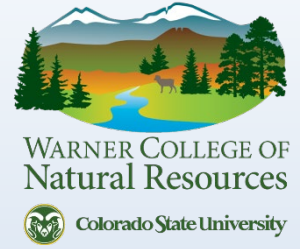


# Collaborative Adaptive Rangeland Management (CARM) to integrate perspectives from ranchers, conservation organizations, and land management agencies



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 Jessica Windh

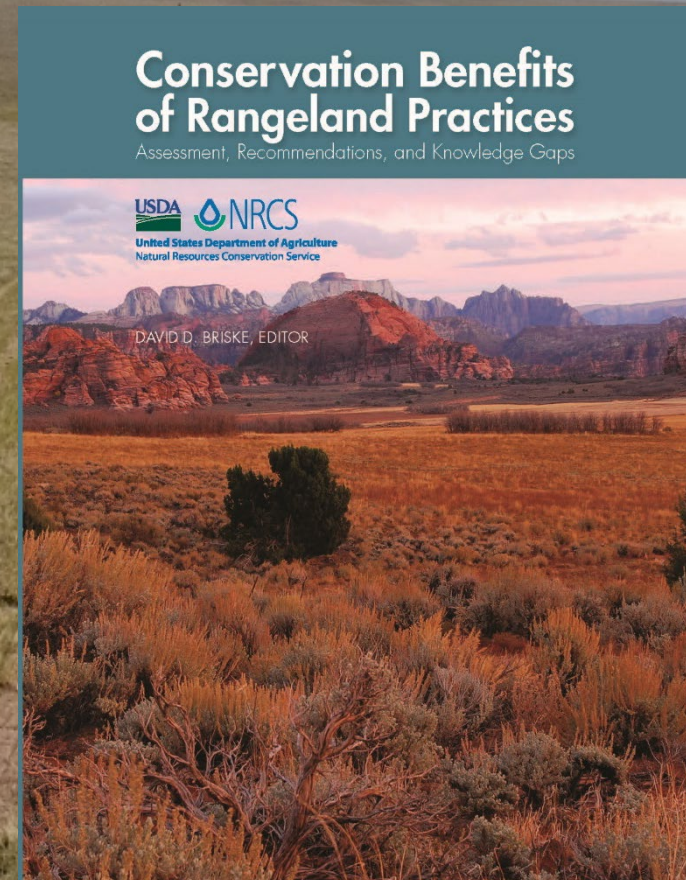
# CARM Science Team



## Motivating Factors

# Key Recommendations for Grazing Management and Research

- Use adaptive management to optimize conservation benefits
- Integrate ecological scales and human dimensions
- Expand conservation-science partnerships



## Motivating Factors

# Declining Grassland Bird Populations

### Contributing factors:

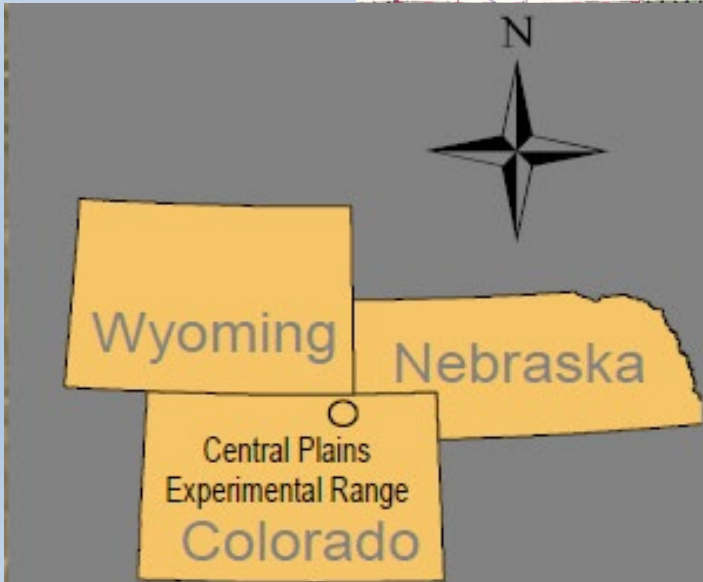
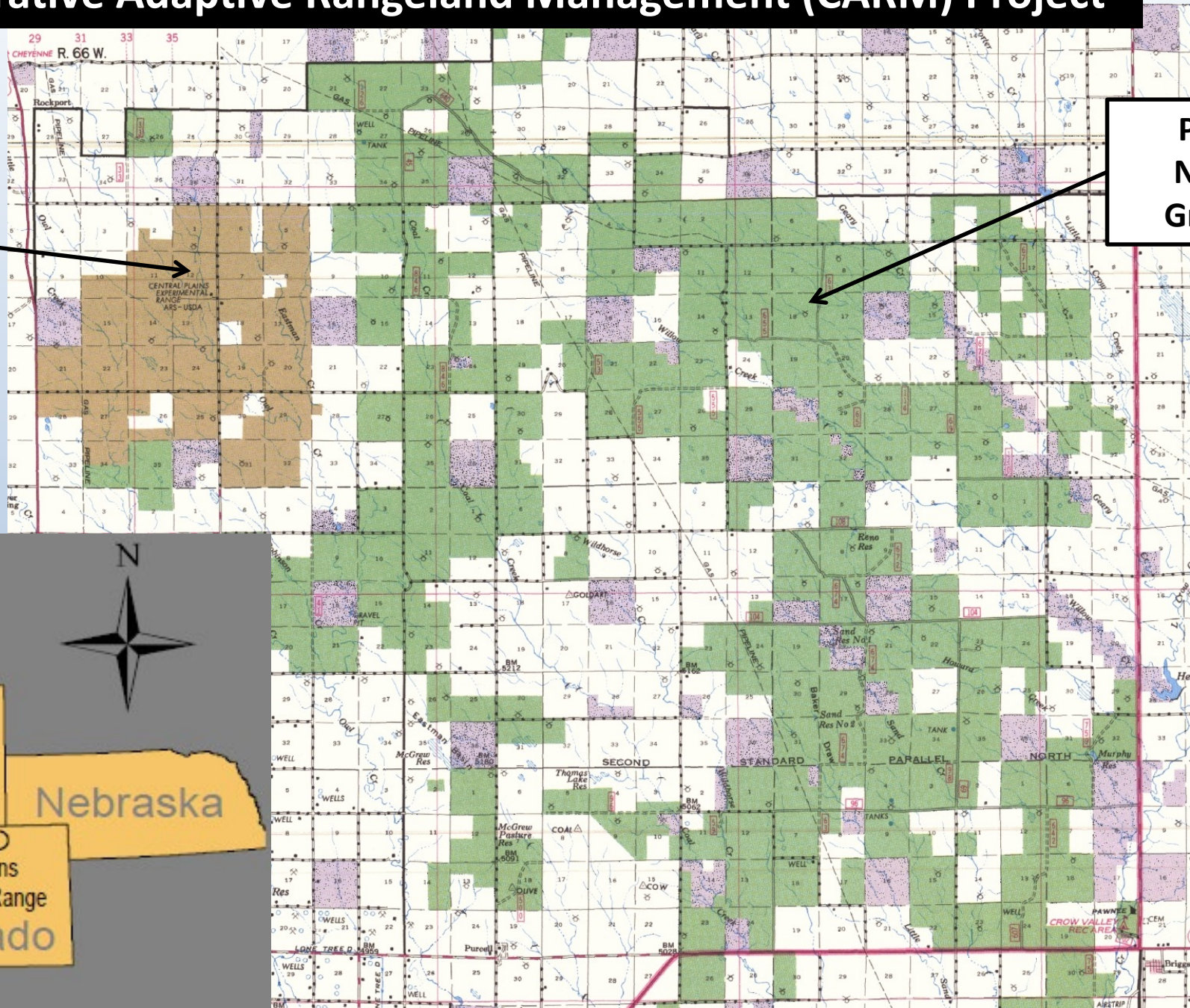
- Conversion to cropland
- Grazing management



