Implementing Collaborative Adaptive Management Research at the UNL Barta Brothers Ranch

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Introduction

Collaborative Adaptive Management (CAM) is a participatory approach to natural resource management that uses an iterative framework for structured decision making and learning with engagement and input of multiple stakeholders (Allen et al. 2011). CAM follows a structured loop of identifying objectives, implementing management, monitoring results, and shifting management in the process of "learning by doing".

In 2020, a CAM project was launched at the UNL Barta Brothers Ranch (BBR) with the aim to address risk and uncertainty related to grassland management in the Nebraska Sandhills. Through a series of stakeholder meetings, three themes were decided on as the focus for the research at BBR: 1) reduce eastern red cedar (*Juniperus virginiana* L.) woody encroachment, 2) increase heterogeneity on the landscape, and 3) maintain or improve livestock production. Many of the group discussions revolved around the role of prescribed fire, a relatively uncommon practice in the region, and how it could be implemented to meet the defined objectives at a meaningful scale. A working cognitive model was developed with the CAM participants to better explore the possibility of using a patch burn grazing experiment at the ranch (Fig. 1).

Methods

- Location: UNL Barta Brothers Ranch near Rose, Nebraska (Fig. 1)
- 4 pastures (mean: 150 acres), previously managed within a 4-pasture deferred rotation, were utilized to develop the patch-burn graze system.
- Fences were let down and gates were left open for yearlings to move across the whole area.
    - Note: This type of management was decided by the group as an option for producers to burn more area (pastures scale) and still manage as a patch burn system without removing established fences/pastures. As such, we are treating this study as a case study.
- Prescribed fires were carried out March 19, 2022 and May 18, 2023. The later date in 2023 was the result of un-safe burn conditions and a statewide burn ban in April 2023.
- Yearling spade heifers were weighed prior to turn out, at mid-season, and at the end of the grazing season. Standard 4-pasture deferred rotation (78 heifers) that is typical on the ranch was compared to patch-burn graze system (106 heifers) at similar stocking rates (0.6 AUMs/Acre).
- 5 to 8 heifers tracked with GPS collars in the patch-burn graze group
- Plant biomass collected from 30 grazing exclosures randomly placed along 3 dune complexes within the burned patch in mid-August. Biomass was compared to a long-term dataset collected from 45 grazing exclosures in 3 adjoining pastures

Working Cognitive Model

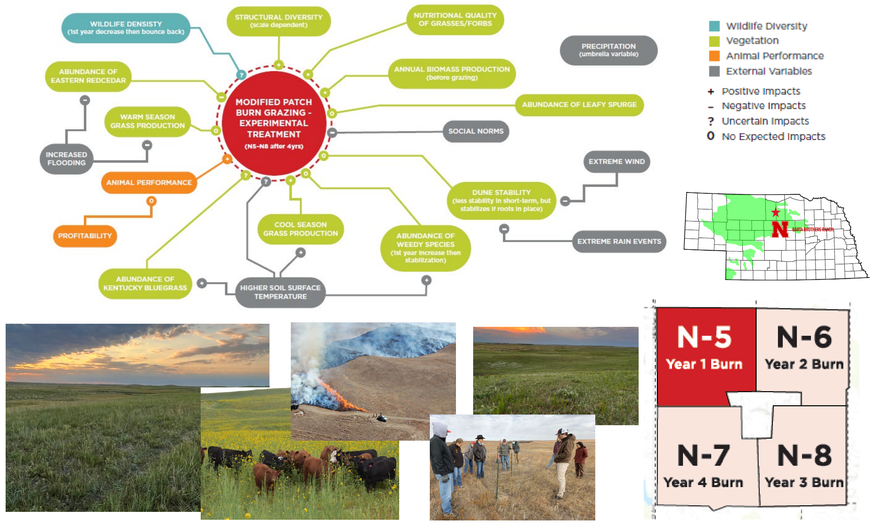

Figure 1. A working cognitive model to visualize knowledge, learning, and consensus in relation to the stated objectives of the collaborative adaptive project at the UNL Barta Brothers Ranch, photos of the ranch and the CAM project, and the general outline of the patch-burn pasture (~ 600 acres) at the ranch.

