Conservation Planning (10:45-11:05)

Lee Grunau, CNHP

David Augustine, USDA-ARS

Tom Cardamone, WBI

Homes on the Range:

Identifying potential landscapes for conservation across North America's central grasslands: Integrating keystone species, land use patterns, and climate change

Ana Davidson, Colorado Natural Heritage Program (CNHP) &
Dept. of Fish, Wildlife and Conservation Biology, Colorado State Univ (CSU)
David Augustine, USDA-Agricultural Research Service
Michael Menefee, CNHP, CSU
Michelle Fink, CNHP, CSU
Michael Houts, Kansas Biological Survey
Fernanda Thiesen Brum, Universidade Federal do Paraná – Brazil
Matt Williamson, Boise State University
Lindsey Sterling-Krank, Prairie Dog Coalition, Humane Society of the US
Bill Van Pelt, Western Association of Fish & Wildlife Agencies (WAFWA)

Methods for Identifying potential landscapes for grassland conservation

1) Generate BTPD habitat suitability model – prairie dog ecosystem focus

2) Incorporating future climate change predictions into BTPD habitat suitability model

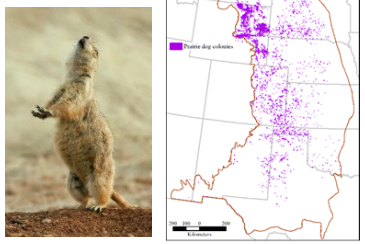
3) Identifying current & future priority areas within predicted suitable habitat

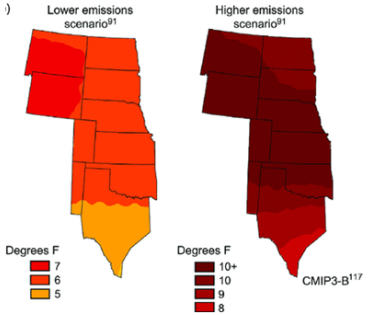
Methods (Part I):

Identify geographic range boundary & obtain BTPD occurrence data
Use WEST range-wide occurrence data and define boundary from this data and historical records

Create BTPD habitat suitability model
Based on WEST BTPD occurrence data, current climate, soils, topography, land cover

Project habitat suitability for BTPD under future climate
Project climate to 2100 from downscaled Global Climate Models (Multivariate Adaptive Constructed Analogs (MACA)





Methods (Part II):

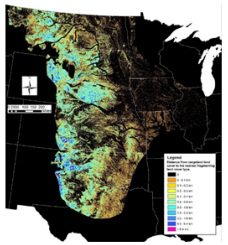
Habitat Suitability Model

Conservation Prioritization Model (Zonation)

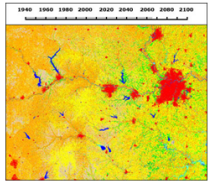
Identify potential landscapes for grassland conservation both now and in the future
Based on BTPD habitat suitability, existing distribution of BTPDs, projected climate and land use change, patch size, connectivity, threats, and social landscape

Scenario 1 **Scenario 2** **Scenario 3** **Scenario x**

Great Plains Fragmentation



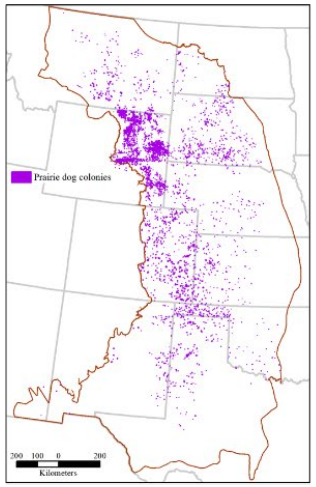
Projected land use change



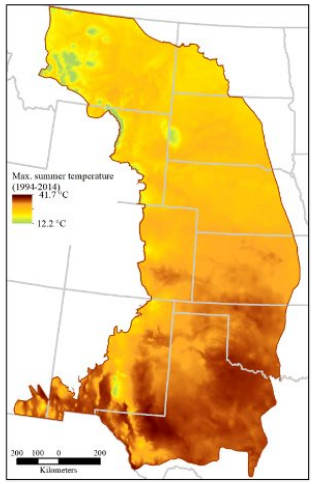
Methods (Part I): Habitat Suitability Model (HSM)