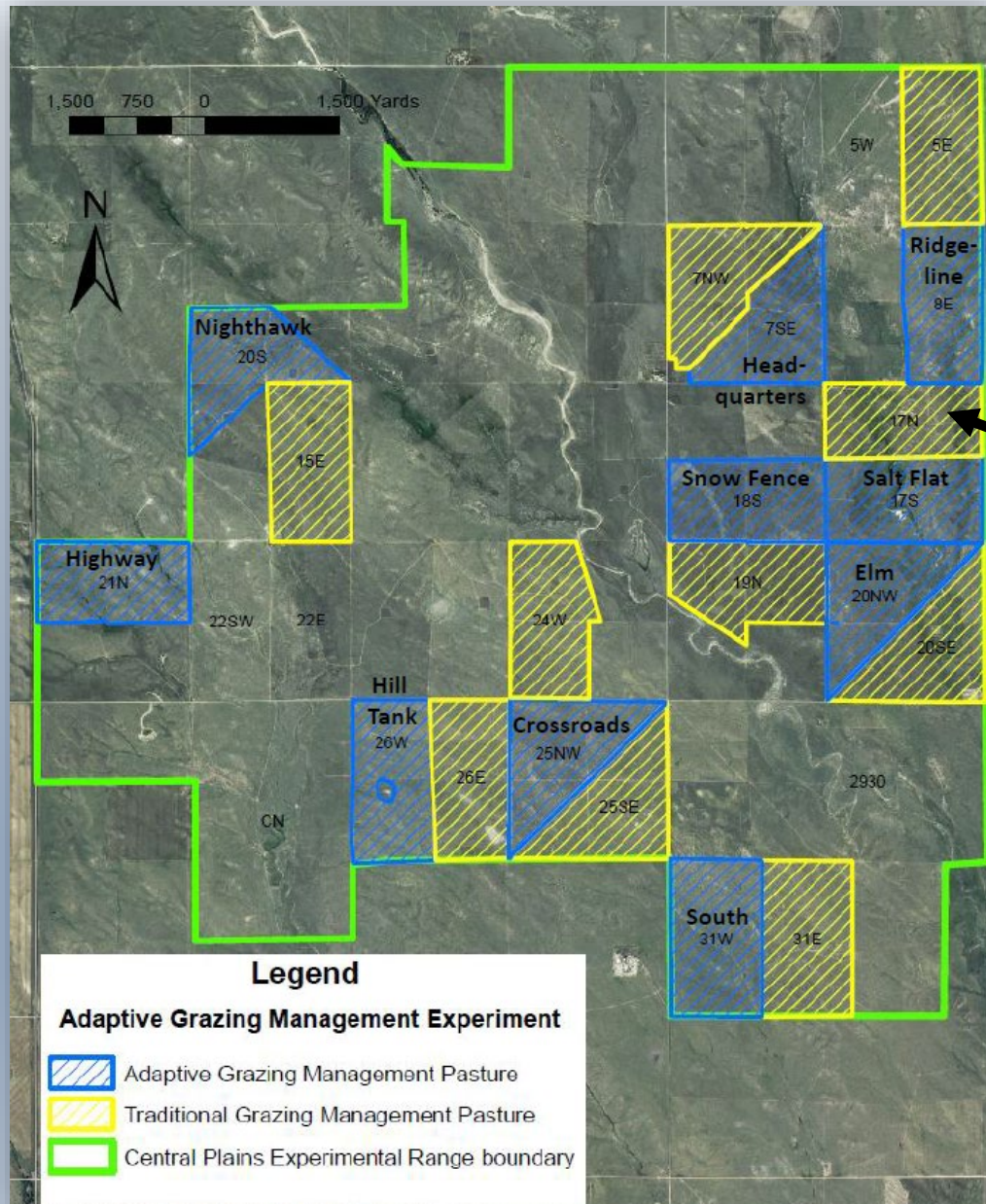
# Collaborative Adaptive Rangeland Management (CARM) Project

Central  
Plains  
Experimental  
Range

Pawnee  
National  
Grassland



# CARM in Colorado

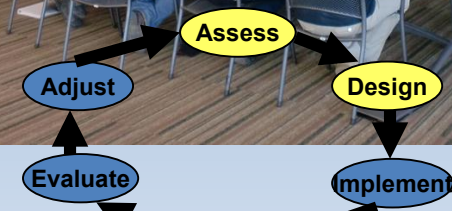


Traditional Rangeland Management Treatment

Moderate, season-long stocking @ low stock density (20 – 24 steers per pasture; May 15 – Oct 1)

# Collaborative Adaptive Management Implemented by 11 member stakeholder group

- 4 ranchers
  - Crow Valley Livestock Cooperative
- 3 conservation groups
  - The Nature Conservancy
  - Environmental Defense Fund
  - Bird Conservancy of the Rockies
- 4 land management agencies
  - NRCS, USFS, CSU Extension, CO State Land Board



Goal: Manage the land in order to pass it on to future generations  
-Economically  
-Ecologically

