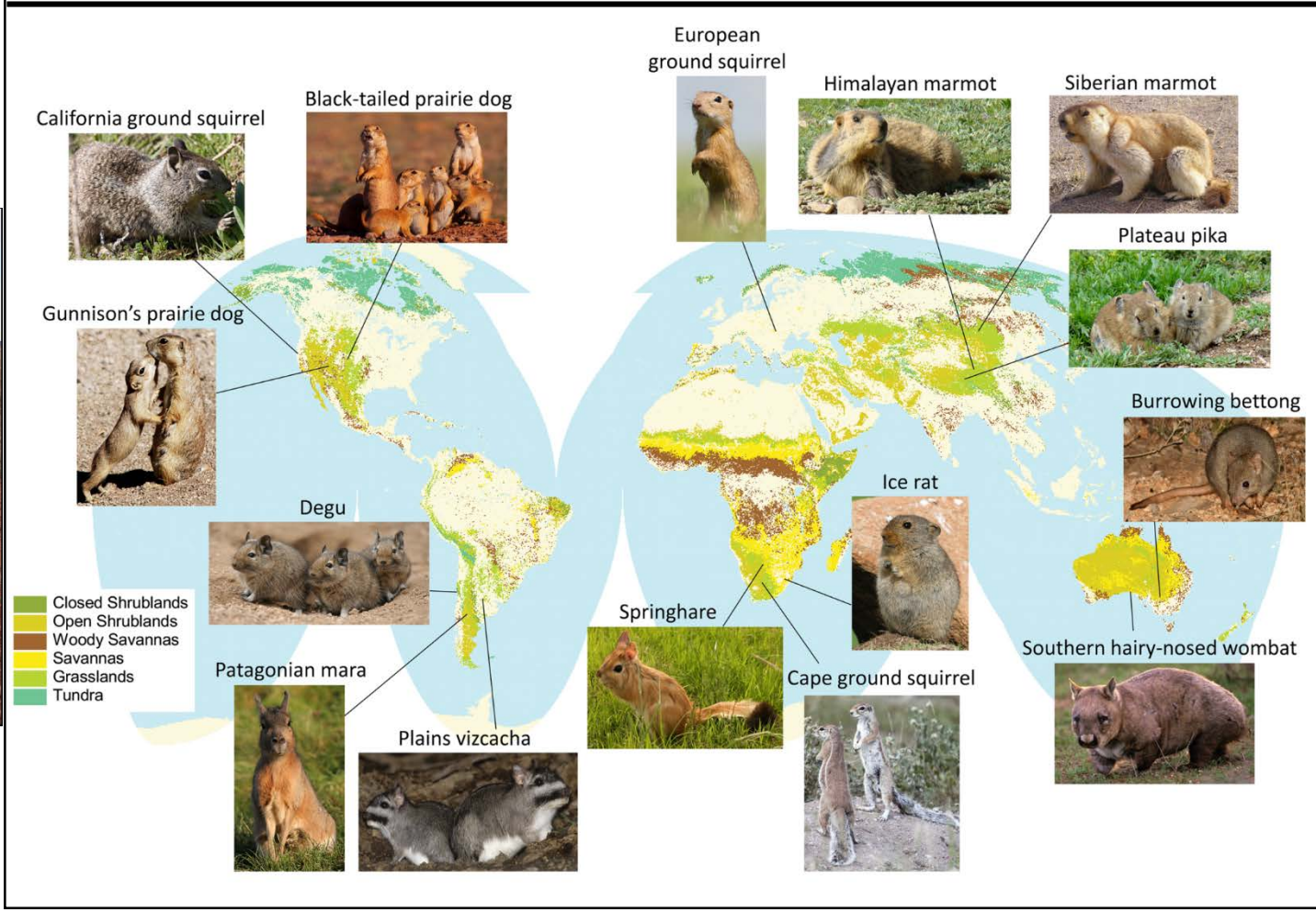
Davidson et al., 2012, *Frontiers*

Grasslands are influenced by **2** key functional groups of mammalian herbivores:

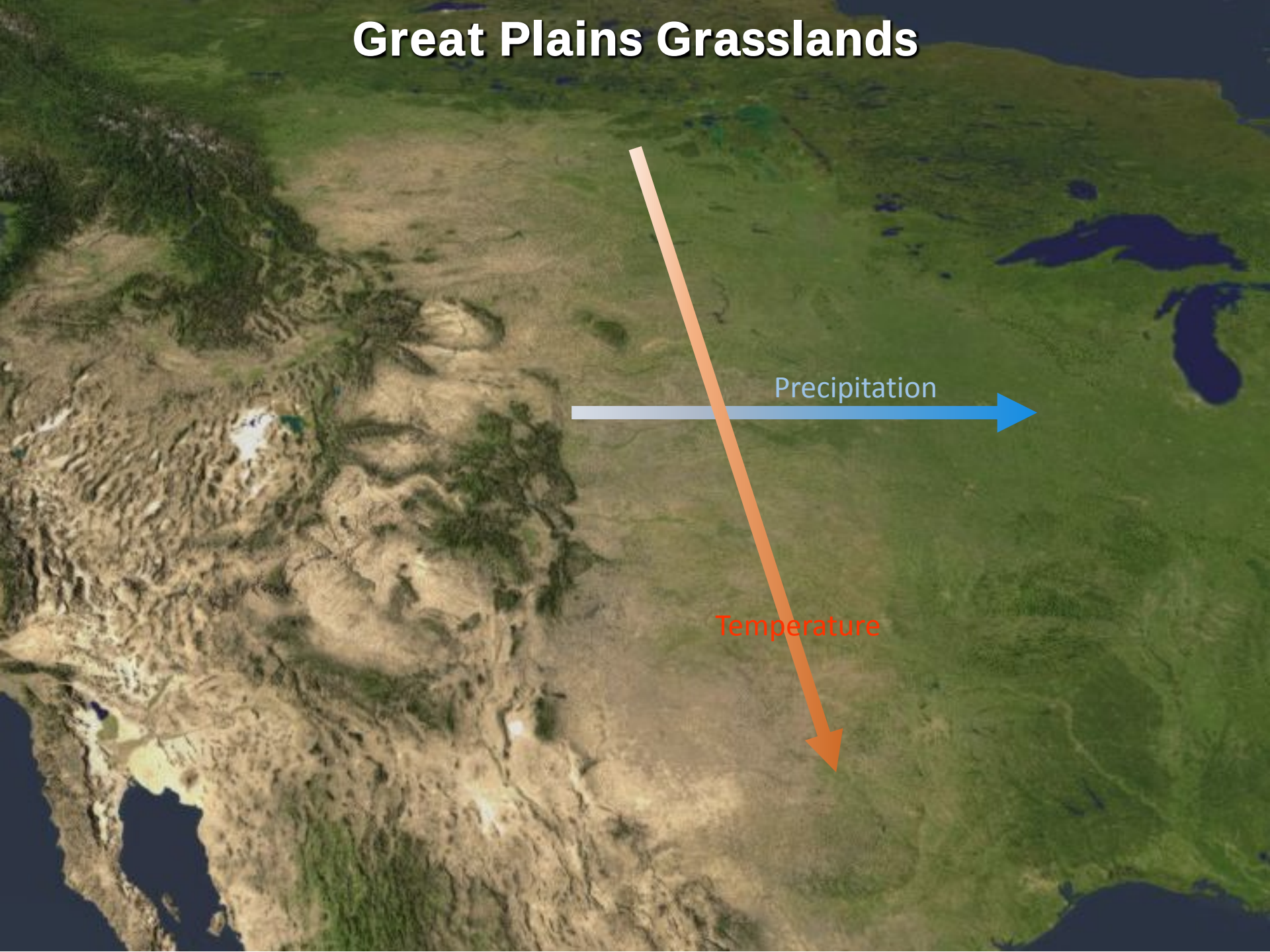


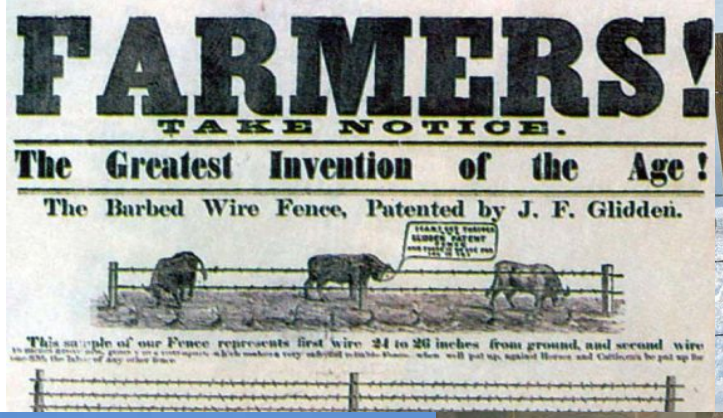
Ecological roles and conservation challenges of social, burrowing, herbivorous mammals in the world's grasslands

Ana D Davidson[1,2*], James K Detling[3], and James H Brown[1]



Great Plains Grasslands

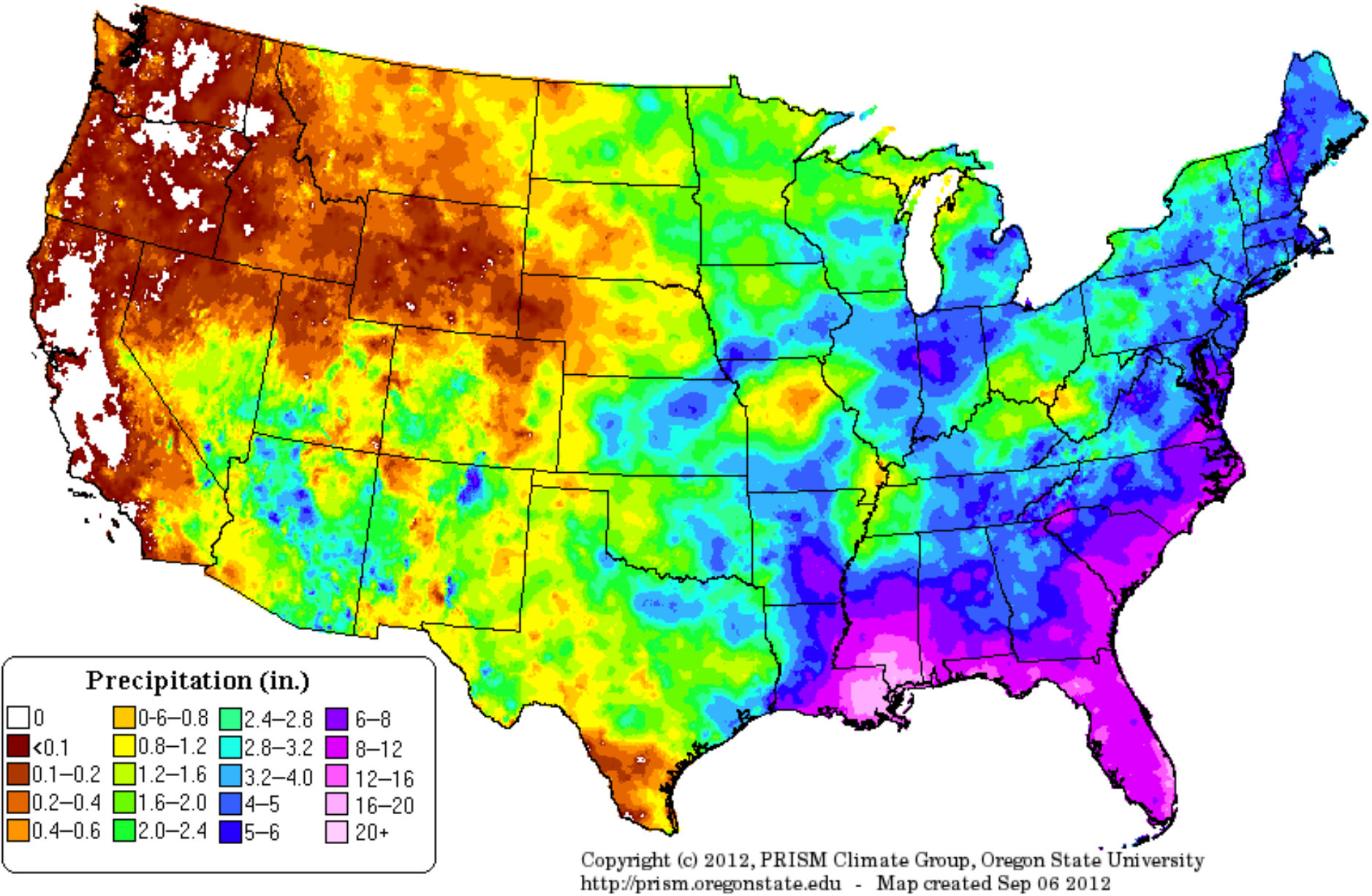



FARMERS!
TAKE NOTICE.
The Greatest Invention of the Age!
The Barbed Wire Fence, Patented by J. F. Glidden.
This sample of our Fence represents first wire 24 to 26 inches from ground, and second wire


For Sale
2 ACRE PARCELS
HERITAGE HOUSE
218·6040

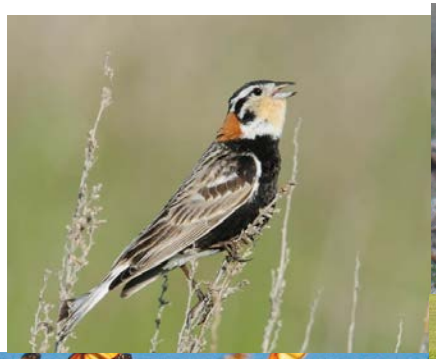
Precipitation: Aug 2012

Provisional Data



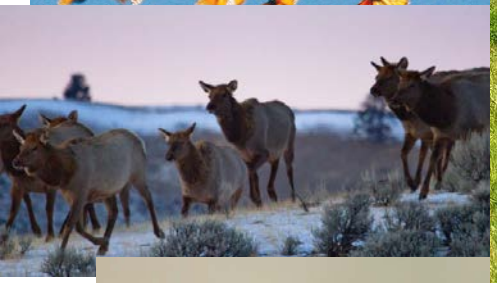
http://prism.oregonstate.edu - Map created Sep 06 2012