Variable	Spatial data layer for Habitat Suitability Model
BTPD colony occurrences	Prairie dog occurrences from WEST survey[10]
Land Cover	USGS National Land Cover Database 2016
Soils	POLARIS 30-m resolution database Metrics: bulk density to 100cm, %Sand to 100cm, %Clay to 100cm, % organic matter to 100cm, pH to 100cm
Slope & elevation	National Elevation Dataset Metrics: Topographic Wetness Index, Topographic Ruggedness Index, slope, aspect
Climate – current	Current climate (1994-2014), using GridMet Metrics: Mean annual precipitation (mm), winter + spring & summer + fall precipitation, max summer temperature, potential evapotranspiration, growing degree days

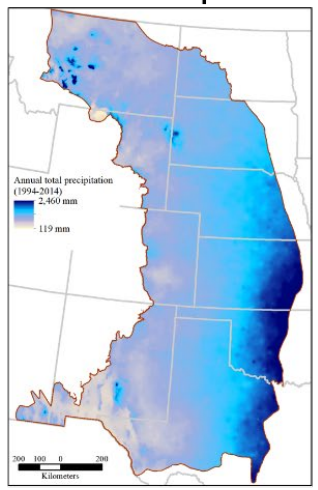
BTPD colonies



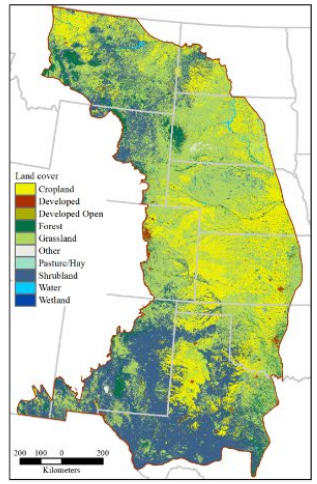
Max Temperature



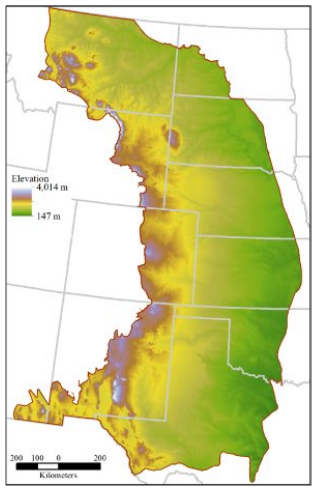