Vegetation



Profitable ranching operations



Wildlife

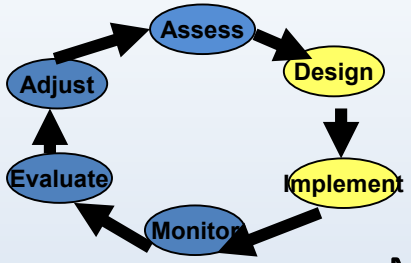


Collaborative Learning





# Adaptive Management Plan



Manage all cattle as one large herd, rotated among pastures

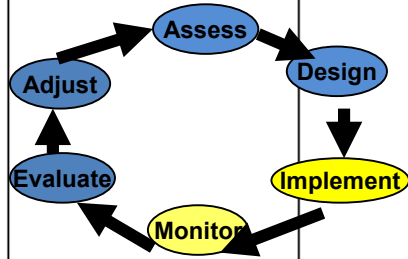
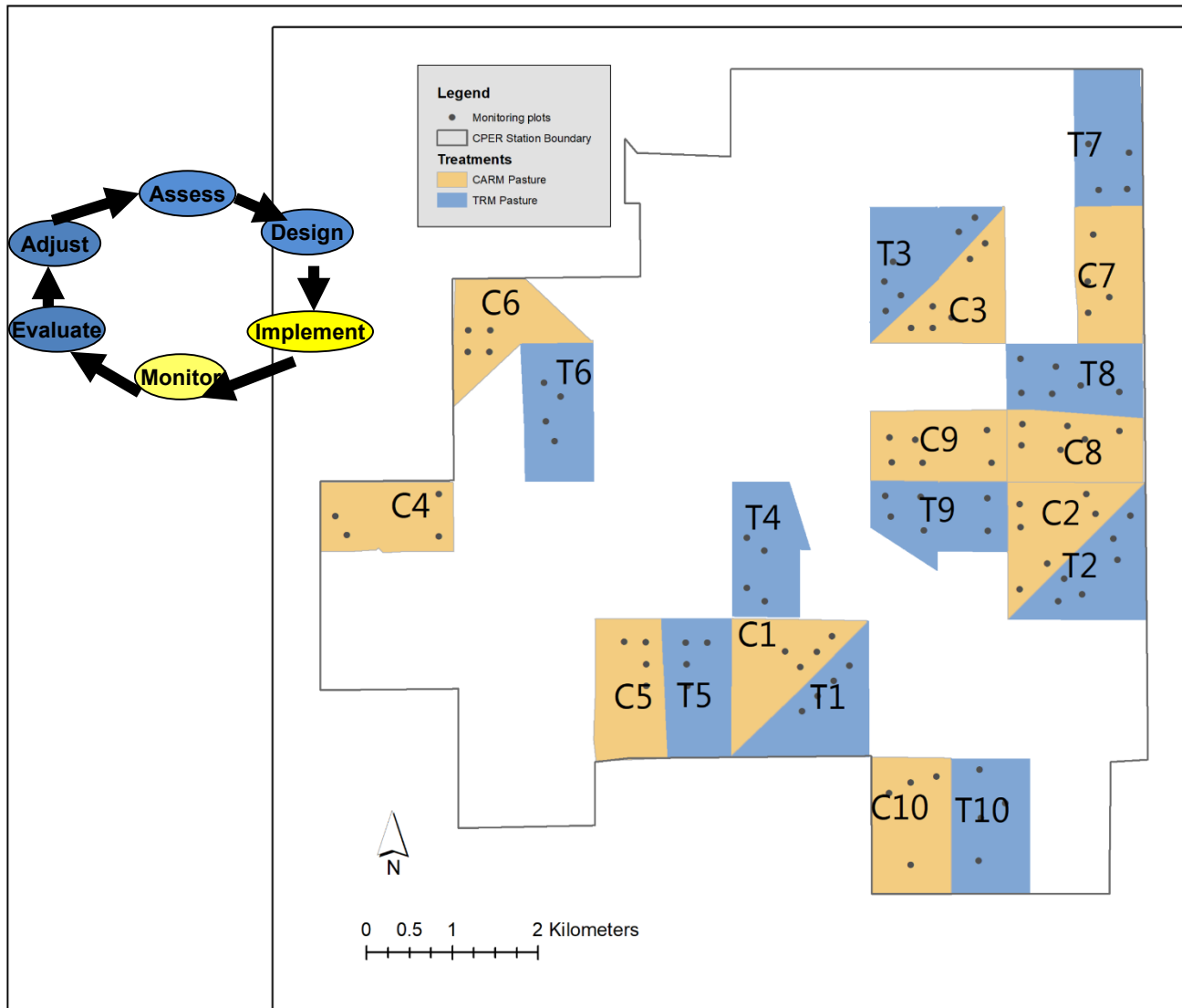
2 rested pastures/yr (grassbanks for dry years)

Movements will consider:

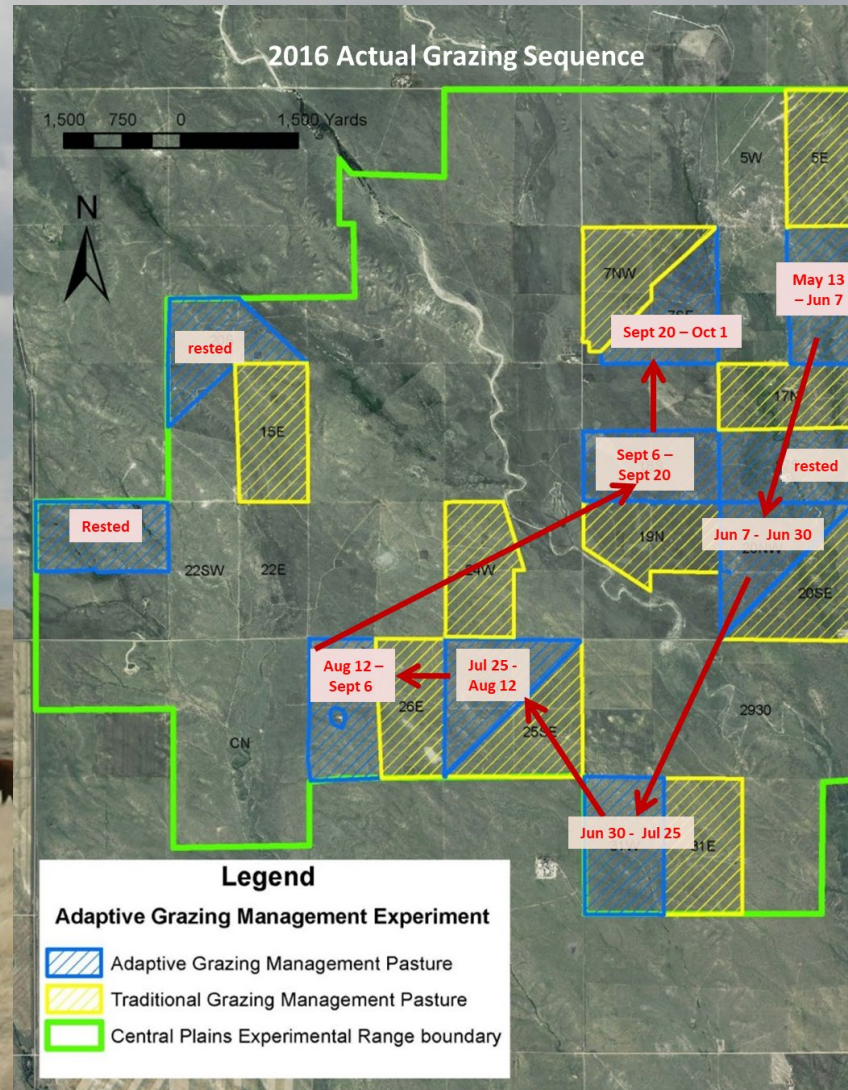
- Precipitation
- Forage biomass (visual obstruction)
- Species composition
- Seasonality