Migration and Mobility in Great Plains Biodiversity

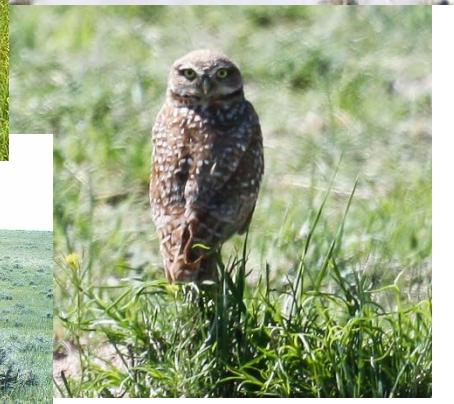










HAWK WATCH INTERNATIONAL

Conserving Raptors and Our Shared Environment

All data are preliminary
Map by: Jesse Watson

Breeding Range
Wintering Range
Fall Migration

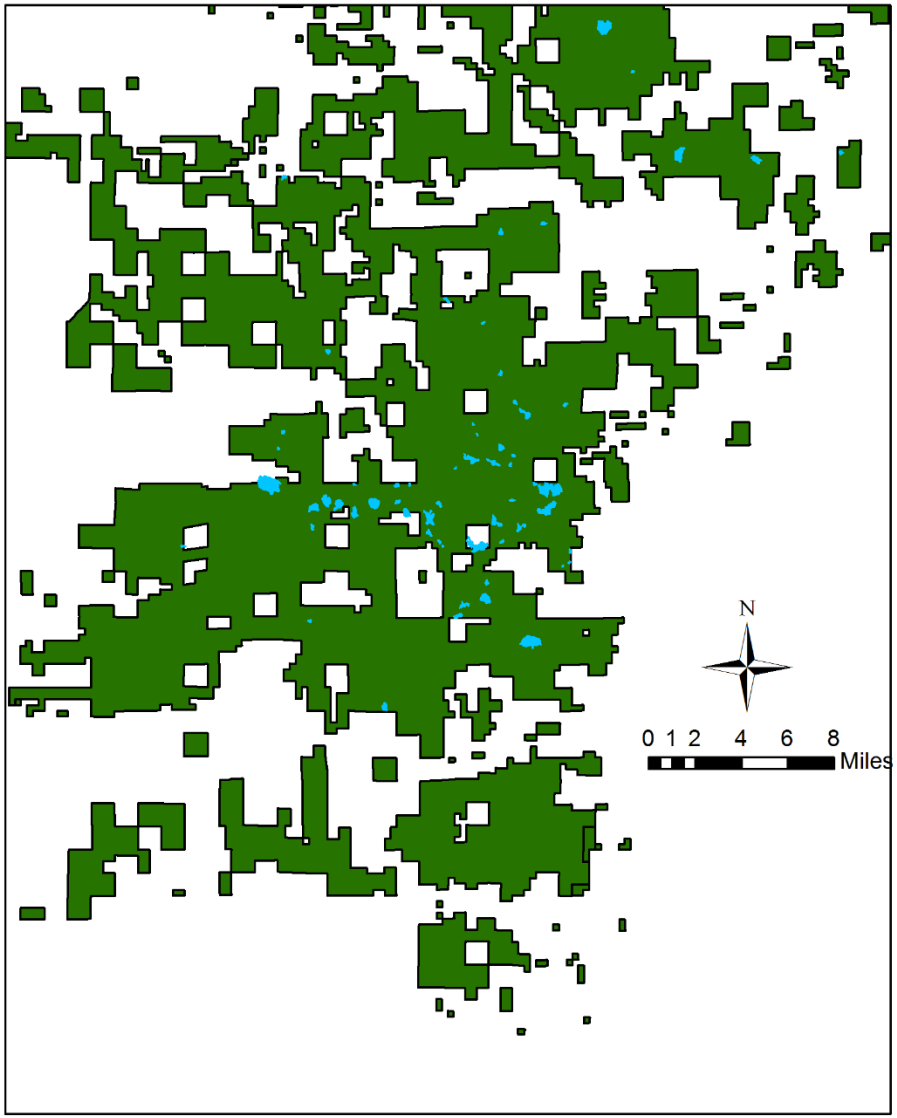
N
0 90 180 360 540
km

Even non-migratory species depend on conservation and management at large spatial scales

Prairie dog colony dynamics in relation to landownership patterns:

Thunder Basin National Grassland, WY

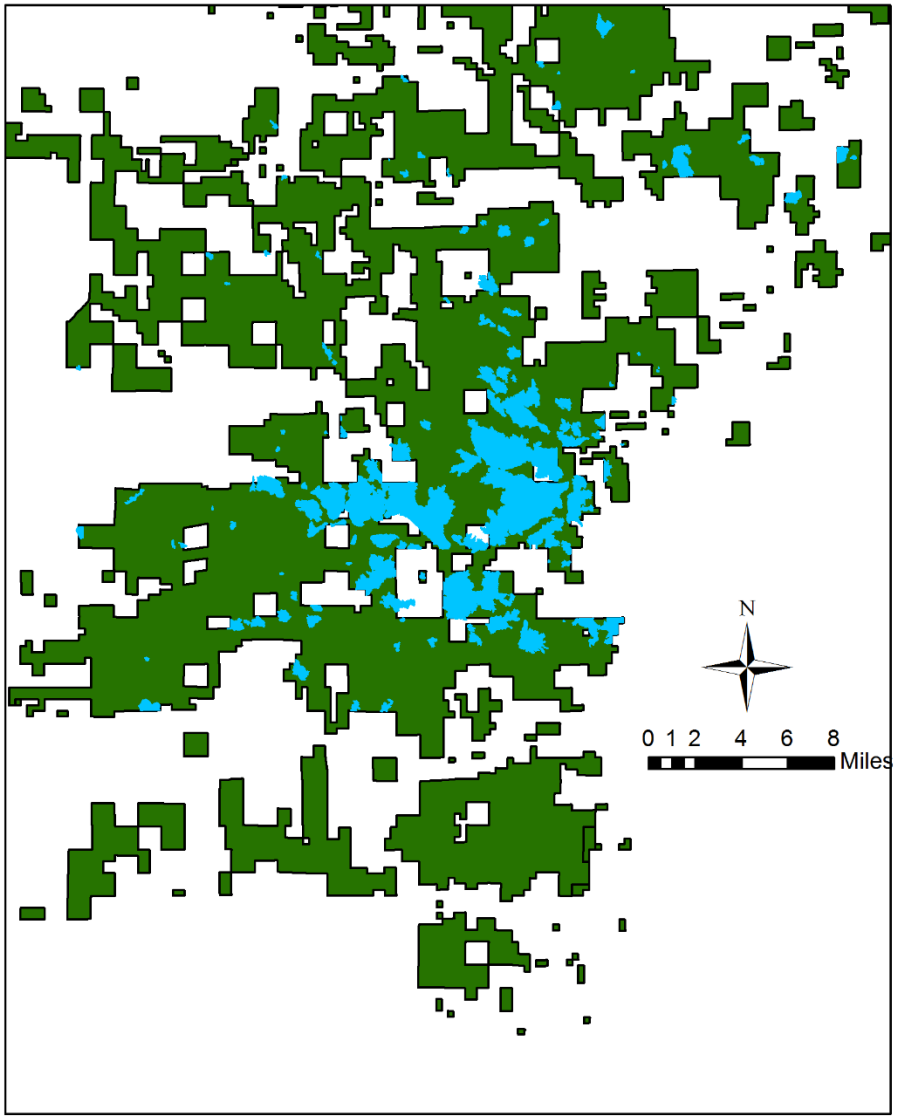
2007



Prairie dog colony dynamics in relation to landownership patterns:

Thunder Basin National Grassland, WY

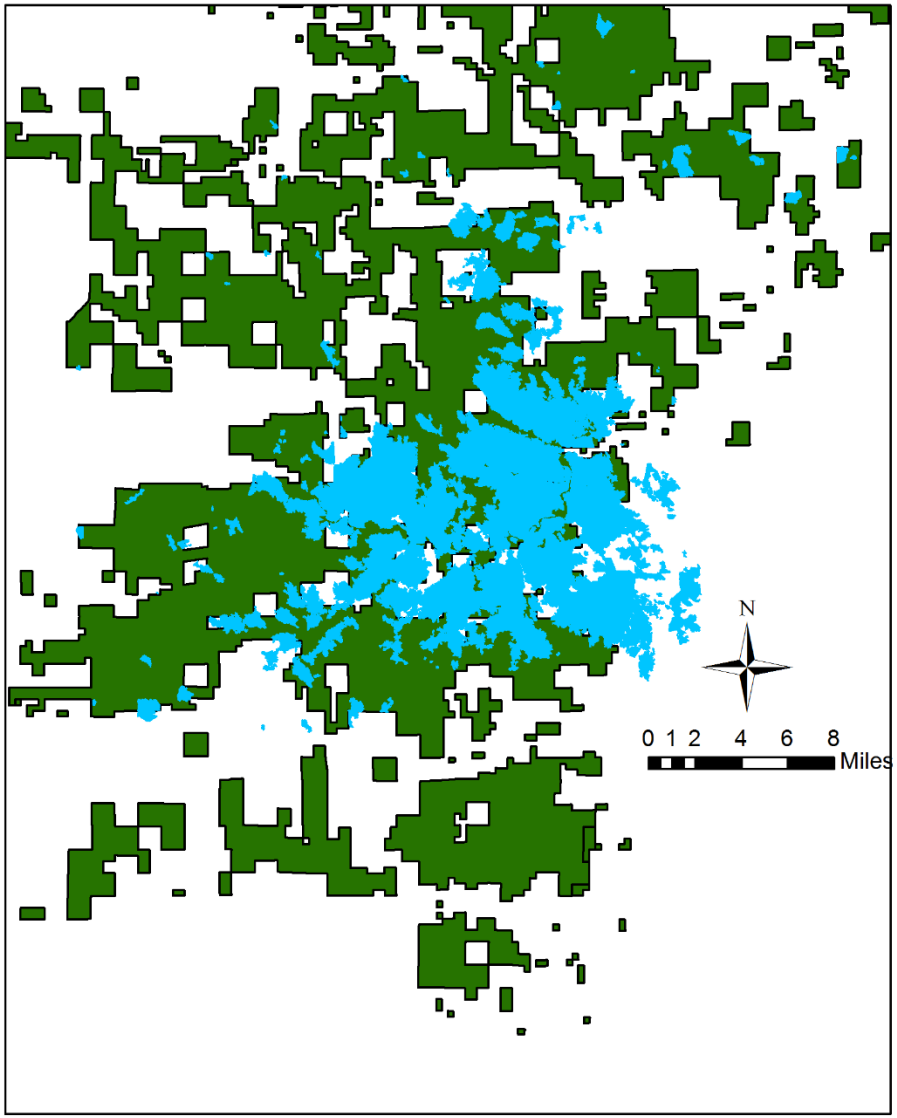
2014-15



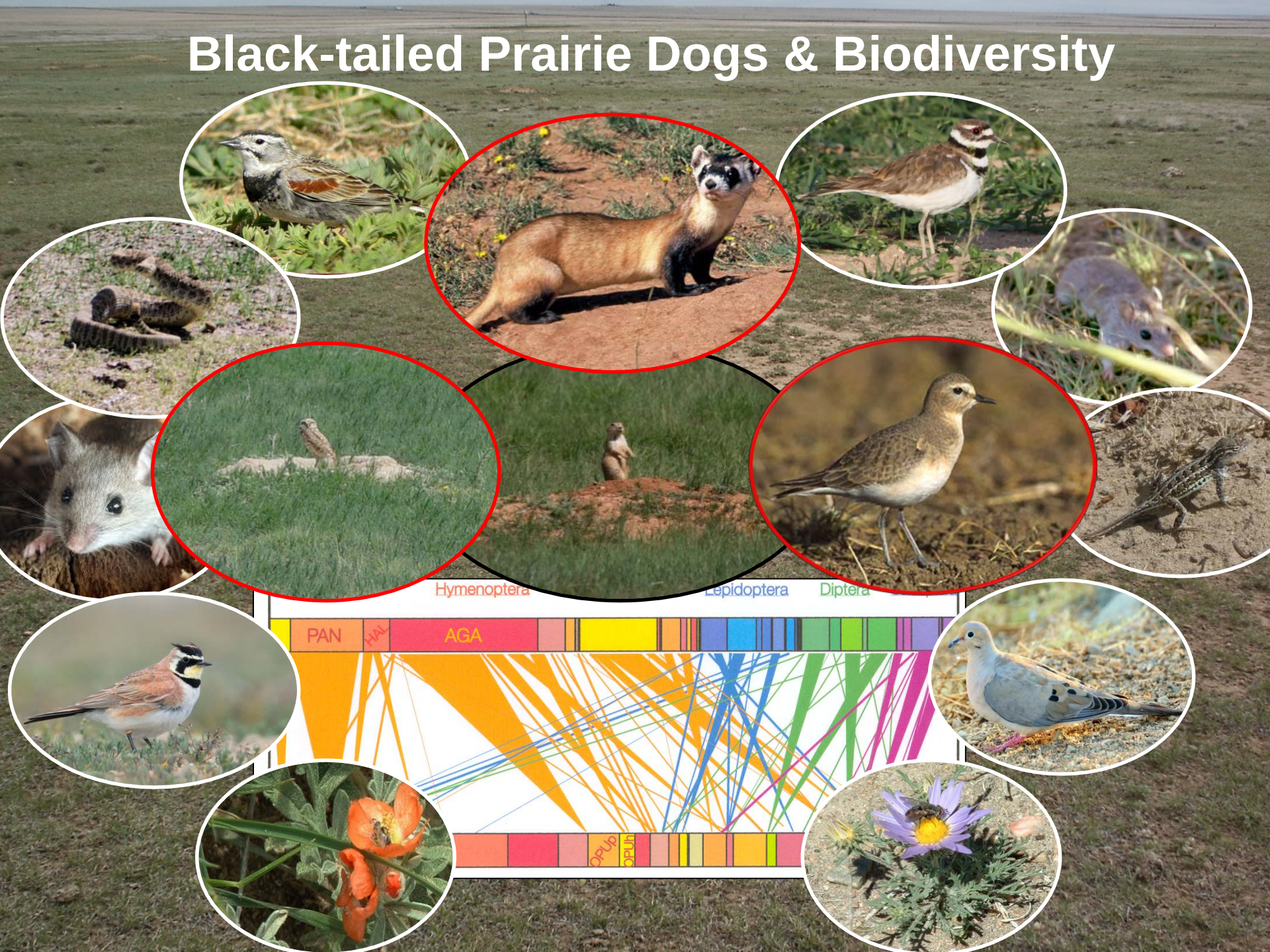
Prairie dog colony dynamics in relation to landownership patterns:

Thunder Basin National Grassland, WY

2016-17



Black-tailed Prairie Dogs & Biodiversity



Large Landscapes and Metapopulation Dynamics

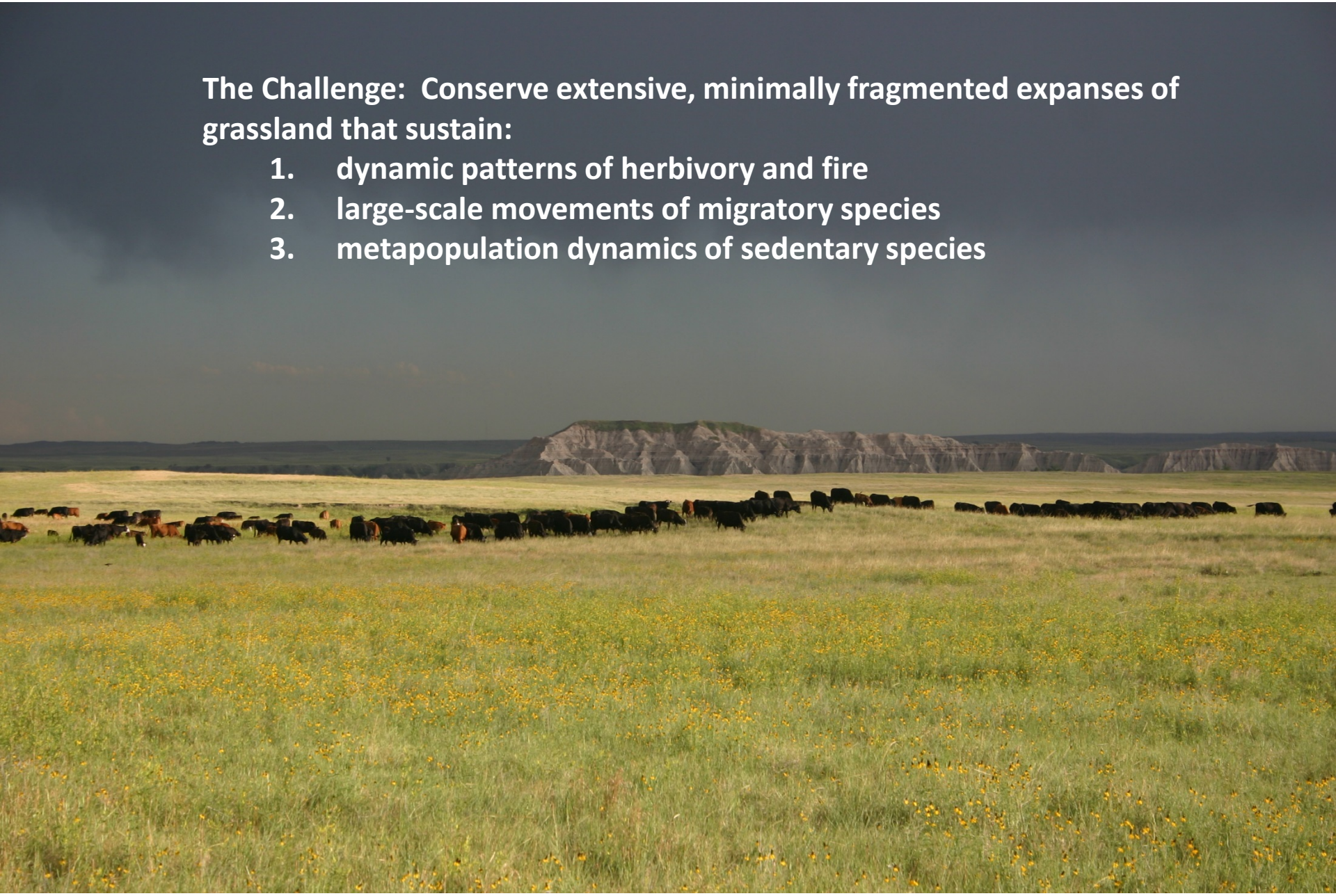
Original research article

Landscape composition creates a threshold influencing Lesser Prairie-Chicken population resilience to extreme drought

Beth E. Ross [a,b,*], David A. Haukos [c], Christian A. Hagen [d], James C. Pitman [e]

[a] Division of Biology, Kansas State University, Manhattan, KS, 66506, USA
[b] U.S. Geological Survey, South Carolina Cooperative Fish and Wildlife Research Unit, Clemson, SC, 29634, USA
[c] U.S. Geological Survey, Kansas Cooperative Fish and Wildlife Research Unit, Manhattan, KS, 66506, USA
[d] Oregon State University, 500 SW Bond St., Ste 107, Bend, OR, 97702, USA
[e] Western Association of Fish and Wildlife Agencies, Emporia, KS, 66801, USA

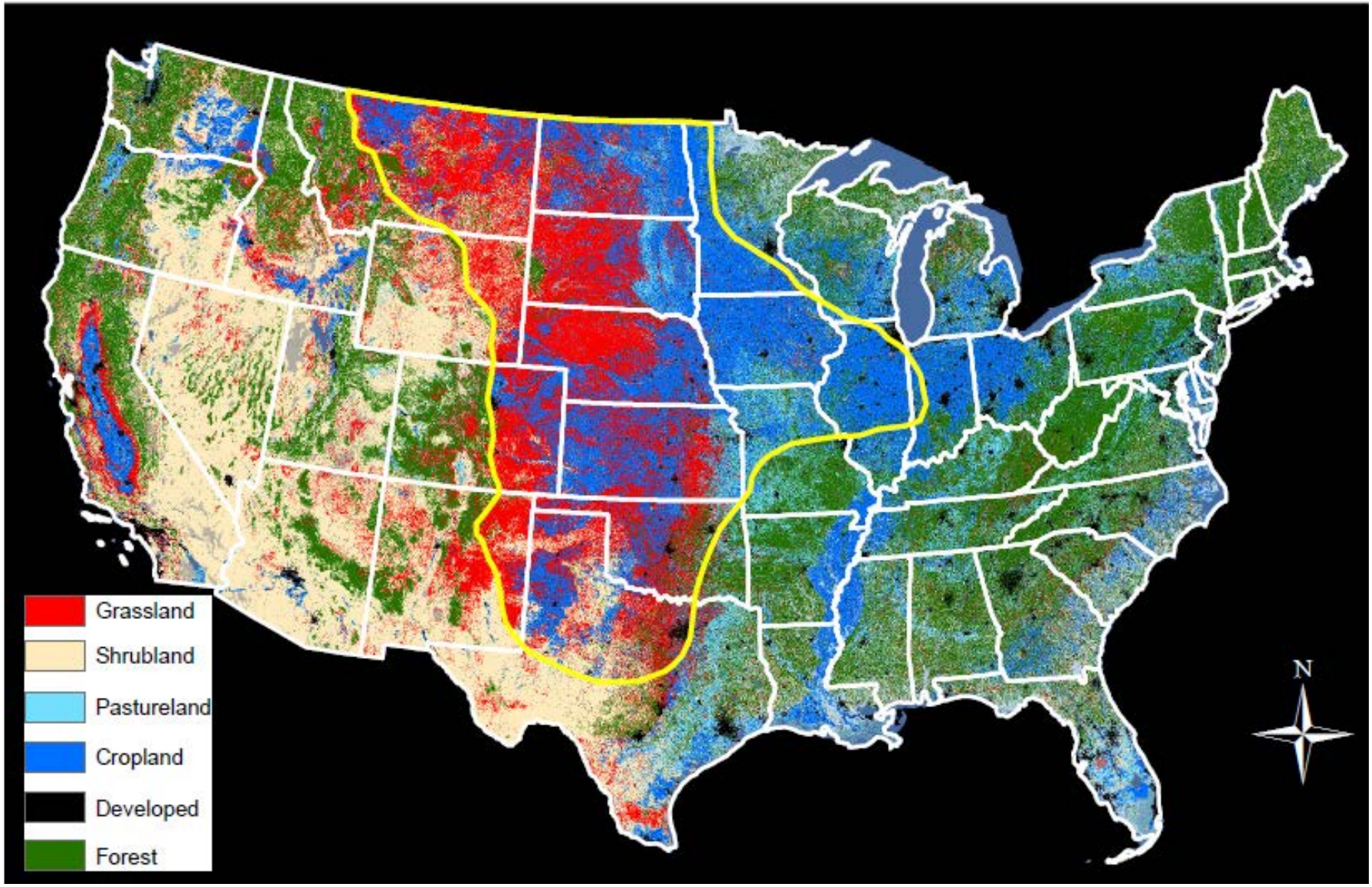
- *A threshold exists for Lesser Prairie-Chickens in response to the gradient of cropland:grassland land cover … [LPC] declined in response to more cropland after the threshold (**9.6% cropland**). Preservation of intact grasslands and continued implementation of initiatives to revert cropland to grassland should increase Lesser Prairie-Chicken resilience to extreme drought events due to climate change.*



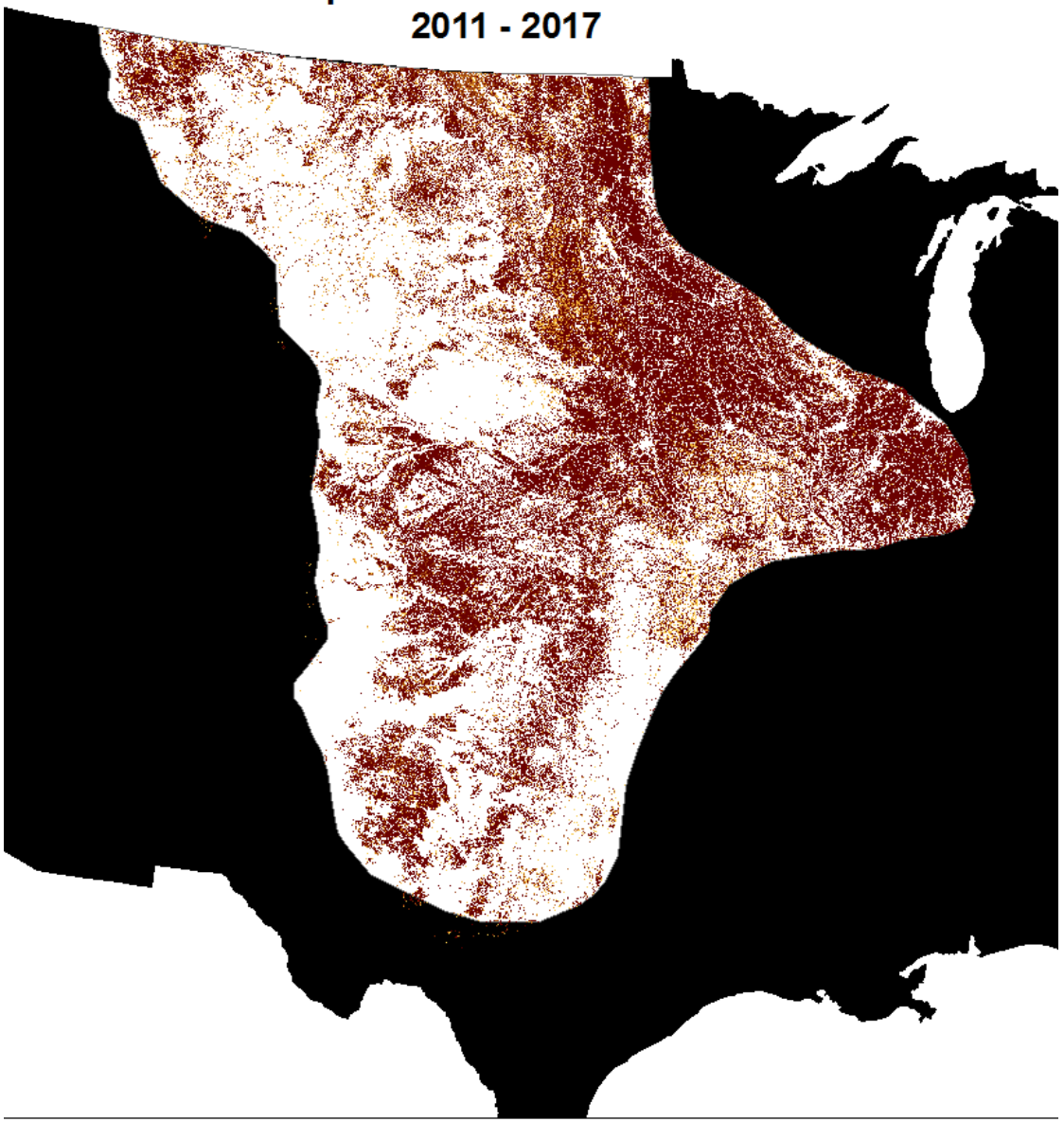
The Challenge: Conserve extensive, minimally fragmented expanses of grassland that sustain:

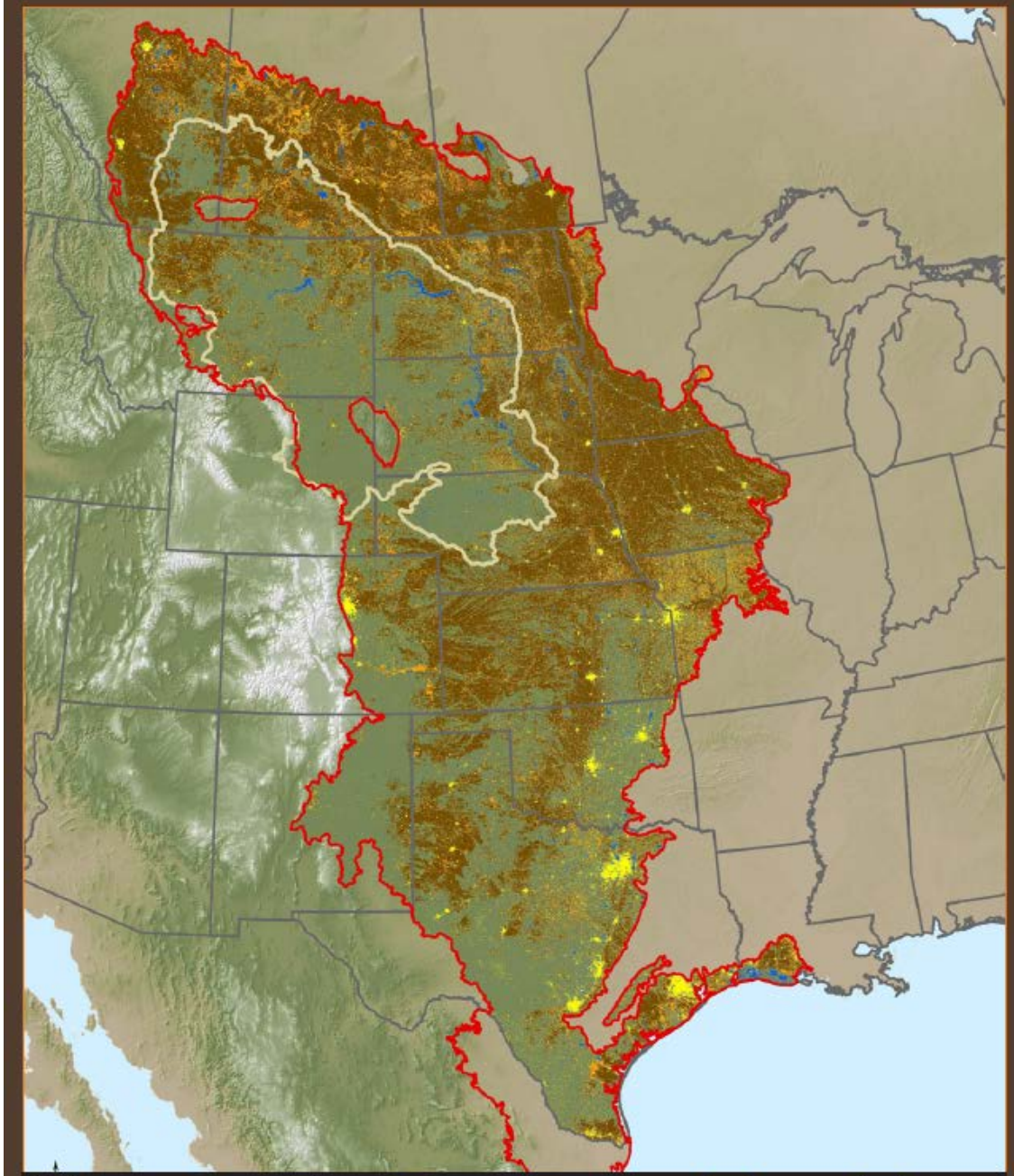
1. **dynamic patterns of herbivory and fire**
2. **large-scale movements of migratory species**
3. **metapopulation dynamics of sedentary species**