Results

- Two in person meetings each year (i.e., growing season and at the end of the growing season) provided multiple opportunities to get input from stakeholders while the data was being collected.
    - ***"I just think when we sit down as a group, we get a little too Nebraska nice. Like, 'Oh, we don't want to do anything too risky.' Well, this is the place to do it, and I want to learn something astounding, you know." -Rancher quote during a discussion on grazing levels on the burn patch***
- While only a single replication within year, weight gains indicate that heifers gained more on the patch burn treatment compared to the standard deferred rotation (Fig. 2).
- Total live plant biomass was not different between burned and unburned rangeland in both years of the study (Fig. 3).
    - Lower cool-season grass biomass ($P < 0.10$) in 2023 is likely the result of later burning date.
    - Early season burning did not reduce total biomass, but did reduce standing dead and litter material (i.e., Total Dead). This provides insight into grazing during the year following fire.
- Time heifers spent within burn patches was variable between years, and likely influenced by differences in timing of the burn (Fig. 4).
- Some rancher stakeholders still express important hesitations for burning.

Preliminary Results

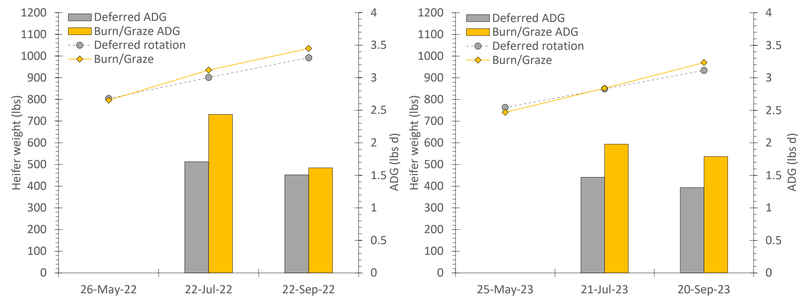

Figure 2. Weight gains and average daily gains (ADG) for spayed heifers managed within a patch-burn graze and a 4-pasture deferred rotation system in 2022 (left graph) and 2023 (right graph).

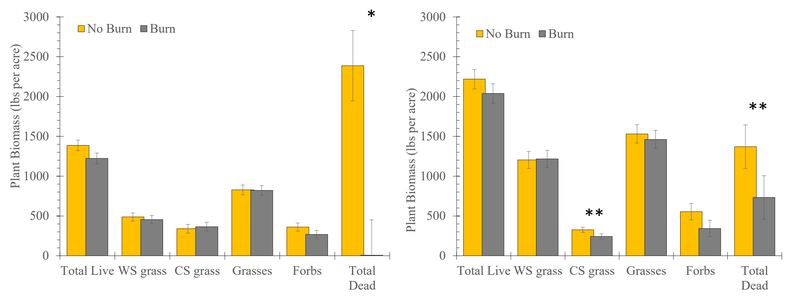

Figure 3. Plant biomass collected from grazing exclosures in 2022 (left graph) and 2023 (right graph) across dune complexes in burned and unburned rangeland

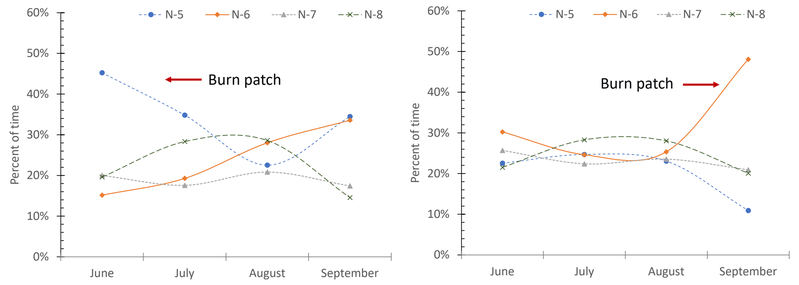

Figure 4. Percent of time GPS-tracked spayed heifers spent in different pastures (all open access to the cattle, see Fig. 1) in 2022 and 2023.

Management Implications

- Using the CAM process has provided opportunities to more closely interact with stakeholders and allow for consistent feedback on what we are learning.
- While more years of data collection are needed, better understanding of how Sandhills grasslands and cattle respond to different management strategies at BBR provide insight into how different management practices can be employed on neighboring ranches.

Adams et al. 1994. Extended grazing systems for improving economic returns from Nebraska Sandhills cow/calf operations. Journal of Range Management 47:258–263
Lamb et al. 1997. Range or meadow regrowth and weaning effects on 2-year old cows. Journal of Range Management 50:16-19.