# 2013-2019: Monitoring for multiple objectives



# Treatments applied 2014 - 2019





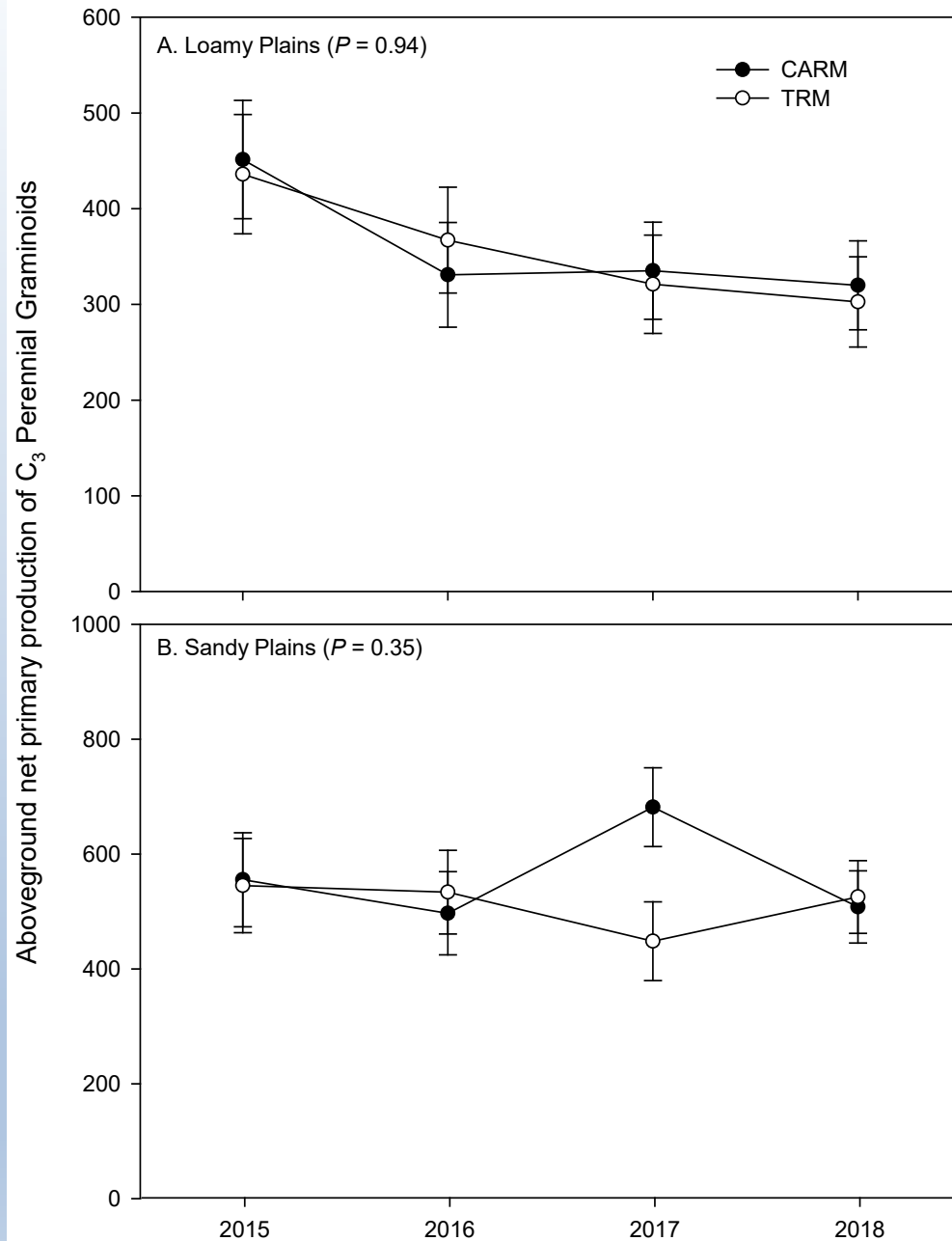
Vegetation



Enhance the abundance and productivity of  
 $C_3$  perennial grasses  
(Western wheatgrass, Needle-and-Thread)

Achieved desired level of C3 grass production for the first 5 years of the experiment,

**BUT**, the same thing happens in the paired pastures managed with season-long grazing



**No change in C3 production  
or densities of C3 plants with CARM**



# Linking grassland bird conservation with drought mitigation

## CARM

Wet Year

Grasshopper  
sparrow

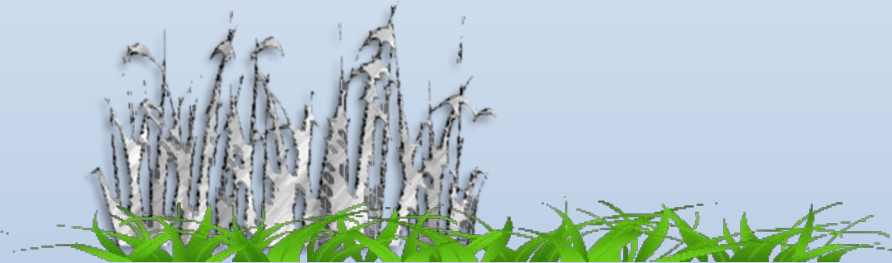


McCown's  
longspur

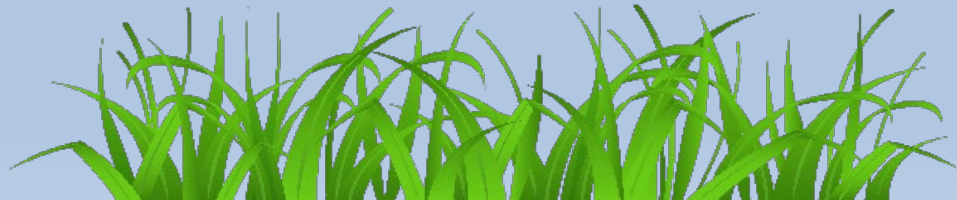


Dry Year

Grass bank helps maintain  
stocking rate



## TRM



No grass bank – reduced  
stocking rate (-\$)