National Land Cover Database, 2011



Cropland in the Great Plains
2011 - 2017





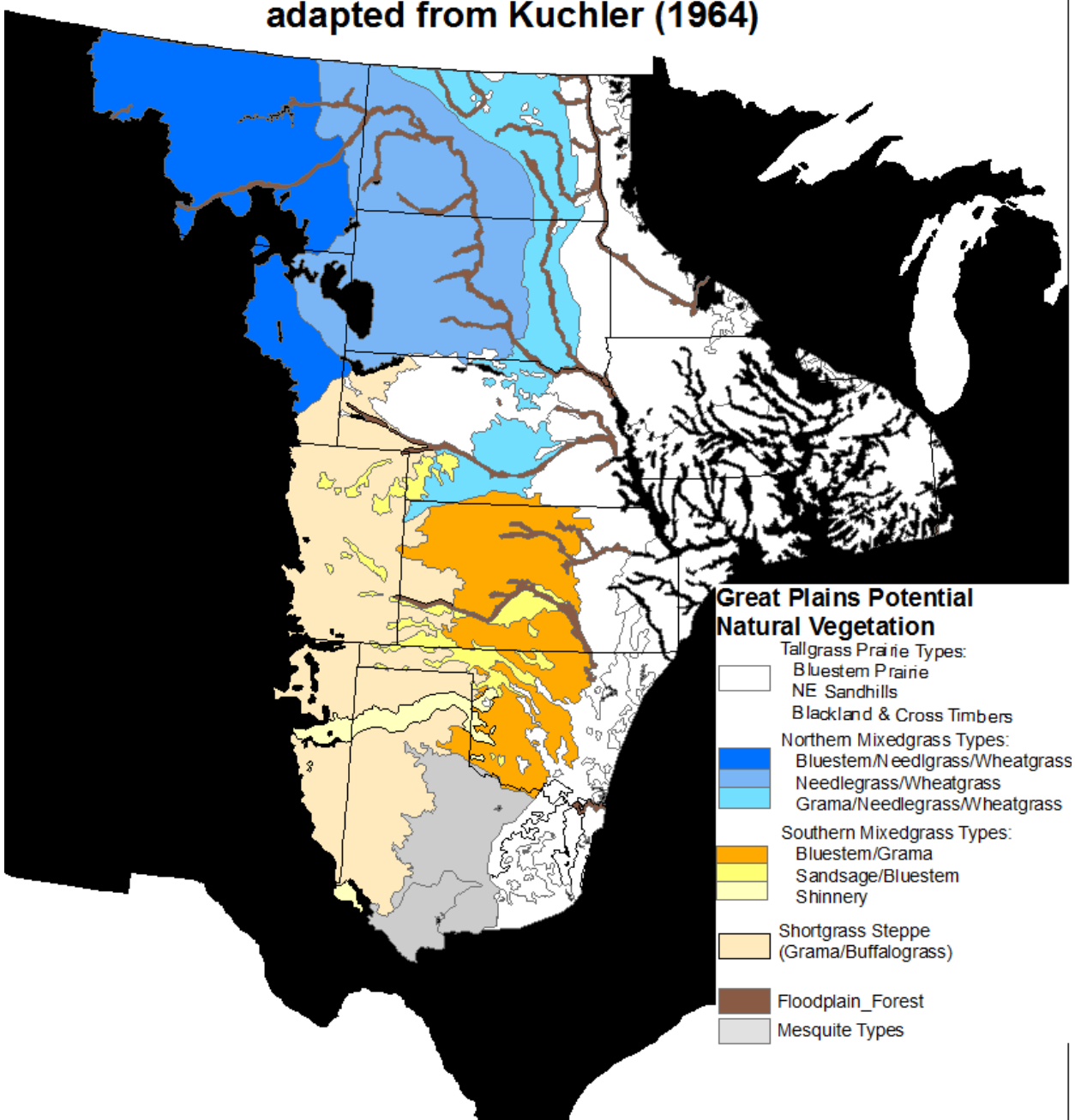
Map of intact grasslands, Plowprint (lands that have been planted to crops beginning in 2009) and the new addition to the Plowprint in 2016 (lands that were plowed in 2016) in the Great Plains[4].

WWF

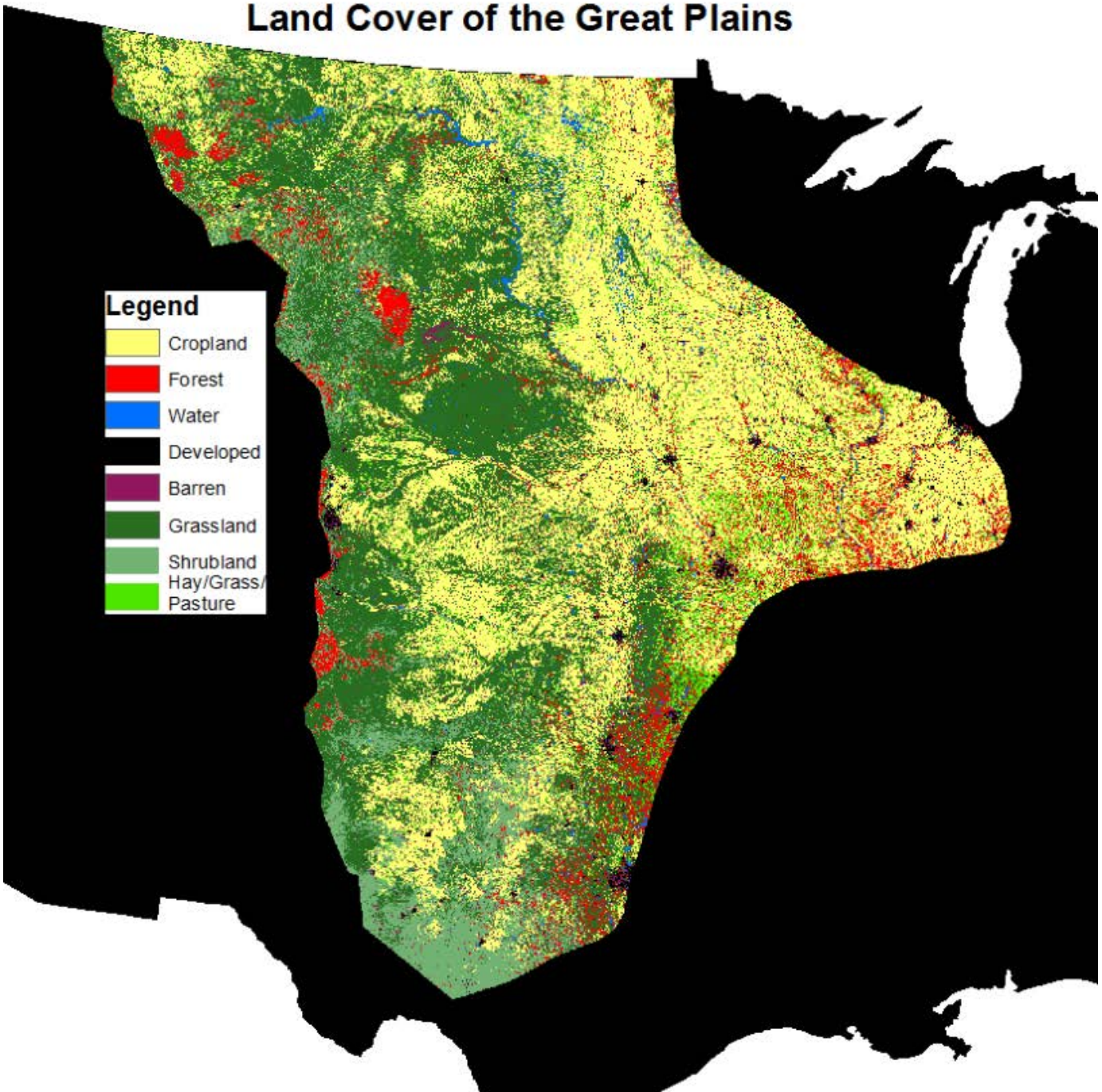
2017

PLOWPRINT

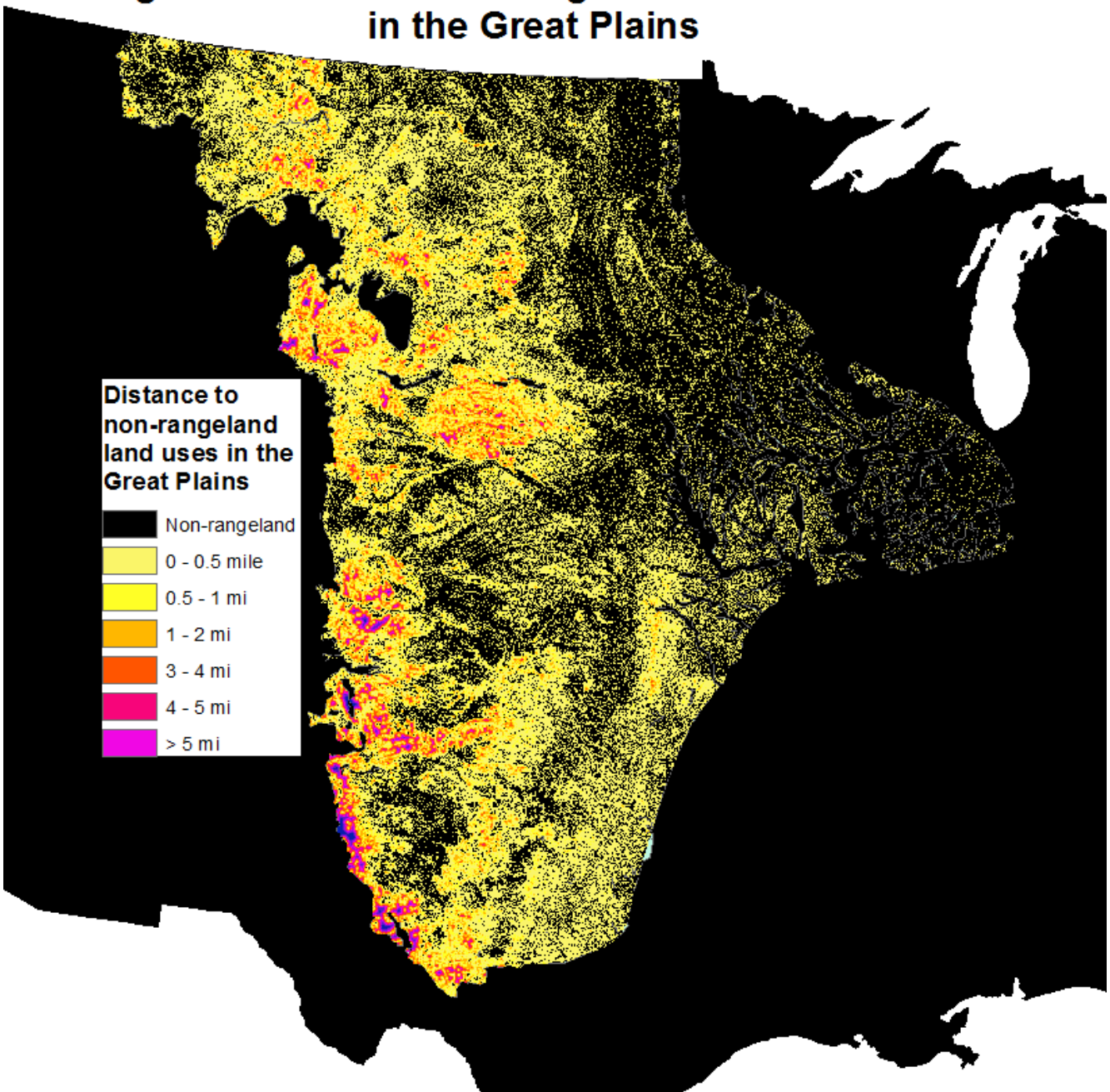
Potential Natural Vegetation Types of the Great Plains
adapted from Kuchler (1964)



