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

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Key Recommendations for Grazing Management and Research

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

Contributing factors:
• Conversion to cropland
• Grazing management
Collaborative Adaptive Rangeland Management (CARM) Project

Central Plains Experimental Range

Pawnee National Grassland

Wyoming, Nebraska, Colorado
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
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

- Assess
- Design
- Implement
- Monitor
- Evaluate
- Adjust
Treatments applied 2014 - 2019
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**

**Wet Year**
- Grass bank helps maintain stocking rate

**Dry Year**
- No grass bank – reduced stocking rate (-$)

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Grasshopper Sparrows

- Increased variation in grazing intensity among pastures

Increased Vegetation Heterogeneity

More Grasshopper Sparrows
Linking grassland bird conservation with drought mitigation

**Wet Year**
- Grass bank helps maintain stocking rate
- Grass bank
- Grasshopper sparrow
- McCown’s longspur

**Dry Year**
- Grass bank helps maintain stocking rate

**CARM**

**TRM**
- No grass bank – reduced stocking rate (-$)

Drawings copyright David Sibley
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

Wet Year
- Grass bank helps maintain stocking rate

Dry Year
- Grass bank helps maintain stocking rate
- No grass bank – reduced stocking rate (-$)

CARM
- Grasshopper sparrow
- McCown’s longspur

TRM
- Wet Year
- Grass bank helps maintain stocking rate
- Dry Year
- No grass bank – reduced stocking rate (-$)

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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

Average Daily Gain (lbs/steer/day)

Year

CARM
TRM

Linking grassland bird conservation with drought mitigation

**Wet Year**
- Grass bank helps maintain stocking rate
- Grass bank helps support sparrows
- McCown's longspurs benefit

**Dry Year**
- No grass bank – reduced stocking rate (-$)

**CARM**
- Grass bank helps maintain stocking rate

**TRM**
- No grass bank – reduced stocking rate (-$)

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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.
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Learn More:


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

Cattle Collar GPS Fixes 07/23/14 - 08/18/14

Fixes from 2 steers per pasture.