Annual Precipitation



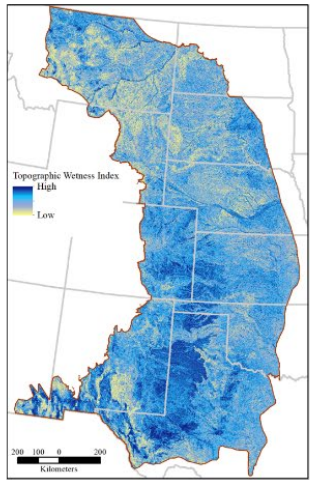
Land cover



Elevation

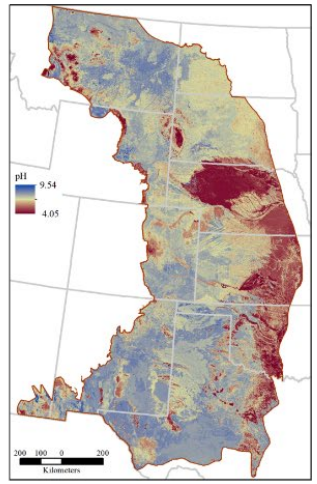


Topographic Wetness Index



Percent Sand

pH



BTPD Rangewide Habitat Suitability

Current Climate

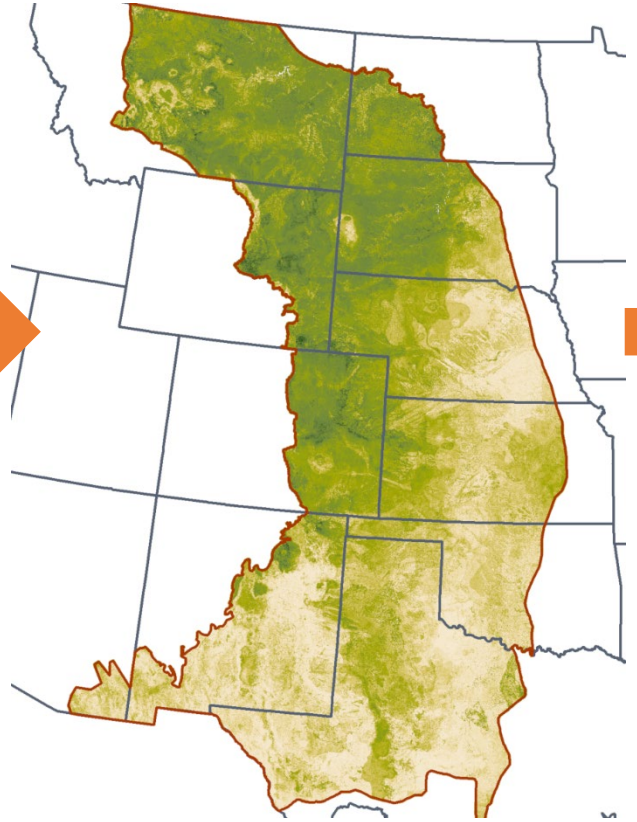
Final Ensemble Model derived from:
1)Generalized Linear Mixed model
2) Random Forest model
3) Boosted Regression Tree model

Michelle Fink,
Landscape Ecologist, Colorado
Natural Heritage Program, CSU

Results (Part I): BTPD Habitat Suitability Model under current & future climate (2100):

HSM under **Current Climate**

HSM under **Future Climate (warm & wet scenario)**



HSM under **Future Climate (hot and dry scenario)**

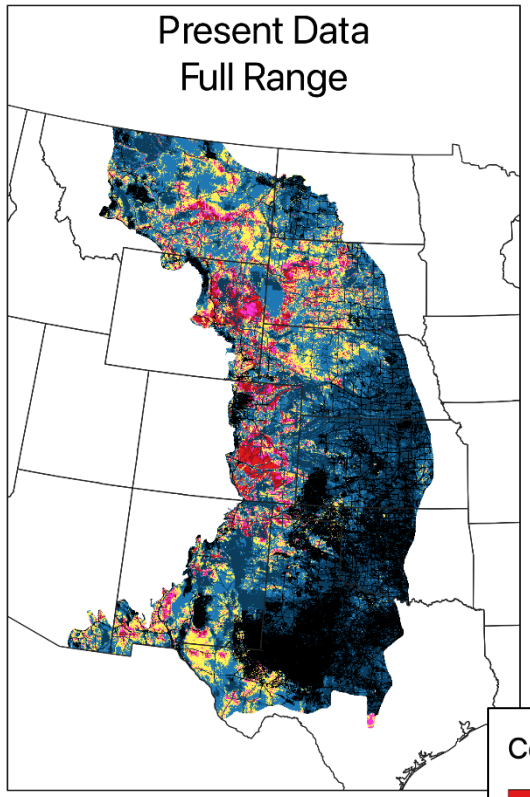
Methods (Part II): Incorporating landscape & social variables to determine conservation priorities