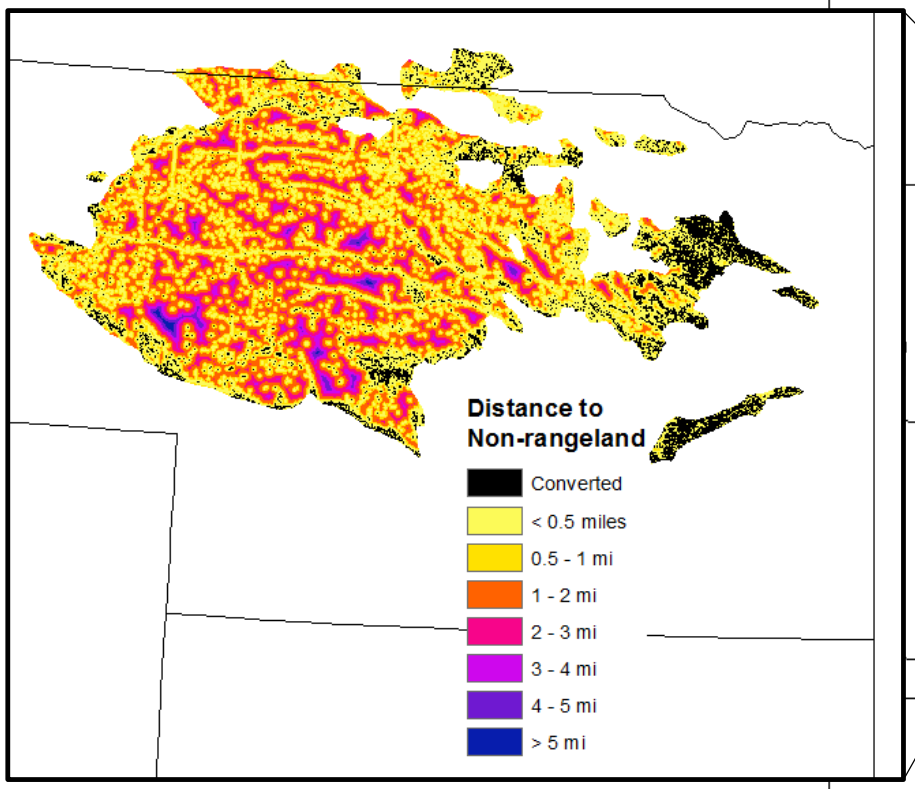
Land Cover of the Great Plains

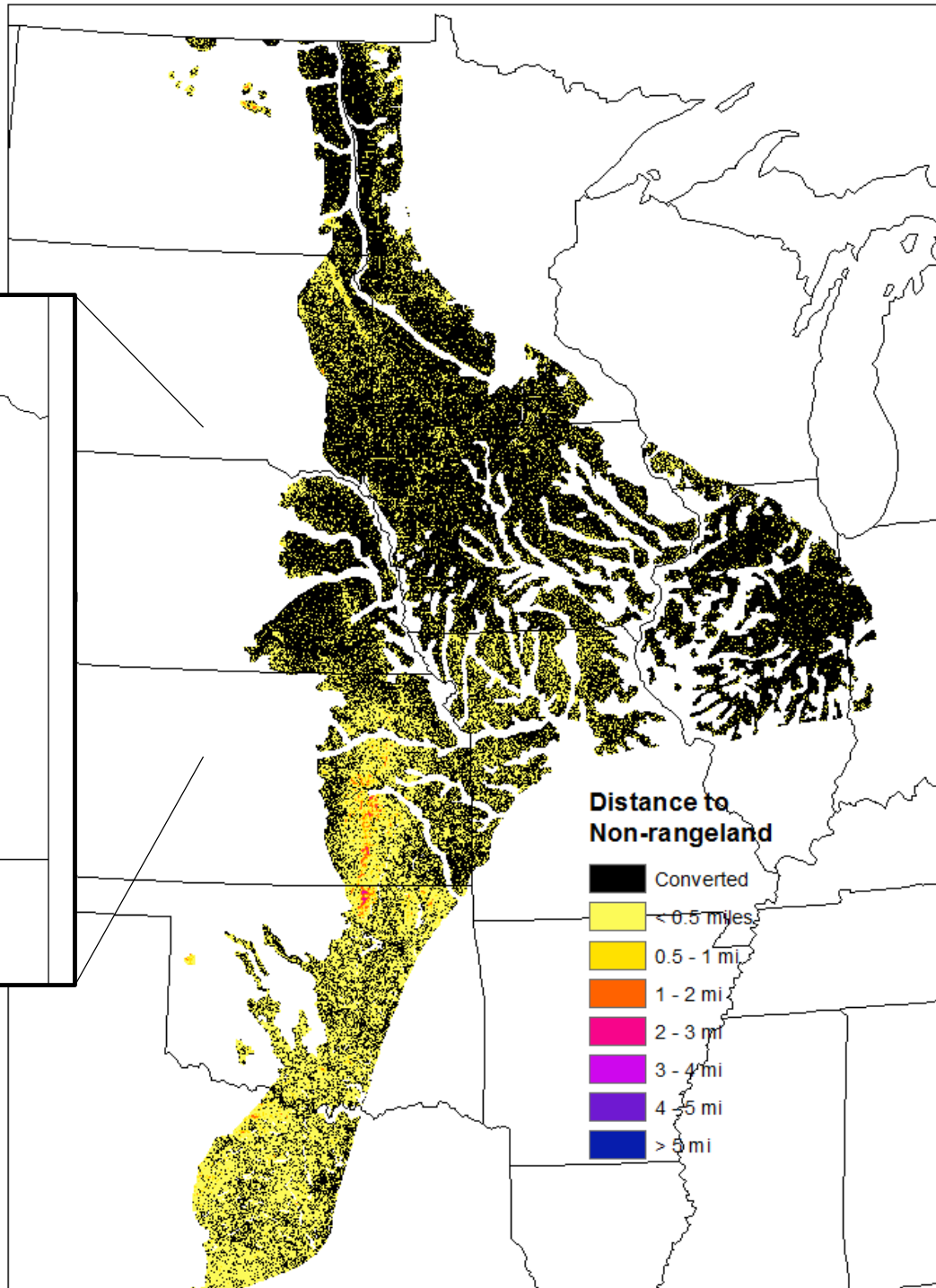


Fragmentation of Remaining Grassland/Shrubland in the Great Plains

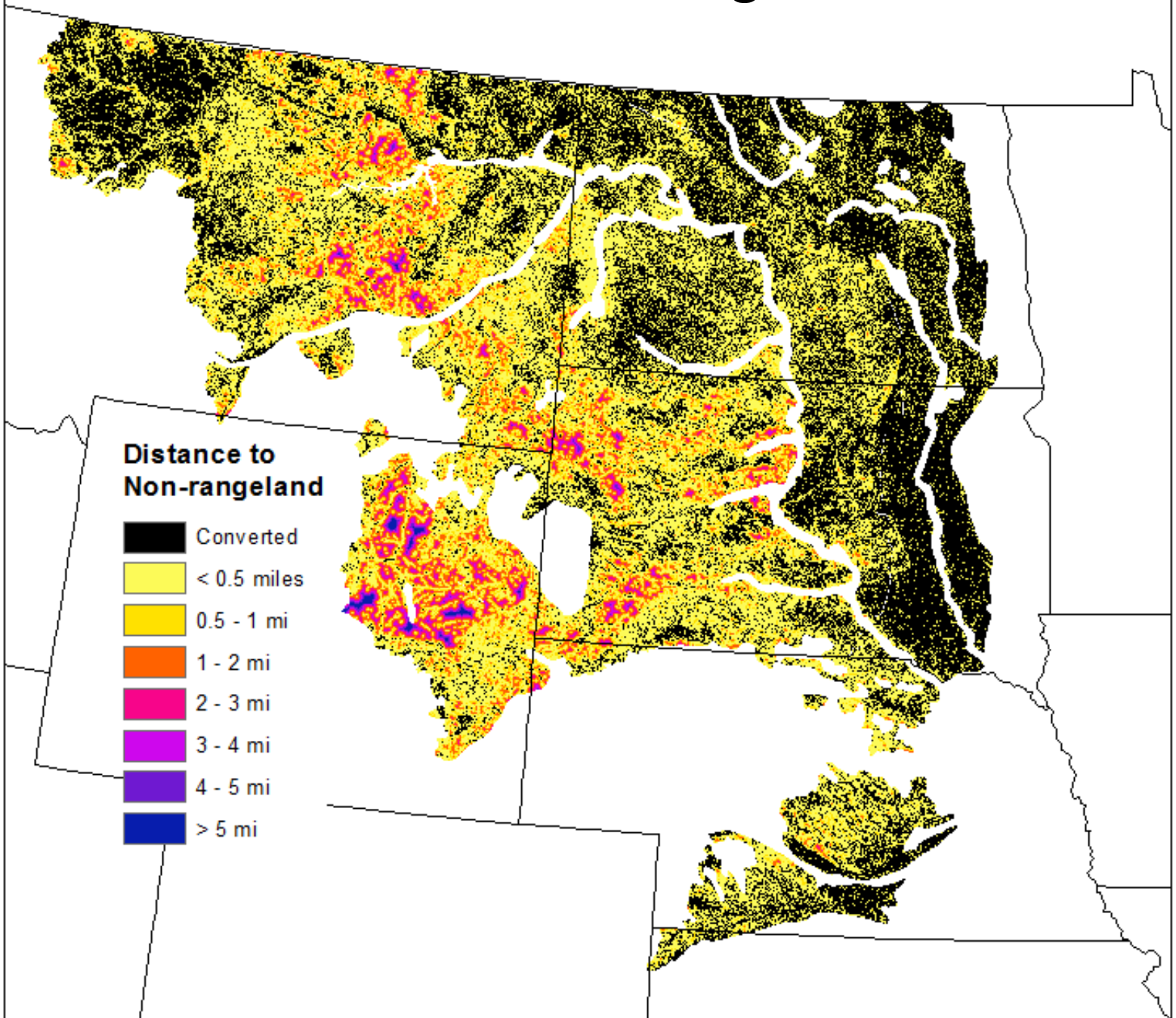


Tallgrass

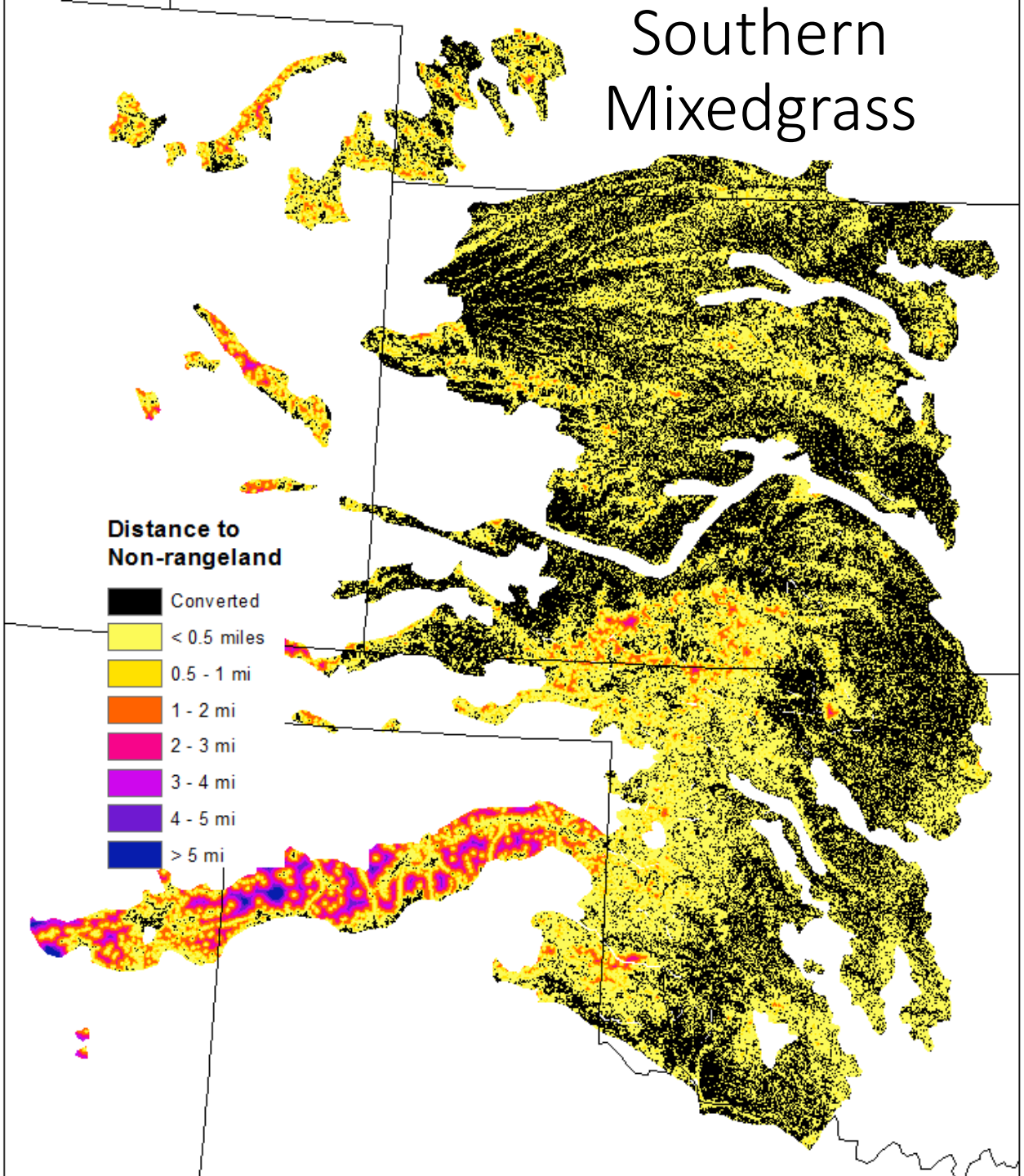

Distance to
Non-rangeland
Converted
< 0.5 miles
0.5 - 1 mi
1 - 2 mi
2 - 3 mi
3 - 4 mi
4 - 5 mi
> 5 mi

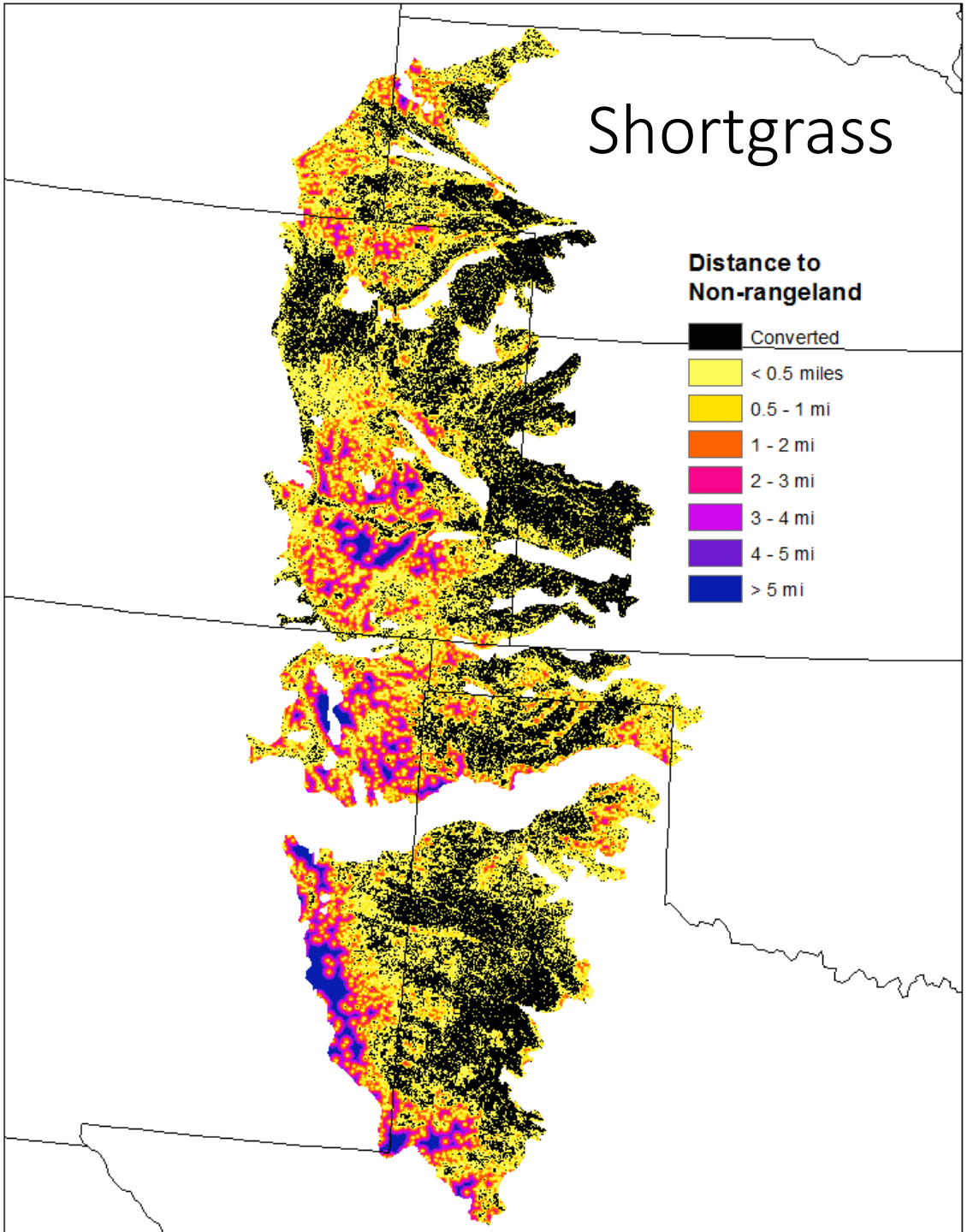

Distance to
Non-rangeland
Converted
< 0.5 miles
0.5 - 1 mi
1 - 2 mi
2 - 3 mi
3 - 4 mi
4 - 5 mi
> 5 mi