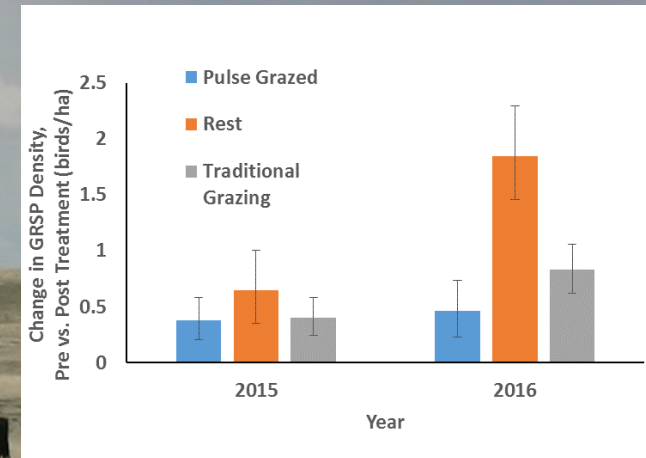
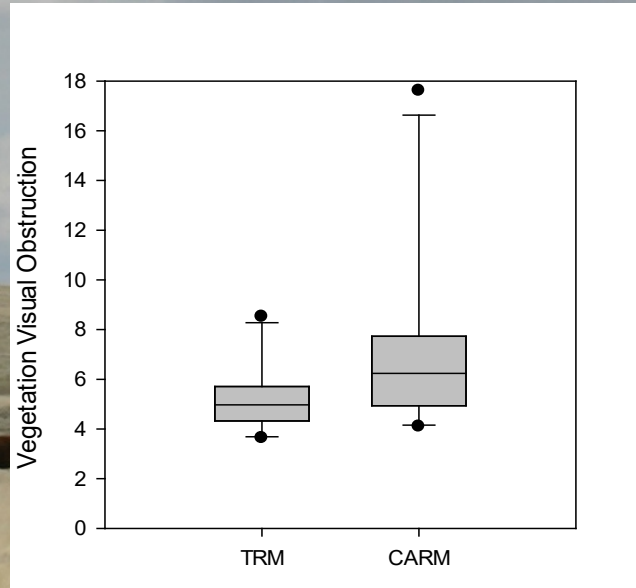
# Grasshopper Sparrows

Increased Vegetation Heterogeneity

More Grasshopper Sparrows



➤ Increased variation in grazing intensity among pastures





# Linking grassland bird conservation with drought mitigation

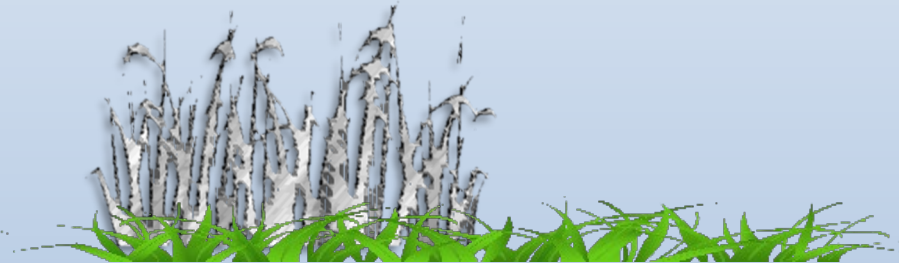
## CARM

Wet Year

Dry Year

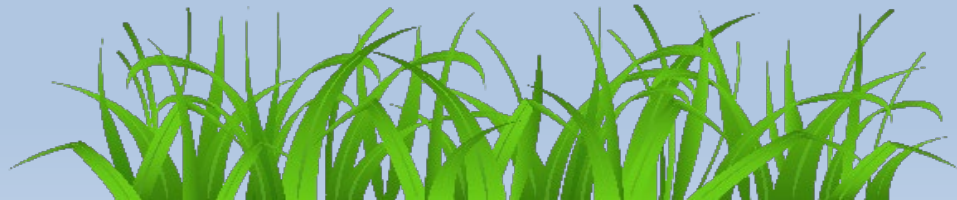


Grass bank helps maintain stocking rate

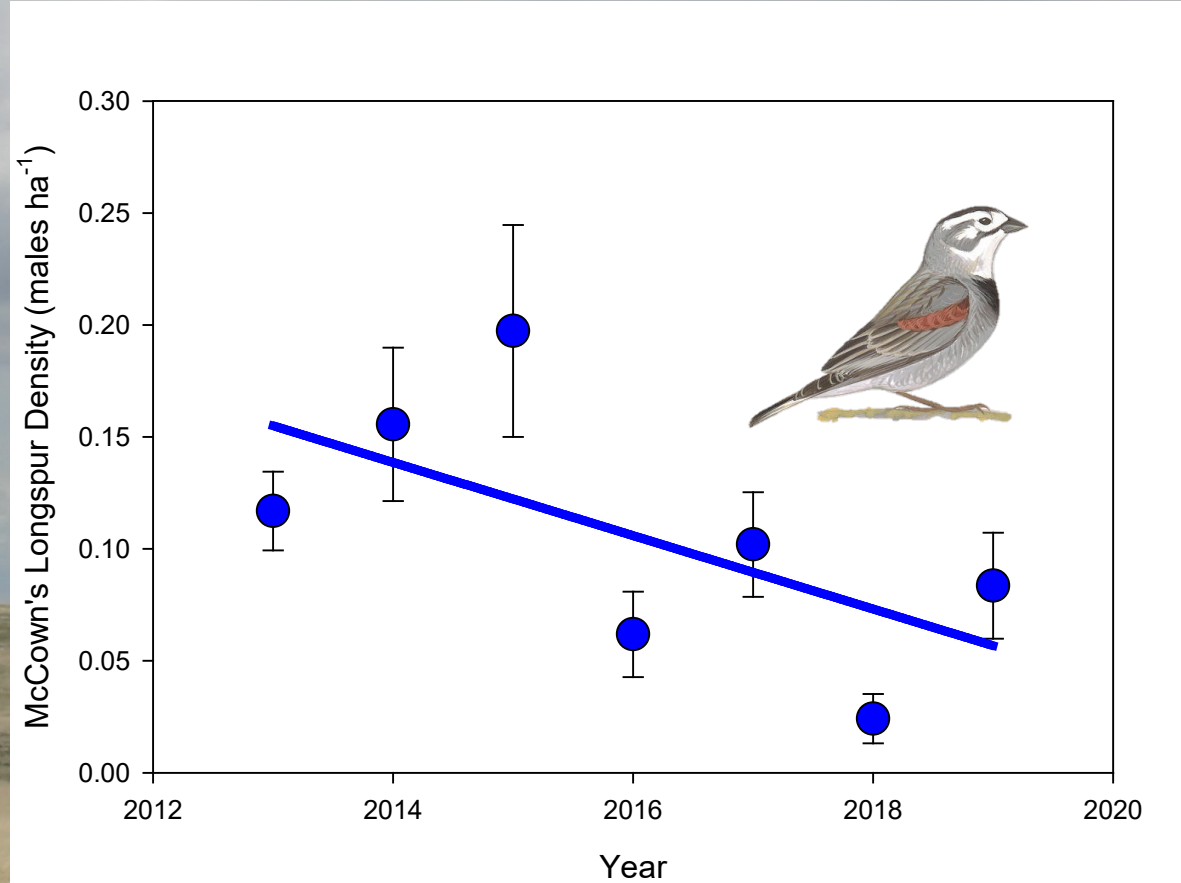


## TRM

No grass bank – reduced stocking rate (-\$)