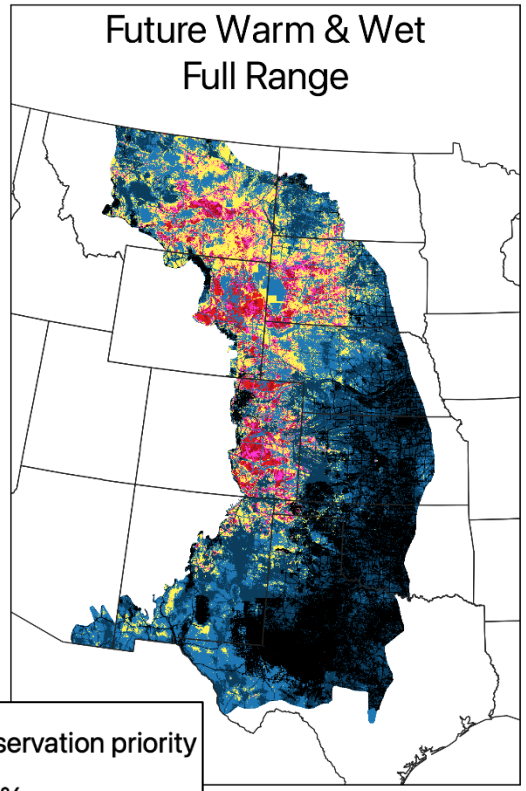
Landscape variables	**Source dataset**
Climate change	BTPD SDM under future climate change (2100) (Fink et al.)
Landuse change	USGS (projected 2100)
Landscape fragmentation	Augustine et al. (2019)
Private Lands Conservation	Turner+SPLT+APR property boundaries
BTPD occurences	WEST et al.
Protected Area	PAD-US
% CRP	County level CRP
% Grass/shrub	2016 NLCD (52, 71, 81)
% Emergent wetland	2016 NLCD (95)
Percent tree cover	NLCD trees + NLCD % tree cover + PIJV cedar/mesquite
Tillage risk	Olimb tillage risk
Oil/gas wells (well count)	Welldatabase.com
Oil/gas wells (well density)	Welldatabase.com
Wind power potential	NREL wind speed at 100 meters
Distance to Transmission lines	DHS transmission lines
Wind turbines	FAA obstruction database
Road density	Impervious descriptor dataset
Social variables	**Source dataset**
Social willingness to embrace conservation	League of Conservation Voters
Social willingness to embrace conservation	LandVote database
Social willingness to embrace **prairie dog** conservation	Prairie dog survey (Williamson et al.)
Institutional capacity to actualize conservation	Count of Land and Water Conservation Fund projects

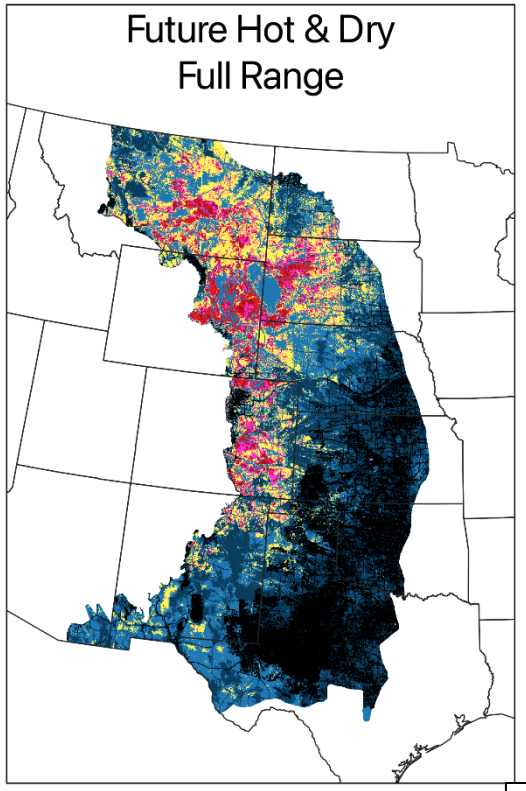
Mike Houts,
Research Associate,
KS Biological Survey