Northern Mixedgrass

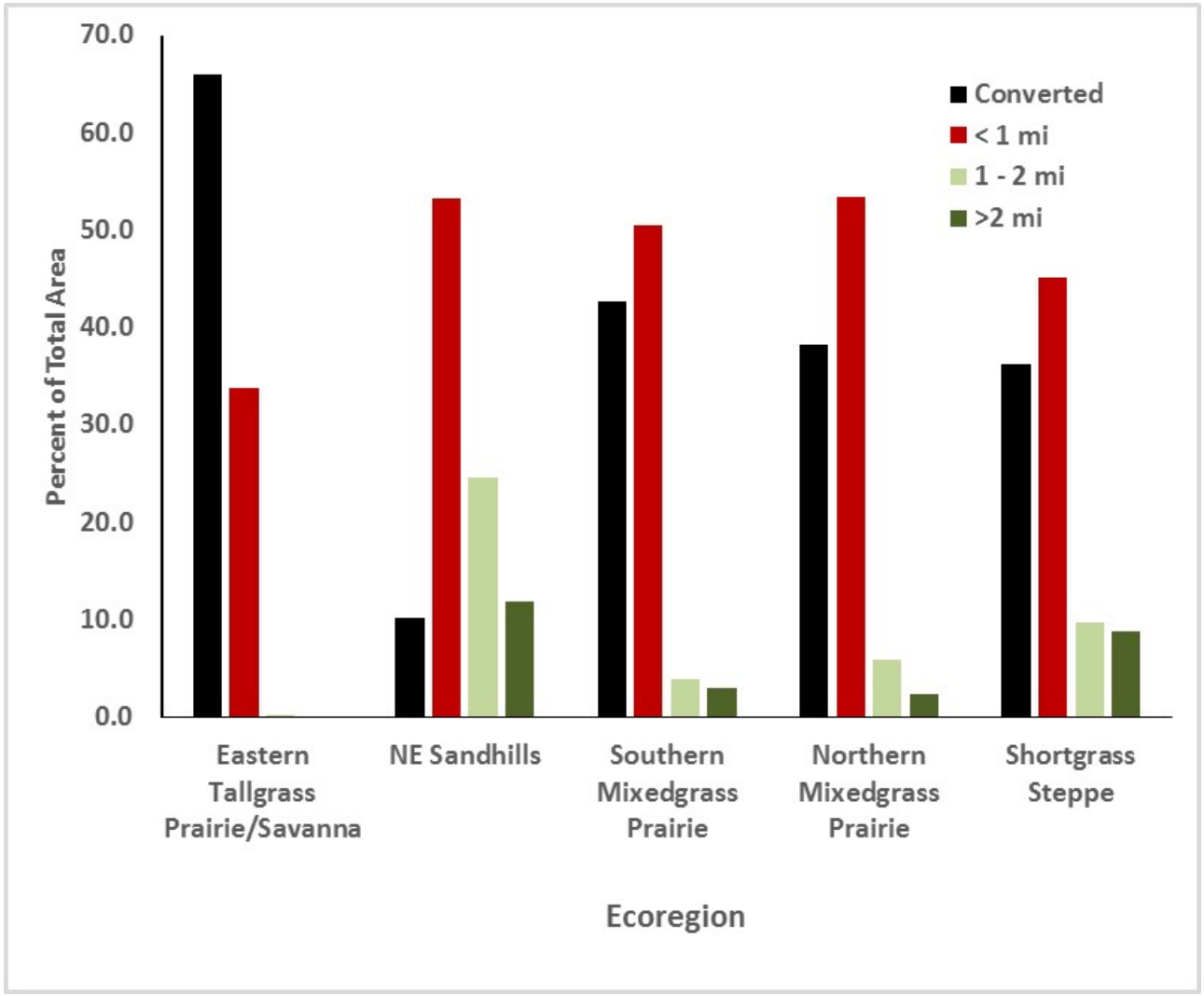


Southern Mixedgrass

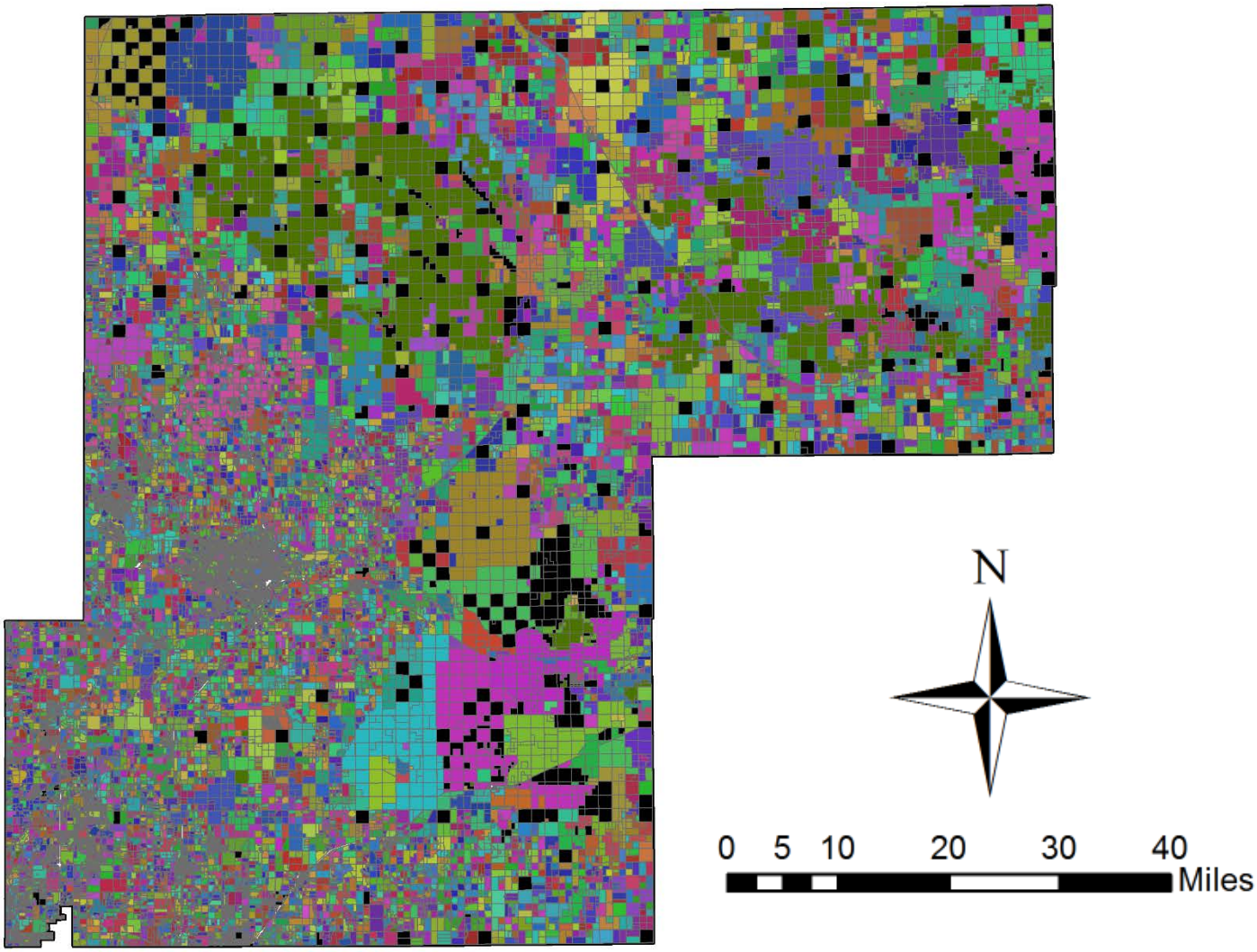



Shortgrass
Distance to Non-rangeland
Converted
< 0.5 miles
0.5 - 1 mi
1 - 2 mi
2 - 3 mi
3 - 4 mi
4 - 5 mi
> 5 mi

Percent of Ecoregion in Fragmentation Class



Weld County Colorado, Landownership Pattern



The Opportunities

- Farm Bill Programs ($$$)
- Land consolidation by state and federal agencies
- Cross-jurisdiction management
- Multidisciplinary management

2014 Farm Bill Mandatory EQIP Funding

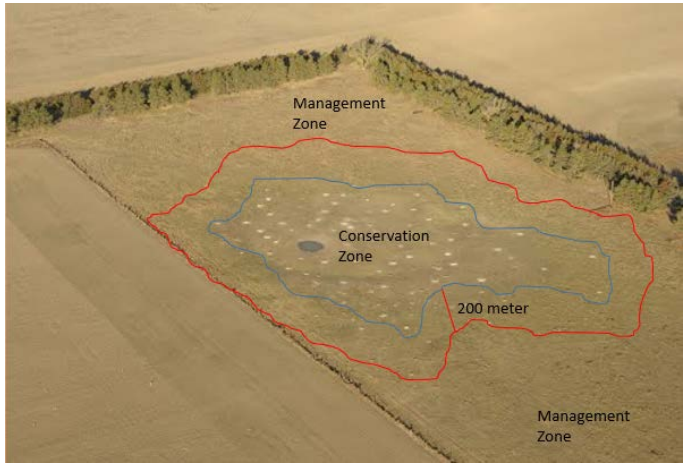
Fiscal Year	Total (millions)
FY 2014	$1,350
FY 2015	$1,600
FY 2016	$1,650
FY 2017	$1,650
FY 2018	$1,750

Natural Resources Conservation Service Colorado

United States Department of Agriculture

Black-footed Ferret Special Effort in Colorado Special Effort Overview

The purpose of the special effort is to promote voluntary, incentive-based conservation on private and Tribal lands, with the primary objective of encouraging landowner participation in black-footed ferret (BFF) recovery while strengthening the productive capacity of working lands and rural economies.



United States Department of Agriculture

FACT SHEET

Conservation Reserve Program CP38E
Lesser Prairie-Chicken Habitat Conservation

USDA's Farm Service Agency (FSA) offers a Continuous Conservation Reserve Program (CRP) practice to conserve and develop mixed grass habitat to maintain and enhance Lesser Prairie-Chicken populations

Sign -up

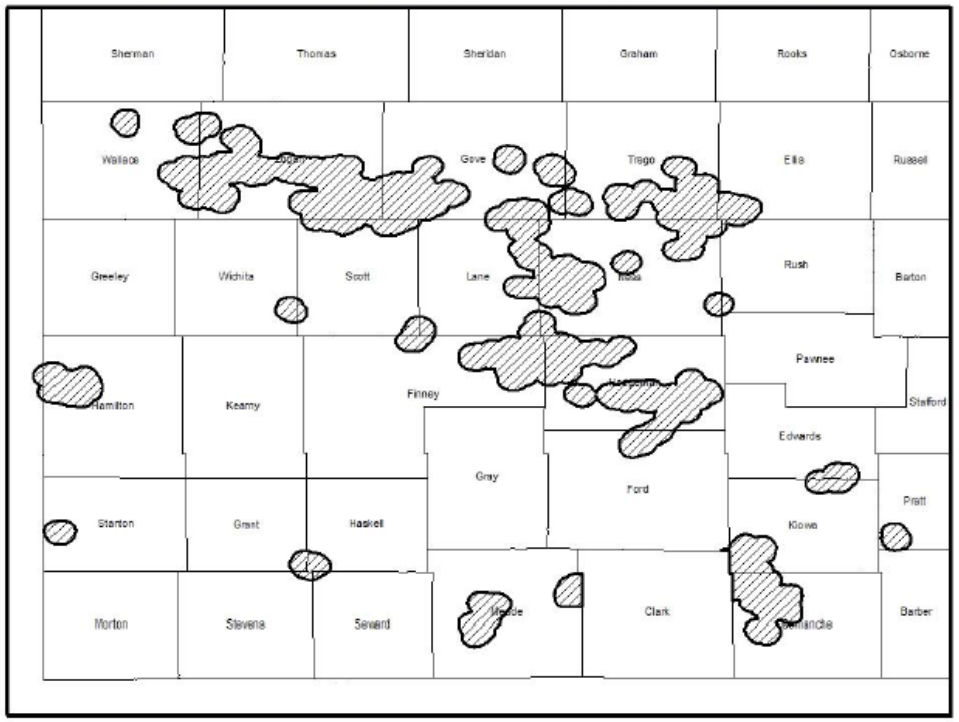
Sign-up begins December 1st, 2010. This SAFE sign-up runs continuously until the acreage goal of 30,000 acres is met.

Eligible Land

Expired CRP may be enrolled, but existing cover must contain suitable wildlife cover. Eligible cropland includes cropland that is planted or considered planted to an agricultural commodity during 4 of the 6 crop years from 2002 through 2007 and is physically and legally capable of being planted in a normal manner to an agricultural commodity.

Eligible land must be within the designated targeted areas.

State Acres for Habitat Enhancement - CP38E Eligible Targeted Areas



and other payment eligibility criteria are met.

Cost-Share Payments

Size Limit

No acreage limitation.

Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: www.elsevier.com/locate/gecco

Original Research Article

Conservation Reserve Program mitigates grassland loss in the lesser prairie-chicken range of Kansas

David Spencer [a,1], David Haukos [b,*], Christian Hagen [c], Melinda Daniels [d], Doug Goodin [a]

[a] Department of Geography, Kansas State University, Manhattan, KS, 66506, USA
[b] U.S. Geological Survey, Kansas Cooperative Fish and Wildlife Research Unit, Kansas State University, 205 Leasure Hall, Manhattan, KS, 66506, USA
[c] Oregon State University, 500 SW Bond Street, Bend, OR 97702, USA
[d] Stroud Water Research Center, 970 Spencer Road, Avondale, PA, 19311, USA

*One approach to **retain CRP fields as grassland**, but in the face of reduced CRP contract enrollment, is to **retain the primary land-use of these as working grasslands** (Natural Resource Conservation Service, 2016). Ecologically-based grazing management can be compatible with lesser prairie-chicken ecology and may increase the likelihood of the species' occurrence in these grassland landscapes (Hagen et al., 2016).*

Transitioning CRP to Permanent Grassland

LESSER PRAIRIE-CHICKEN INITIATIVE

Kansas Rancher Puts Expired CRP Grasslands to Work for Cattle and Wildlife

Rancher Dwight Abell (photo Jeremy Roberts, Conservation Media)

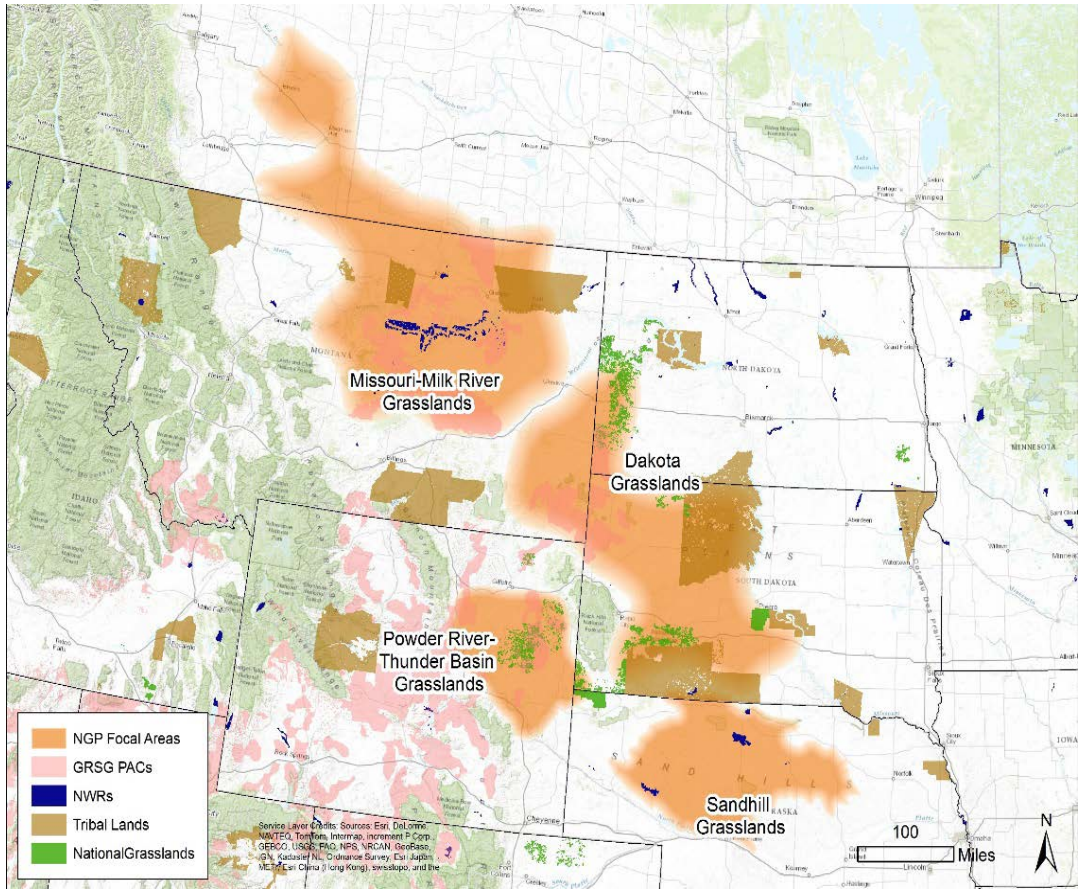
Ten years ago, Abell enrolled his cropland acreage into the Conservation Reserve Program (CRP). The mix of native grass and forb species in Abell's CRP grasslands … provide prime habitat for lesser prairie-chickens.

When the 10-year CRP contract expired, Abell looked to the Lesser Prairie-Chicken Initiative (LPCI) for assistance in shifting the expired CRP grasslands to cattle grazing. It's a win-win proposition

Northern Great Plains

- Goal: Enhance and sustain native prairie landscapes that will contribute to the recovery of prairie dependent species
  - Annual ≈ $3 Million Grant Cycle
  - 1 million acres/$25 million over ten years (2016)
- Protect and restore intact grassland ecosystems in focal areas
- Support the local ranching/tribal community and economy

Geographic Focus



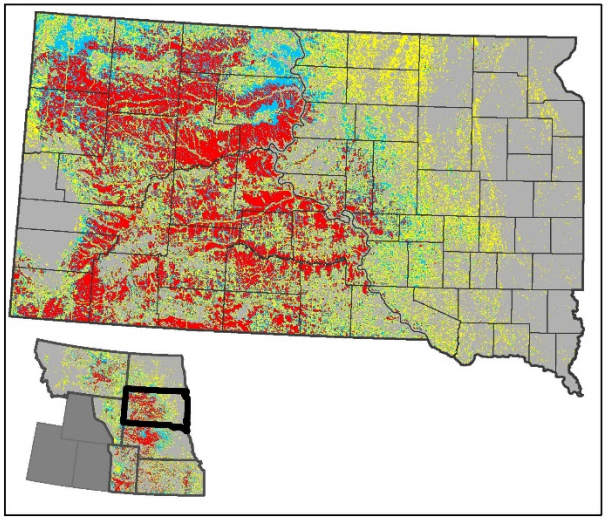
Targeting Expiring CRP and Large Blocks of Grasslands for Conservation Using Species Models

U.S. Fish & Wildlife Service

Identifying Focal Areas for Grasshopper Sparrow Conservation

HAPET Habitat And Population Evaluation Team

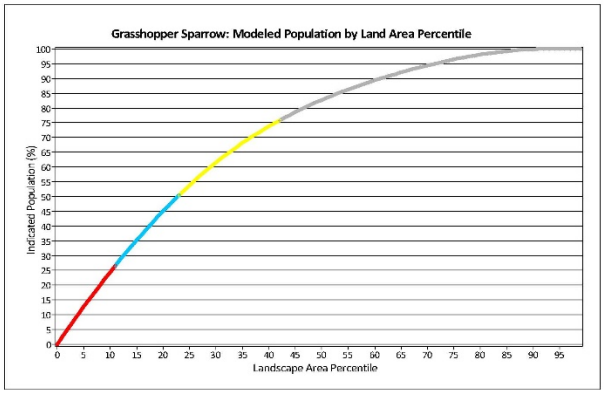
We used stop-level Breeding Bird Survey data in conjunction with landcover, topographic, and climatic data to develop statistical models predicting occurrence of grasshopper sparrow across all or portions of seven states. Relationships identified in the these models enable us to prioritize areas for conservation, and provide the foundation for additional, treatment-specific decision-support tools.



Indicated Population (%)

- Top 25%
- 25 - 50%
- 50 - 75%
- Lowest 25%
- Not Sampled

Predictive models provide spatially explicit population estimates, enabling prioritization of entire landscapes. In the example shown here, the entire region was divided into 100 equal-area zones, ranked by the predicted number of birds in each zone. These areas were then aggregated into four groups, by color, with each color representing 25% of the Region 6 grasshopper sparrow population.



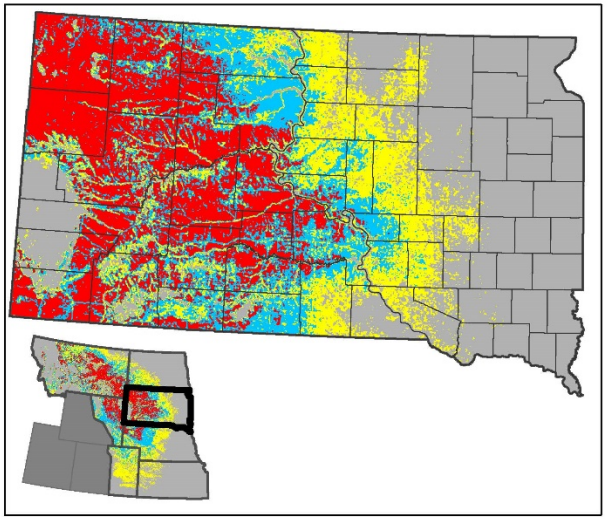
Those areas with high bird numbers (the red zone) offer greater conservation benefits per unit area than areas with low bird densities (the grey zone). The non-linear relationship between landscape area and bird numbers means that conservation benefits are highest where the line is steepest, and a large proportion of the bird population can be conserved in a relatively small area. In the case of grasshopper sparrow, 50% (red and blue zones) of the population in Region 6 can be conserved in only 23% of the land area.

U.S. Fish & Wildlife Service

Identifying Focal Areas for Western Meadowlark Conservation

HAPET Habitat And Population Evaluation Team

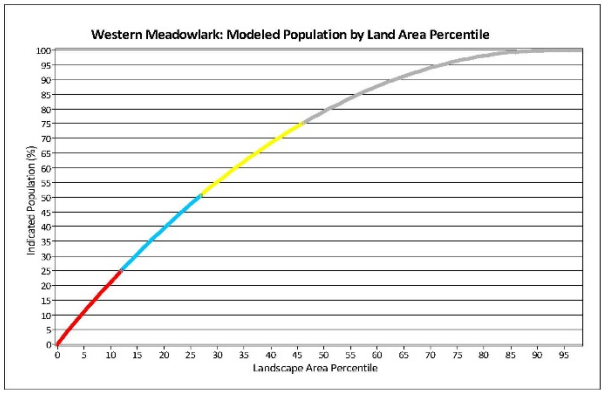
We used stop-level Breeding Bird Survey data in conjunction with landcover, topographic, and climatic data to develop statistical models predicting occurrence of Western meadowlark across all or portions of seven states. Relationships identified in the these models enable us to prioritize areas for conservation, and provide the foundation for additional, treatment-specific decision-support tools.



Indicated Population (%)

- Top 25%
- 25 - 50%
- 50 - 75%
- Lowest 25%
- Not Sampled

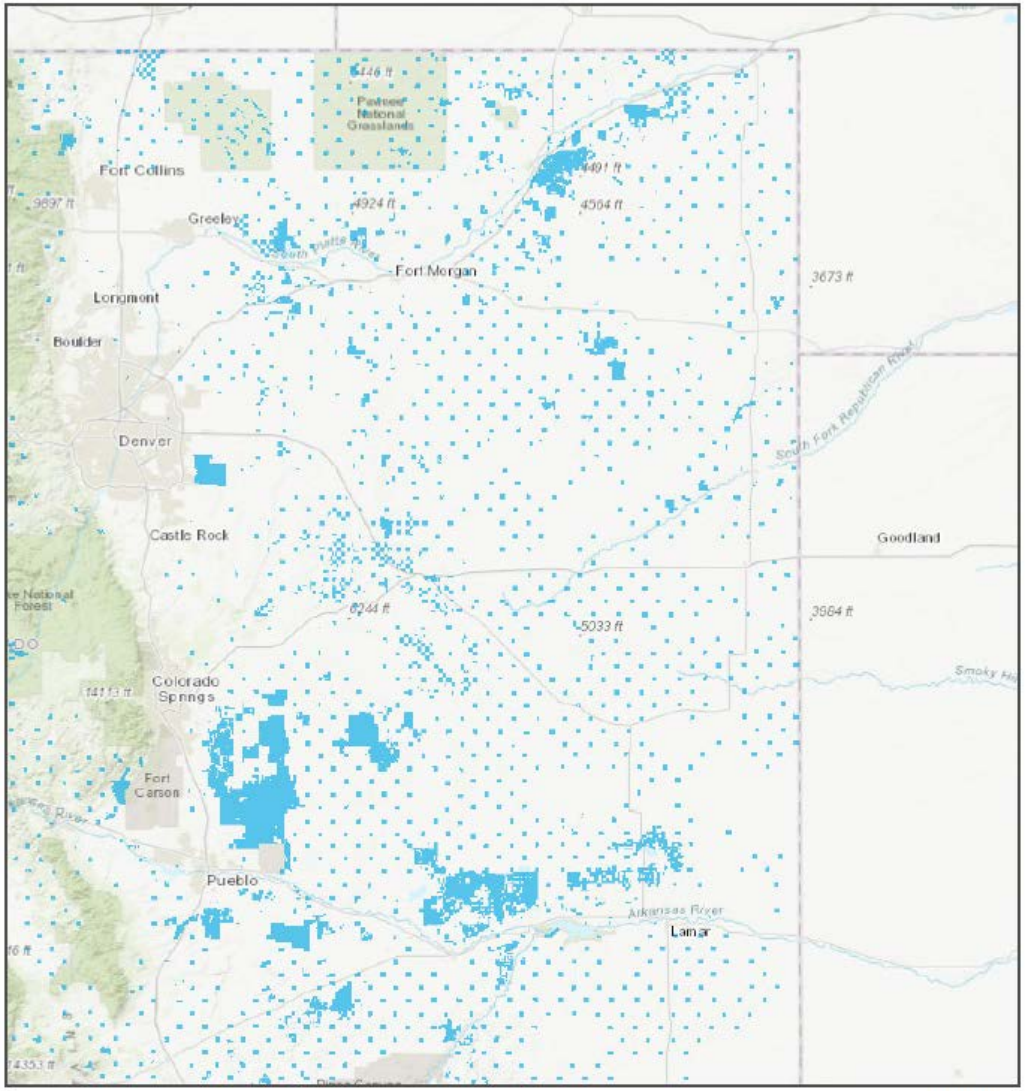
Predictive models provide spatially explicit population estimates, enabling prioritization of entire landscapes. In the example shown here, the entire region was divided into 100 equal-area zones, ranked by the predicted number of birds in each zone. These areas were then aggregated into four groups, by color, with each color representing 25% of the Region 6 Western Meadowlark population.



Those areas with high bird numbers (the red zone) offer greater conservation benefits per unit area than areas with low bird densities (the grey zone). The non-linear relationship between landscape area and bird numbers means that conservation benefits are highest where the line is steepest, and a large proportion of the bird population can be conserved in a relatively small area. In the case of Western meadowlark, 50% (red and blue zones) of the population in Region 6 can be conserved in about 26% of the land area.