# McCown's Longspur



**Abundance declining to a similar degree in BOTH the CARM and Traditional treatments over past 7 years.**

# Linking grassland bird conservation with drought mitigation

CARM

Wet Year

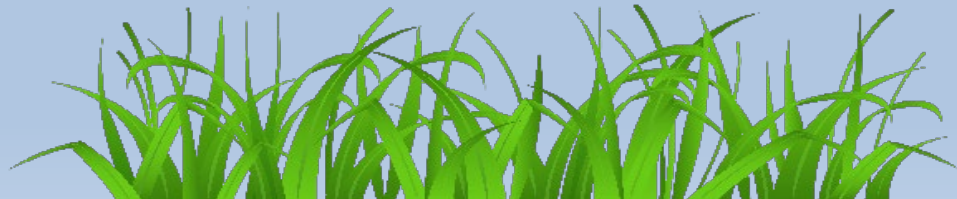
Dry Year



Grass bank helps maintain stocking rate

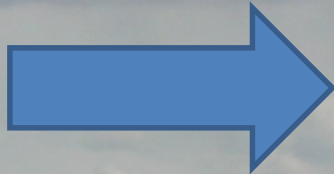
TRM

No grass bank – reduced stocking rate (-\$)



# Uncertainty: will short-term losses be offset by long-term gains?

10 – 60% of CARM landscape is rested each year

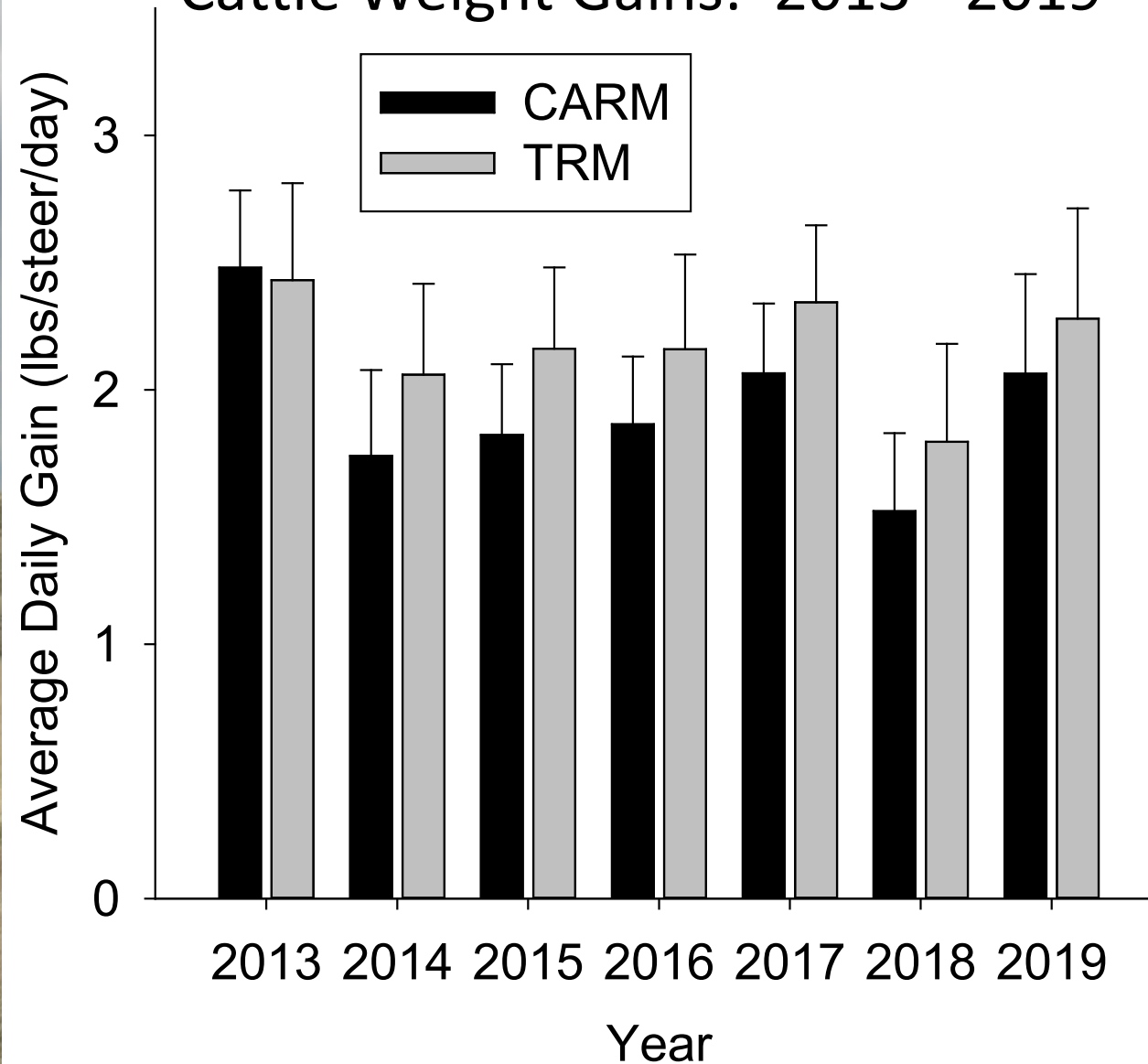


Increased capacity to sustain cattle through drought could offset weight losses in wet years??