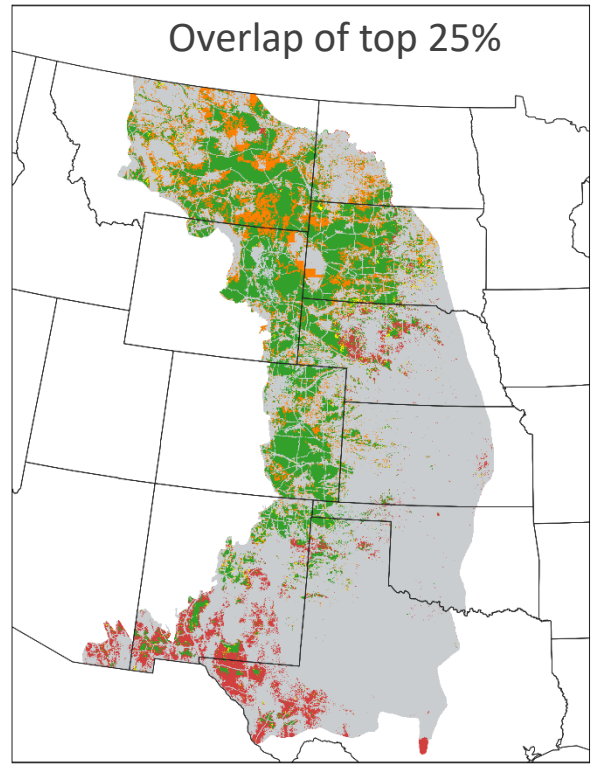
Matt Williamson,
Assistant Professor,
Boise State University

Results (Part II): Identifying current & future priority areas and the top 25% across all









Conservation priority
- 2%
- 5%
- 10%
- 25%
- 50%
- 75%
- 100%

Top 25% priorities
- Only for present
- Only for future scenarios (W&W and/or H&D)
- Present and one of the future scenarios (W&W or H&D)
- Overlapped

Partners

BOISE STATE
UNIVERSITY

THE HUMANE SOCIETY
OF THE UNITED STATES

Prairie Dog Colony Dynamics and Their Coexistence with Cattle

Ana Davidson
Colorado Natural Heritage Program &
Dept. of Fish, Wildlife and Conservation Biology
Colorado State University

