# Linking animal, wildlife and social research for Collaborative Adaptive Rangeland Management

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Collaborative adaptive management attempts to bridge the science-management divide through a processes of science-based, participatory rangeland management research.

11 stakeholders make decisions about goals/objectives, grazing, stocking rates and vegetation treatments.

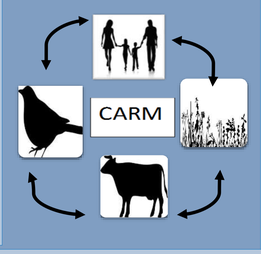
**Collaborative Adaptive Rangeland Management**

The CARM project began in 2012 and is planned for 10 years. Pastures were stocked in 2013 for baseline data collection and treatments began in 2014.

Stakeholders: The Nature Conservancy; Colorado State Extension; USDA Forest Service; Colorado State Land Board; Crow Valley Livestock Cooperative (4 ranchers); Bird Conservancy of the Rockies; Natural Resources Conservation Service; Environmental Defense Fund

**Stakeholder Goal:**
To manage land in order to pass it on to future generations

**Wildlife Objectives:**
A: Maintain populations of McCown's longspur, Western meadowlark and horned lark
B: Increase populations of grasshopper sparrow, Cassin's sparrow, Brewer's sparrow, lark bunting and mountain plover
C: Maintain control of prairie dog populations

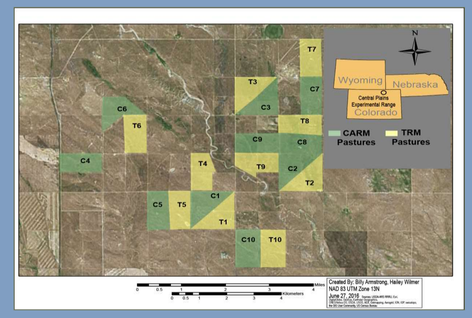



**Vegetation Objectives:**
A: Increase percentage of cool season grasses and non-shortgrass plants by weight and number of plants
B: Increase variation in vegetation structure, composition and density within and among pastures
C: Maintain or increase size of four-wing saltbush and winterfat shrubs

**Profitable Ranching Objectives:**
A: Maintain or increase livestock weight gain
B: Reduce economic impact of drought
C: Maintain or reduce operating costs

## Treatments: CARM vs. TRM

**Collaborative Adaptive Rangeland Management (CARM):** 10, 320-acre shortgrass pastures stocked from mid-May to October with yearling cattle, managed through collaborative adaptive management (rotations, stocking rate informed by monitoring data and multi-stakeholder collaboration).




**Traditional rangeland management (TRM):** 10 pastures paired to CARM, season-long (mid-May to October) continuous grazing at same stocking rate.

**Social-Ecological System**

Multiple Rangeland Objectives

**Multi-disciplinary** contributions from young scientists and mentors in **animal, social and wildlife sciences** evaluate outcomes of CARM vs. TRM treatments and decision-making processes.

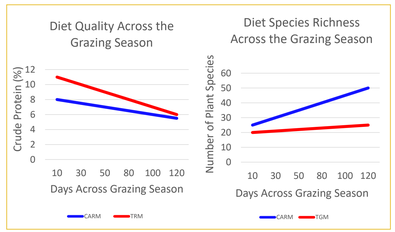
This work was supported by the USDA-ARS, University of Wyoming, Western SARE GW17-059, USDA-ARS RRSRU, Environmental Defense Fund, AFRI awards 2009-04442 and 2012-38415-21 20328, USDA-NIFA award 2015-67019-23009, Colorado Agricultural Experiment Station project COLO0698, the Nebraska Game and Parks Commission, and the Center for Collaborative Conservation at Colorado State University.