# CARM Tradeoffs

## Cattle Weight Gains: 2013 - 2019



# Linking grassland bird conservation with drought mitigation

CARM

Wet Year

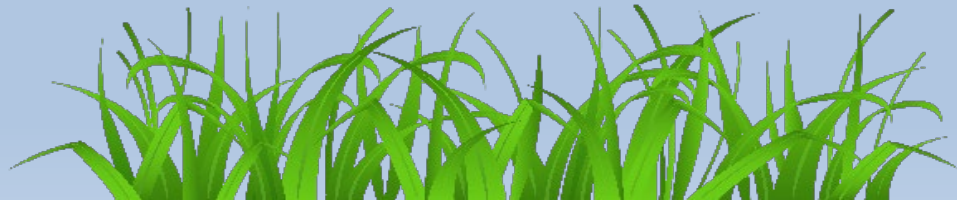
Dry Year



Grass bank helps maintain stocking rate

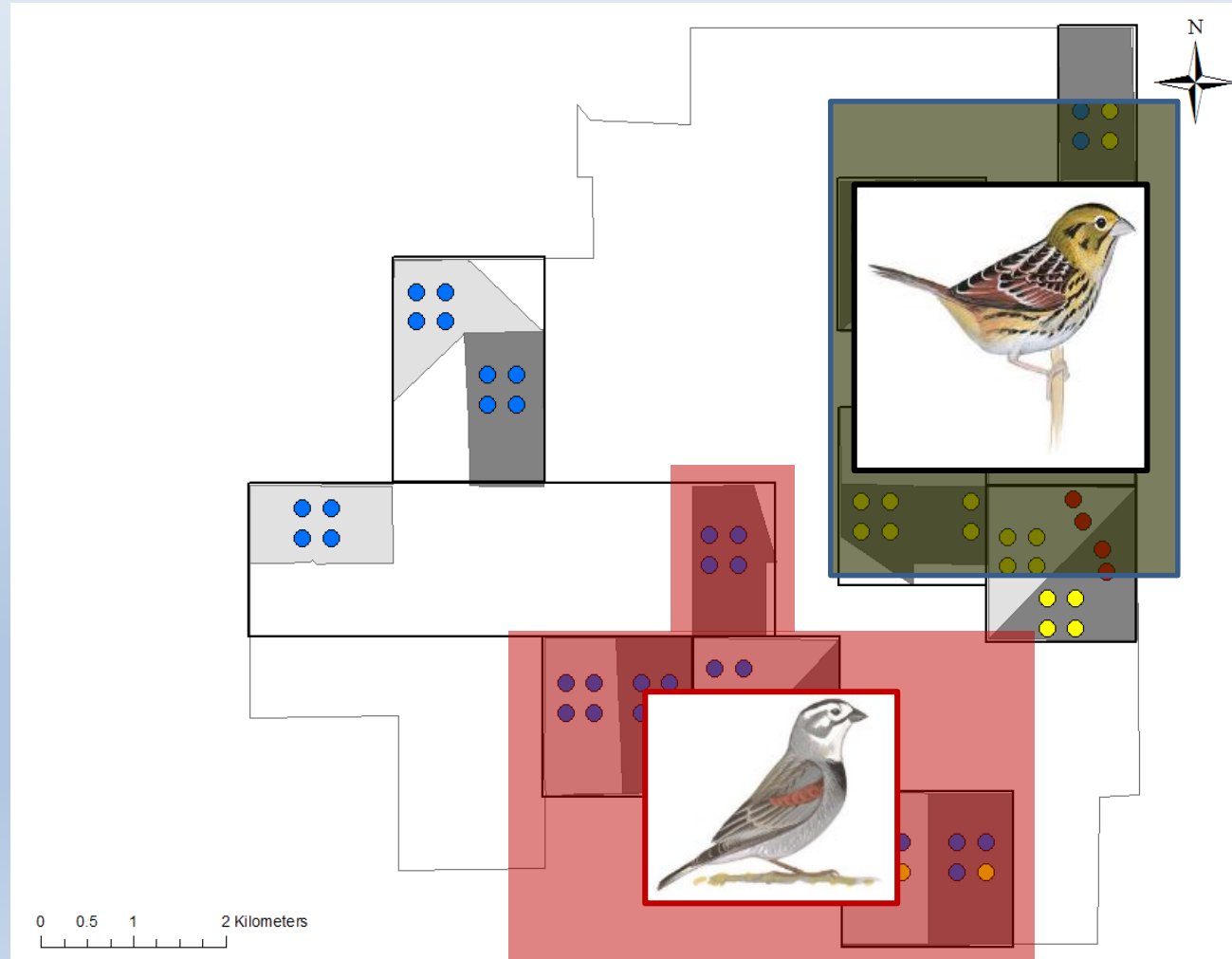
TRM

No grass bank – reduced stocking rate (-\$)



## Key Takeaways:

- 1) Spatial Prioritization of bird habitat objectives
- 2) Longer periods of intensive grazing may be needed for shortgrass obligates



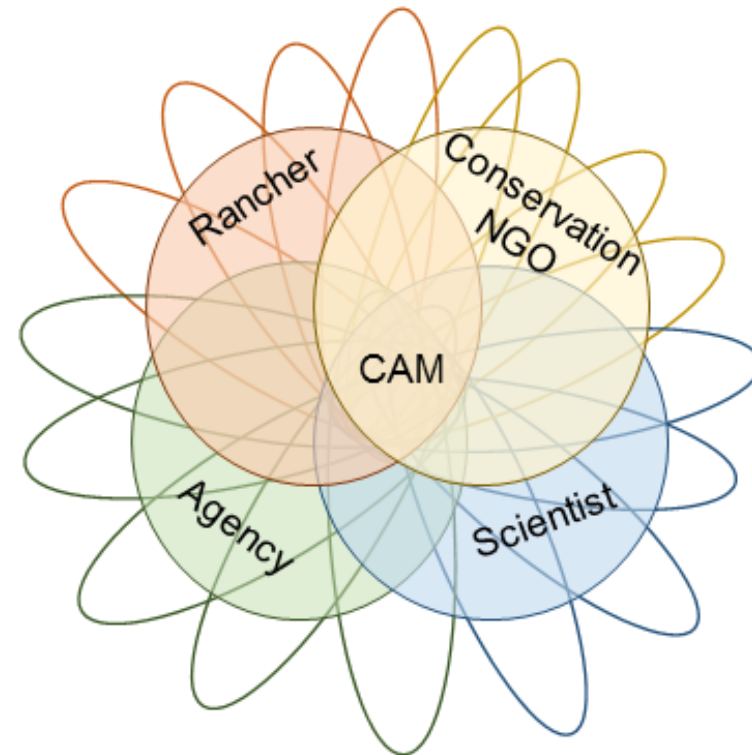
Conclusions: Grappling with complexity drove learning and progress in CARM, and built trust for co-produced science





Conclusions: There is no unitary “public”, but rather the intersection of many different mental models and social worlds.

CAM makes visible, but does not reconcile, differences among stakeholder knowledge sources.



CAM conceptualized as encounter of multiple individual mental models (ellipses) and social worlds (circles) leading to creation of new, shared domain of interaction.

Contact: [David.Augustine@usda.gov](mailto:David.Augustine@usda.gov)

Learn More:

Wilmer, Hailey, Justin D Derner, Maria E. Fernández-Giménez, David D Briske, David J Augustine, Lauren M Porensky, and The CARM Stakeholder Group. 2018. “Collaborative Adaptive Rangeland Management Fosters Management-Science Partnerships.” *Rangeland Ecology & Management* **71 (5): 646–57.**