COLORADO NATURAL HERITAGE PROGRAM

WARNER COLLEGE OF NATURAL RESOURCES
COLORADO STATE UNIVERSITY

USDA Agricultural Research Service

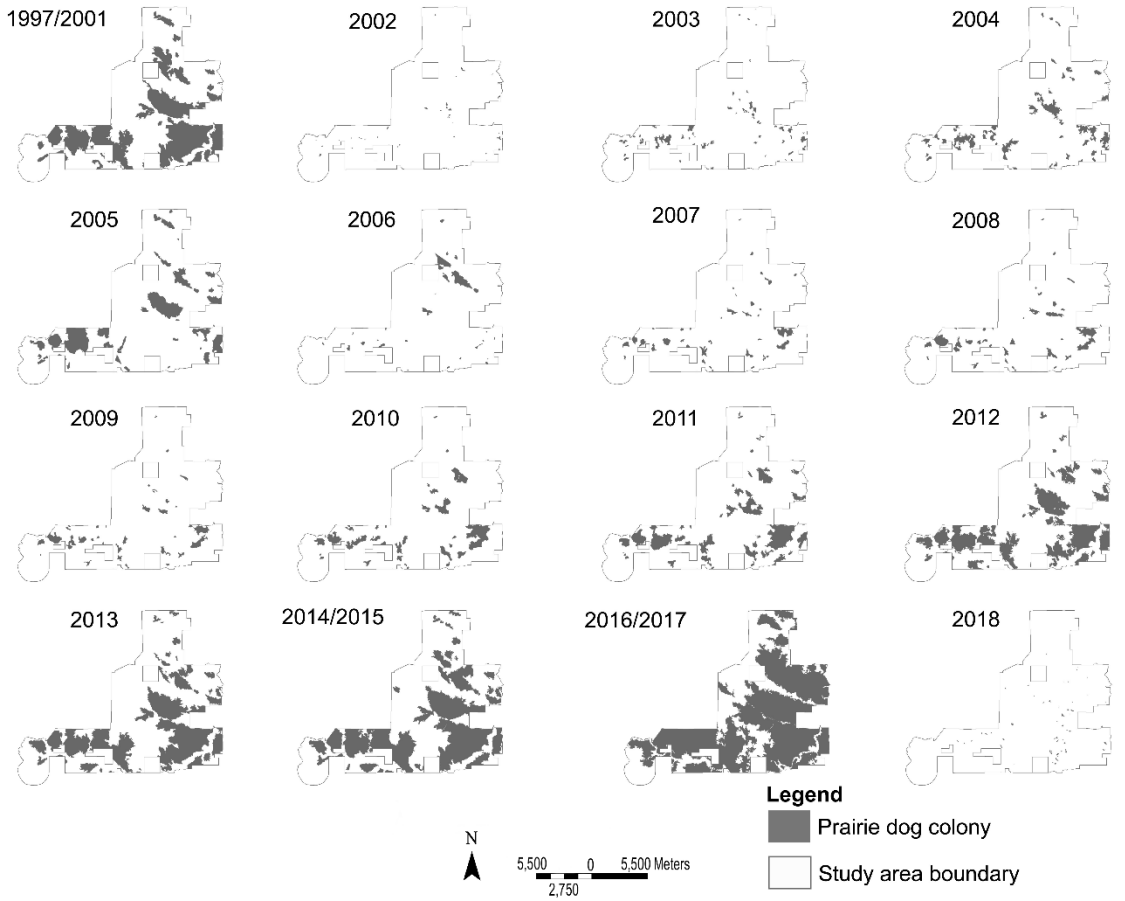
NIFA

In Press: Boom and bust cycles of black-tailed prairie dog populations in the Thunder Basin grassland ecosystem

Journal of Mammalogy

Ana Davidson[1,2*], David J. Augustine[3], Hannah Jacobsen[1,4], Dave Pellatz[5], Lauren M. Porensky[3], Gwyn McKee[6], and Courtney Duchardt[7]

[1*]Colorado Natural Heritage Program, Colorado State University (CSU)
[2]Department of Fish, Wildlife Conservation Biology, CSU, Fort Collins, CO
[3]USDA Agricultural Research Service, Fort Collins, CO
[4]Department of Human Dimensions, CSU, Ft. Collins, CO
[5]Thunder Basin Grasslands Prairie Ecosystem Association, Douglas, WY
[6]Great Plains Wildlife Consulting, Inc., Banner, WY
[7]Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK



In Revision: Disease and weather induce rapid shifts in a rangeland ecosystem mediated by a keystone species (*Cynomys ludovicianus*)

Ecological Applications

Courtney Duchardt[1,2], David Augustine[3], Lauren M. Porensky[3], Jeff Beck[2], Jacob Hennig[2], Dave Pellatz[4], Lauren Connell[5], and Ana Davidson[6,7]