Consolidation

Colorado State Land Board



CO State Land

4/7/2018

Colorado State Land Board

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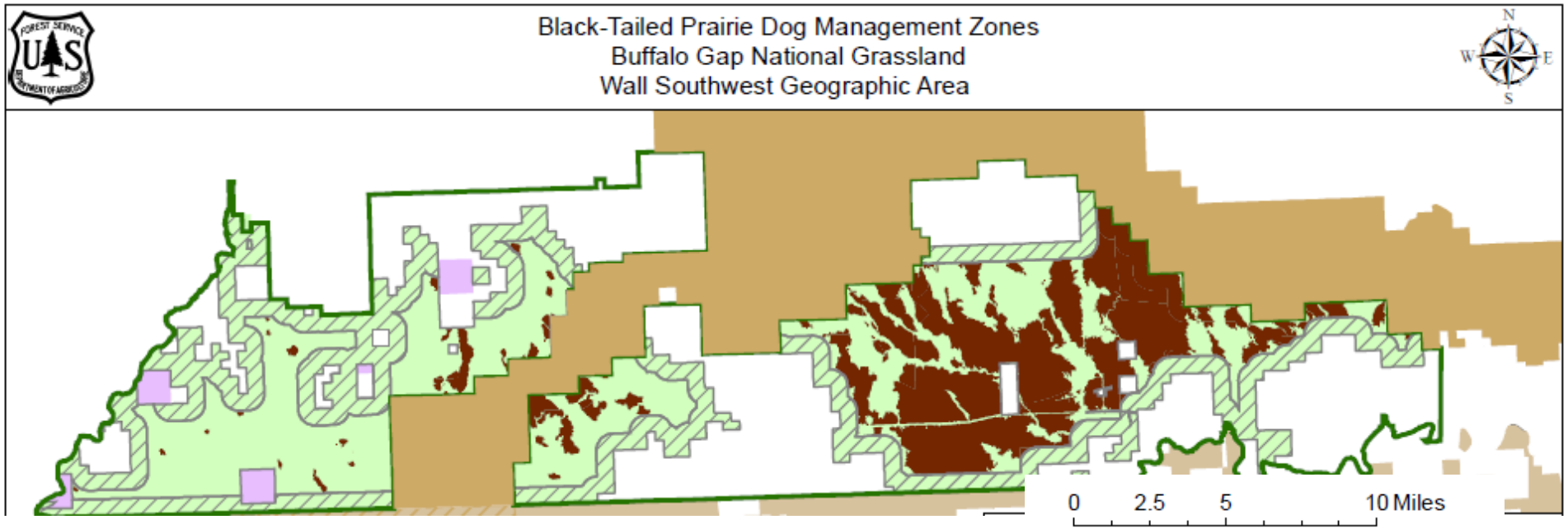
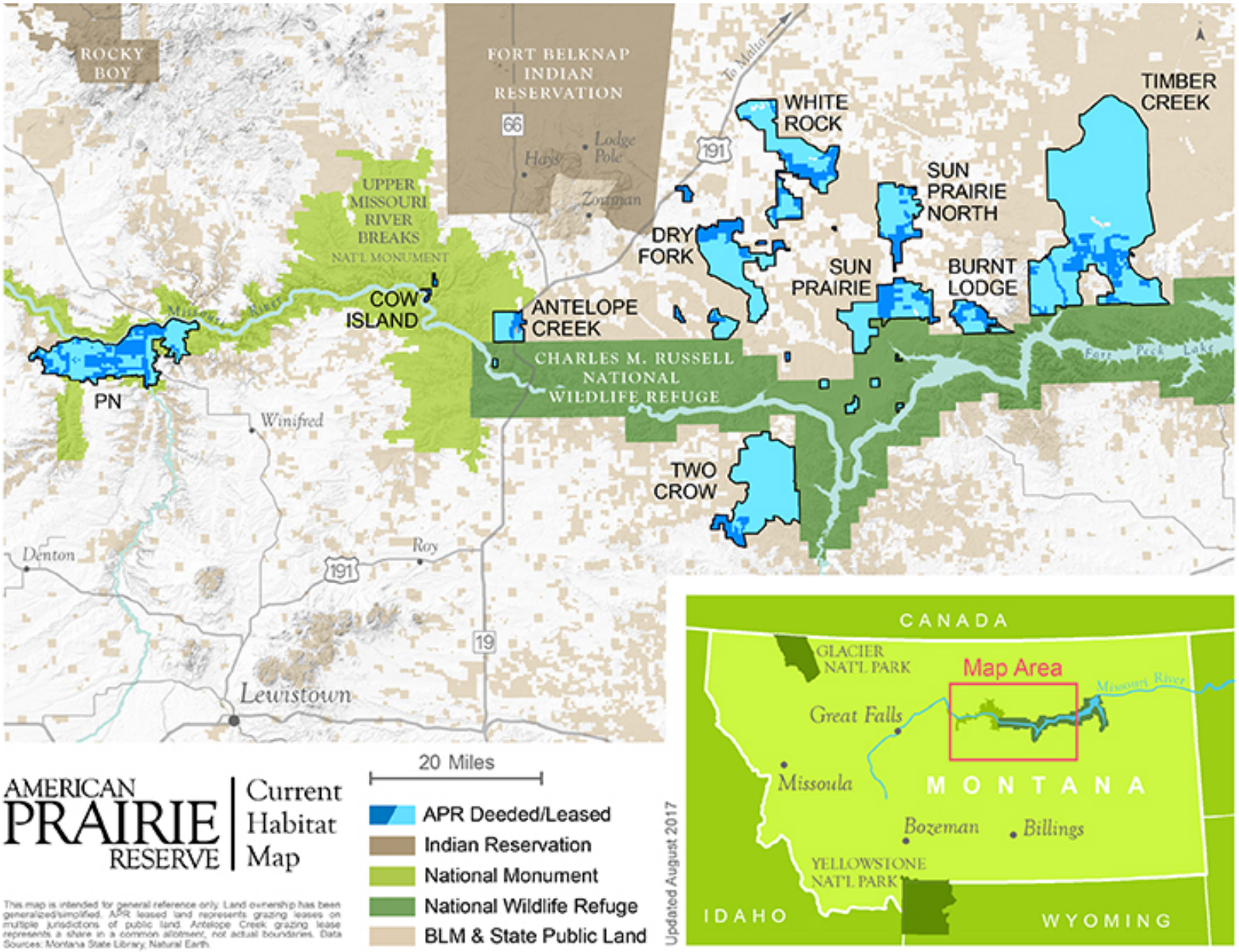
Consolidation



Consolidation

	Acres		
National Grassland	Total Area	Areas >1/2 mi from Boundary	% of Area >1/2 mi
Buffalo Gap	654,802	242,078	37.0
Little Missouri	1,114,758	352,861	31.7
Comanche-Timpas	186,510	52,939	28.4
Sheyenne	82,004	21,129	25.8
Thunder Basin	553,292	138,376	25.0
Rita Blanca	94,154	21,983	23.3
Grand River	187,227	37,481	20.0
Comanche-Carrizo	257,254	41,317	16.1
Pawnee	192,546	23,385	12.1
Black Kettle	33,256	114	0.3

Consolidation & Cross-Jurisdiction Management



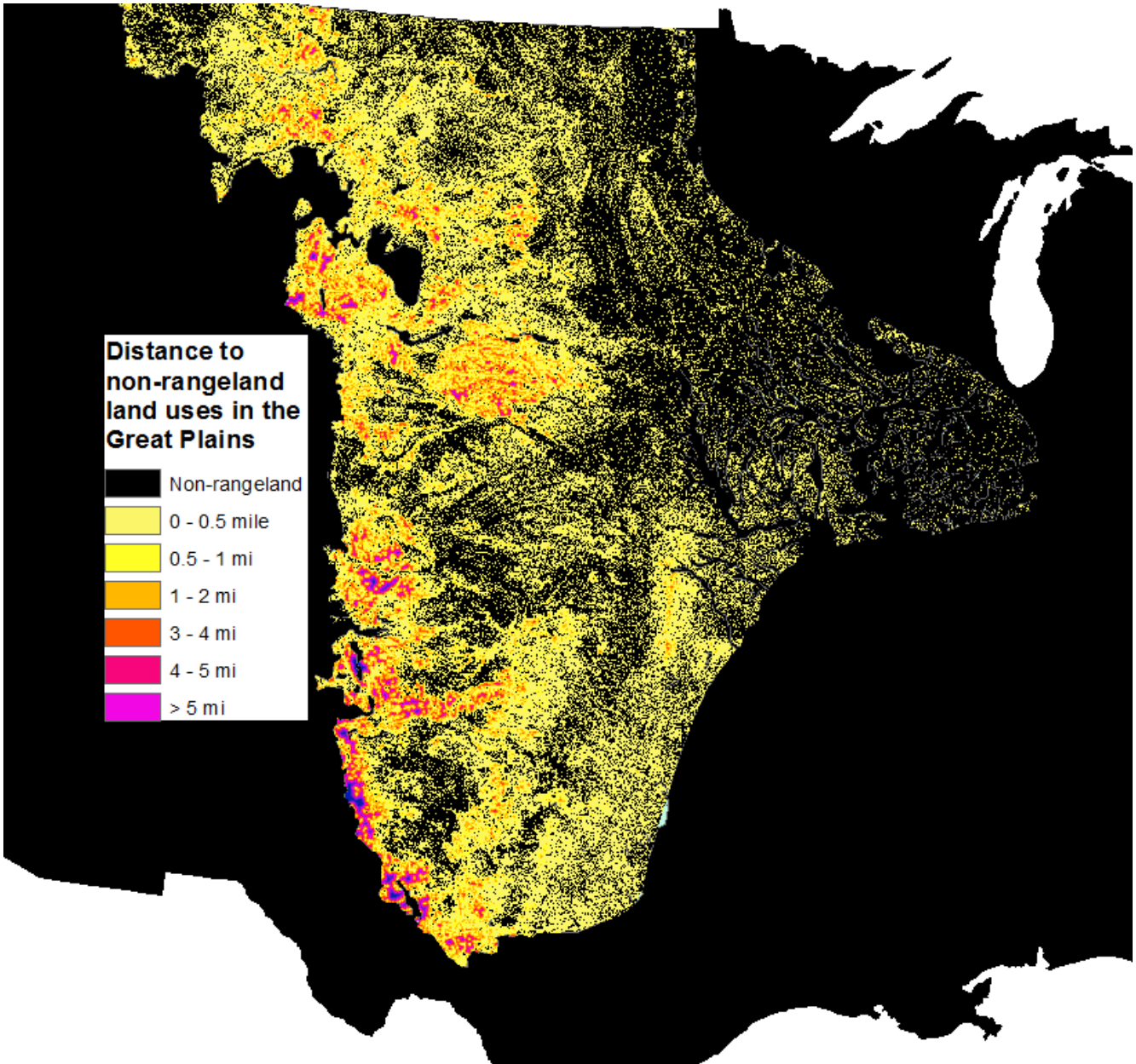
Cross-Jurisdiction Collaboration and Management

High Plains Partnership --
Conservation Of The High Plains Legacy

Solutions

- **Strong grassroots Partnerships:**
  - Private Landowners
  - State agencies
    - Agriculture extension, fish and wildlife, and water resource agencies
  - Tribes
  - Department of Agriculture
    - Natural Resources Conservation Service, Forest Service, Resource Conservation and Development Districts
  - Department of the Interior
    - Bureau of Land Management, Bureau of Indian Affairs, U. S. Geological Survey, U. S. Fish and Wildlife Service, Bureau of Reclamation
  - Non-governmental Organizations
    - National Wildlife Federation
    - The Nature Conservancy
    - Wildlife Management Institute
    - American Farm Bureau Federation and State affiliates
    - National Cattlemen's Beef Association and State affiliates

Cross-Jurisdiction Collaboration and Management



Cross-Jurisdiction Collaboration and Management: Moving beyond native grazers = “good” and livestock =“threat”

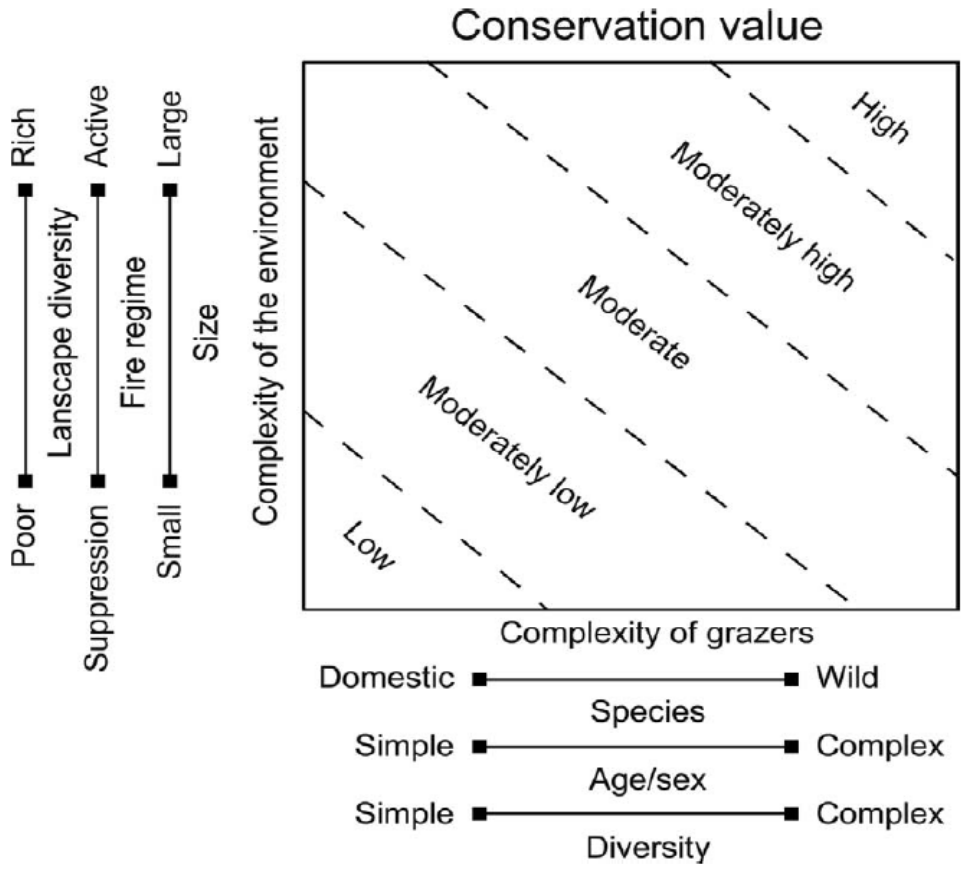


Fig. 5. Conceptual model to evaluate conservation value with respect to animal and environmental factors.

The role of herbivores in Great Plains conservation: comparative ecology of bison and cattle

Brady W. Allred,[1,†] Samuel D. Fuhlendorf,[1] and Robert G. Hamilton[2]

Thinking like a Grassland

Large Grazers
Stocking rates
Intense, pulsed grazing
Grassland with long-term rest

Prairie Dogs
Locations of large colonies
Recent plague epizootics
Poisoning for boundary issues

Prescribed Fire
Fuel loads (weather, livestock, prairie dogs, plague)
Objectives (cactus, plovers, forage quality/quantity)

Shifting Mosaics
At Broad Spatial Scales
that sustain grassland
biodiversity

Shifting Mosaics At Broad Spatial Scales

that sustain grassland biodiversity