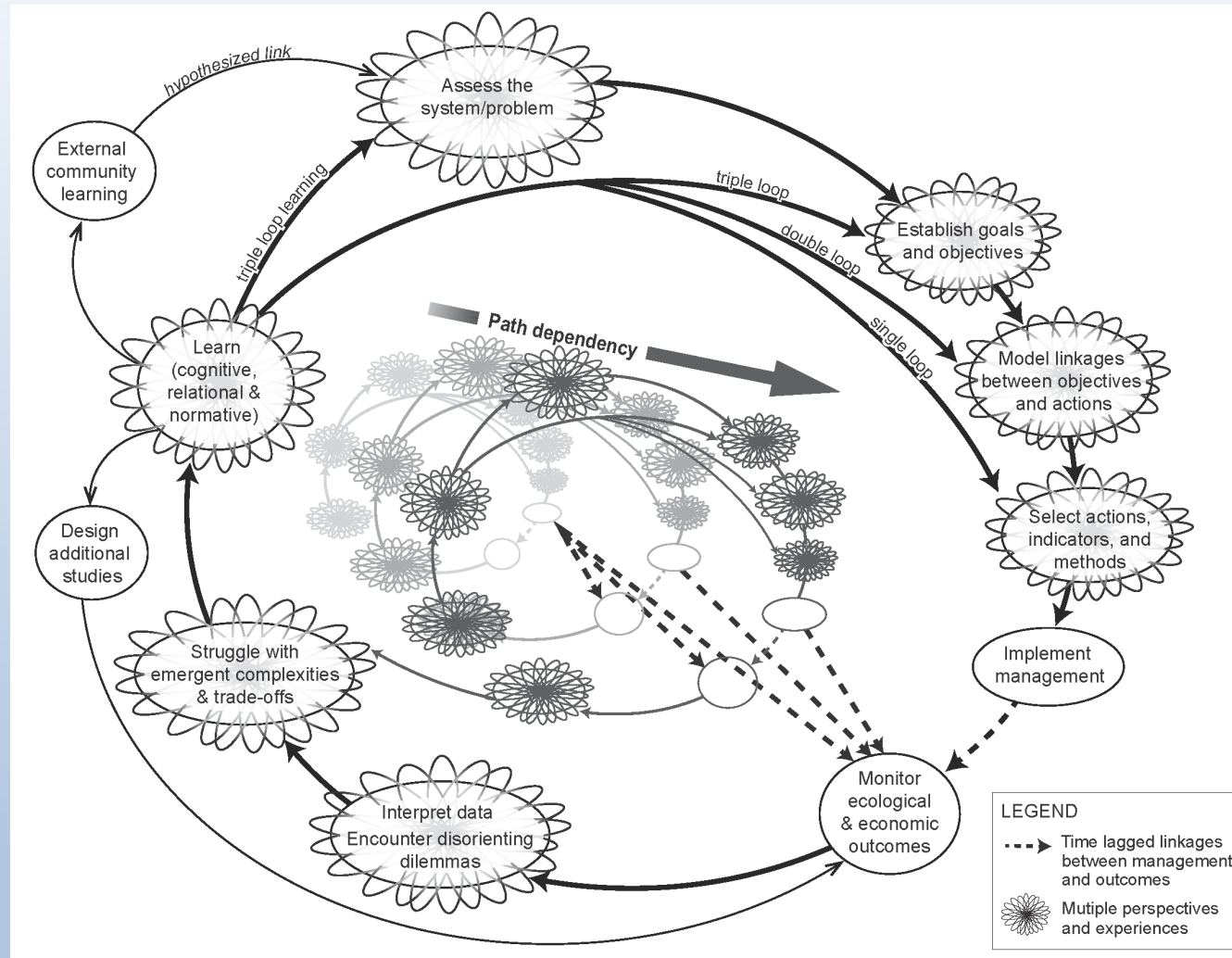
Digital Fact sheet: <https://spark.adobe.com/page/cDD9u5v5ZeC88/>



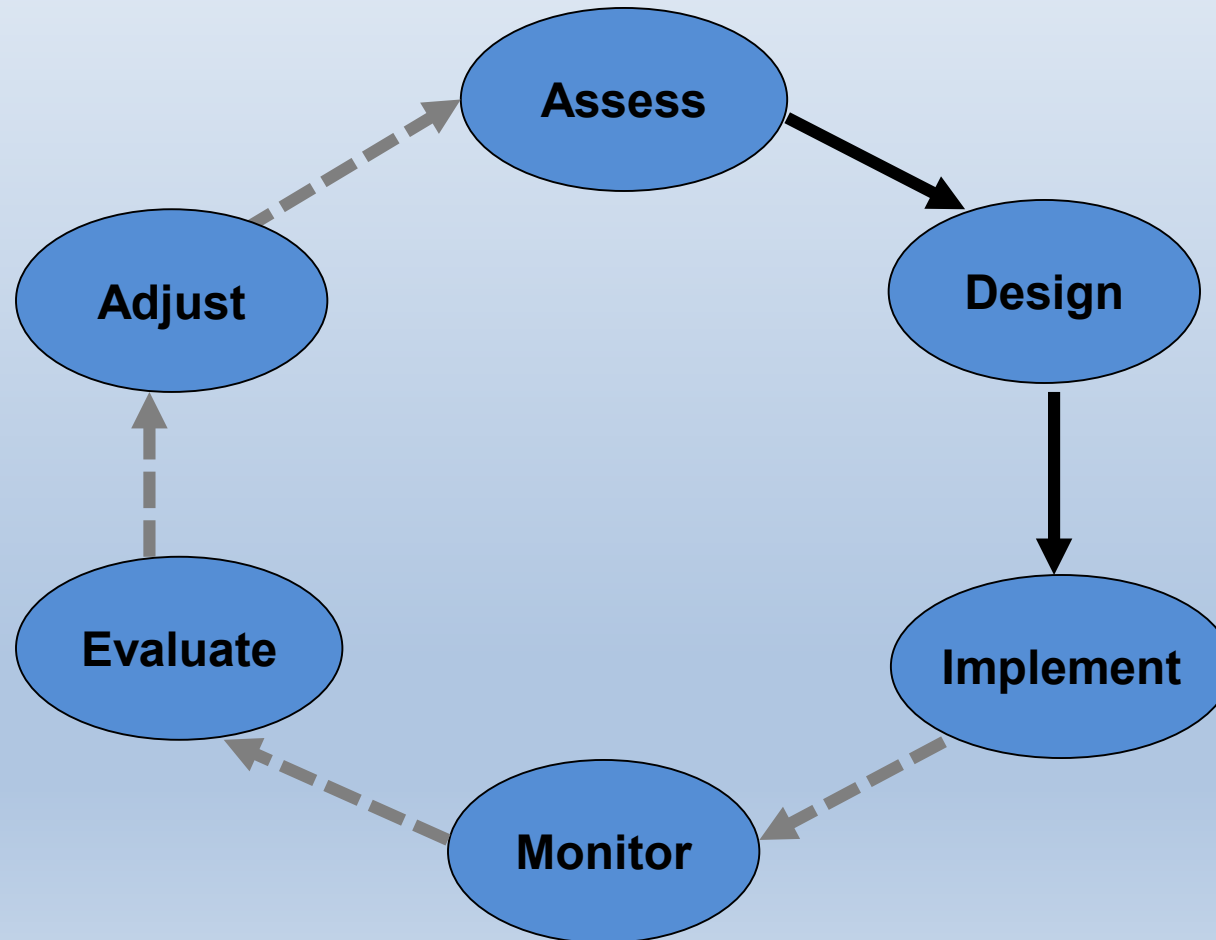
adaptive grazing management



# The Collaborative Adaptive Management Spiral



Conclusions: Time lags and complex tradeoffs  
impede “closing the loop”



Conclusions: CAM is not a circle, but rather a spiral. Path-dependency makes it impossible to repeatedly adjust a single system component in isolation.



# Herd size affects foraging behavior