[1]Department of Natural Resource Ecology and Management, Oklahoma State University, Still water, OK
[2]Department of Ecosystem Science and Management, University o Wyoming, Laramie, WY
[3]USDA-Agricultural Research Service, Fort Collins, CO
[4]Thunder Basin Grassland Prairie Ecosystem Association, Bill, WY
[5]Bird Conservancy of the Rockies, Fort Collins, CO
[6]Colorado Natural Heritage Program, , Colorado State University
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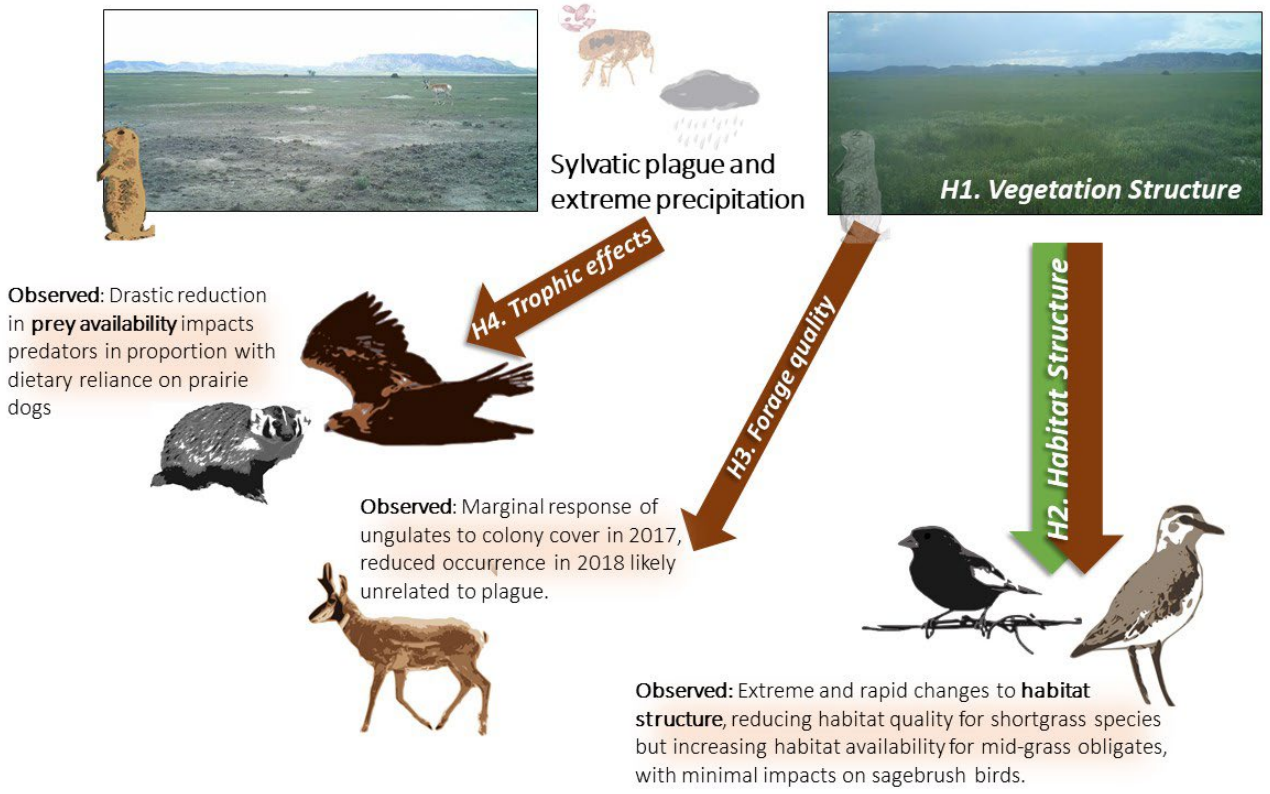

Current Research: How can prairie dogs and cattle co-exist in a way that supports *both* livestock production and grassland ecosystem conservation?

Ana Davidson[1,2*], David J. Augustine[3], Gabe Barrile[1], Justin Derner[3], Courtney Duchardt[4], Cynthia Hartway[1], Greg Newman[5], Dave Pellatz[6], Lauren M. Porensky[3], Derek Scasta[7], Kevin Shoemaker[8]

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[4]Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK
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[6]Thunder Basin Grasslands Prairie Ecosystem Association, Douglas, WY
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[8]Department of Natural Resources, University of Nevada-Reno, Reno, NV

Current Research: How can prairie dogs and cattle co-exist in a way that supports *both* livestock production and grassland ecosystem conservation?

Goals:

- Understanding drivers of boom-bust cycles
- Determine where, when, and how to best manage prairie dogs

Approaches:

- Long-term data and ecological modelling
- Participatory research
- Co-create decision support tools with ranchers