## Question

Tami Plechaty, Ruminant Nutrition

**What are the differences in diet quality and dietary selection of cattle in CARM vs. TRM treatments?**

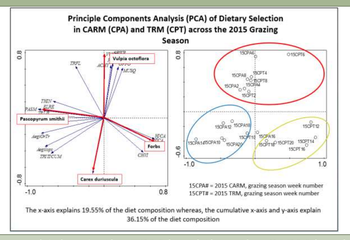
## Hypothesis




## Methods

- Assessed diet quality of cattle (crude protein) through Near Infrared Reflectance Spectroscopy (NIRS) on herd fecal samples, weekly
- Quantified plant species/genus protein composition in the diet through DNA Metabarcoding analysis on herd fecal samples, bimonthly

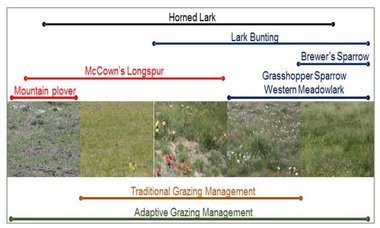
## Results



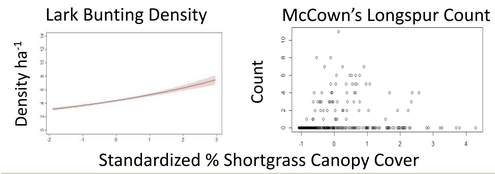

Diet quality was higher in the TRM herd than the CARM herd. CARM cattle eat more western wheatgrass (*Pascopyrum smithii*) and TRM cattle eat more forbs and blue grama (*Bouteloua gracilis*).

Kristin Davis, Wildlife Biology

**How do grazing management (CARM or TRM), weather, and landscape characteristics influence the abundance of grassland birds?**



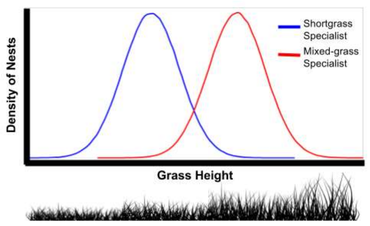

- Measured species abundance through point counts
- Measured vegetation structure and composition along transects
- Used generalized linear models (GLMs) to test for effects of weather, habitat and/or grazing treatment on grassland bird abundance



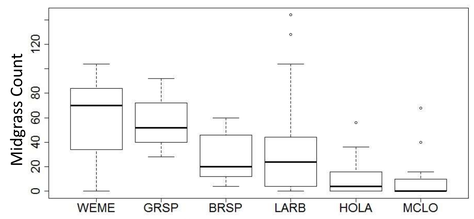

Our preliminary GLM results show lark bunting and McCown's longspur abundances were most influenced by structural vegetation cover. Lark bunting abundance was most influenced by shortgrass and forb cover, and McCown's longspur abundance was most influenced by shortgrass cover. Neither species was directly influenced by grazing management.

Amber Carver, Wildlife Biology

**What is the relative impact of nest-site and area vegetation on nest establishment and survival?**



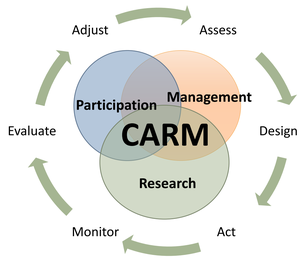

- Located nests through rope-dragging
- Assessed nest fate through high-frequency monitoring; measured nest-site vegetation
- Modeled species-specific effect of vegetation on nest establishment
- Will model effect of nest vegetation on nest survival




**Nest-site midgrass cover differs by species.**
WEME: Western Meadowlark; GRSP: Grasshopper Sparrow; BRSP: Brewer's Sparrow; LARB: Lark Bunting; HOLA: Horned Lark; MCLO: McCown's Longspur

Hailey Wilmer, Social Science

**How do co-produced and existing knowledge inform stakeholder decision-making?**




- Process tracing of decision-making from meetings, interviews and participatory focus group

*"I hope the major lesson that comes out of it is that collaborative, multi-stakeholder processes actually work. That you can have your cake and eat it too."*
- Stakeholder, Spring 2016

The CARM process is non-linear. CARM makes visible, but does not reconcile differences between, stakeholders' rangeland management knowledges. Stakeholder act upon understanding that not collaborating has risks for their real-world rangeland management decision-making.

## Discussion

Grazing management influences diet quality and selection of cattle, and alters vegetation structure across the landscape.

Landscape heterogeneity in vegetation structure determines the distribution, abundance and nest-site selection of the grassland birds.

Participatory rangeland research is an opportunity to build trust and understanding among diverse stakeholders.

Multi-disciplinary collaborations enhance collaborative adaptive rangeland management processes that address social-ecological management objectives.