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Efficacy of low-stress herding and low-moisture block to target cattle grazing locations on New Mexico rangelands

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ABSTRACT

Efficacy of low-stress herding (LSH) and strategic placement of low-moisture block (LMB) protein supplement was evaluated to target cattle grazing on underutilized areas of extensive and rugged rangelands in south central New Mexico. Global positioning system-tracked cattle spent more time ($P < 0.01$) on target areas (6.9 ± 0.6 h d^{-1}) than non-target areas (0.5 ± 0.6 h d^{-1}) when LSH and LMB treatments were applied. Mean distance from target areas was reduced ($P < 0.05$) by over 1 km and cattle spent less time within 100 m of water with LSH and LMB treatments compared to a free-roaming period before the treatments. Targeted cattle grazing treatments reduced current year, dormant perennial grass standing crop on target areas, but no differences were detected in the reduction in standing crop between target and non-target areas within the study pastures. Height-weight curve utilization estimates indicated that utilization was greater ($P = 0.03$) on target areas ($15.2 \pm 2.9\%$) compared to non-target areas ($5.8 \pm 2.2\%$). Overall, low-stress herding and LMB were effective tools to focus cattle grazing, but fencing may be required if greater utilization within target areas is desired.

1. Introduction

Targeted cattle grazing, the application of grazing animals on a distinct location at a specified season, intensity, and duration to achieve a defined vegetation or landscape management objective, has been suggested as a viable management tool to decrease the effects of wildfires by reducing fine fuel loads and disrupting fine fuel continuity on arid rangelands (Hobbs, 1996; Davison, 1996; Taylor, 2006; Diamond et al., 2009; Strand et al., 2014). Targeted grazing also has been suggested as a management tool to alter vegetation characteristics (e.g., species composition, forage quality, and vegetation structure) for potential forage and habitat benefits of wildlife (Holechek et al., 1982; Vavra, 2005; Mosley and Brewer, 2006; Derner et al., 2009). However, application of targeted cattle grazing on extensive western US rangelands is often difficult because of rough topography, large pasture size, and limited water availability.

Targeted cattle grazing methods often include building smaller paddocks and increasing stocking densities to achieve desired levels of utilization on target areas or target plant species (Ralphs et al., 2007; Diamond et al., 2012). Because landscapes in many areas of the western US consist of heterogeneous ecological sites (e.g., riparian areas in close proximity to less productive uplands), simply increasing livestock densities on large pastures may only cause overgrazing on preferred areas while areas farther from water or on steeper slopes remain ungrazed or only lightly grazed (Irving et al., 1995; Bailey and Brown, 2011). Building smaller paddocks may provide opportunities to increase stocking densities on specific target areas, but building fences in locations with rough topography and limited water availability may be impractical in many areas of the western United States. Furthermore, disruption of wildlife movement by fences makes building smaller pastures undesirable on many public rangelands that are managed for multiple uses (Yoakum, 1975; Stevens et al., 2012).

The use of low-moisture block (LMB) protein supplements to attract cattle to underutilized areas is a successful and cost effective alternative to fencing in order to manipulate distribution of cattle grazing within large, topographically diverse pastures (Bailey and Welling, 1999; Bailey et al., 2001; George et al., 2008; Bailey, 2005; Tanaka et al., 2007). Supplement placement can increase

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forage utilization in areas up to 600 m surrounding LMB supplement placement (Bailey et al., 2001; George et al., 2008). However, topography may affect the efficacy of LMB supplement as an attractant to underutilized areas. Bailey and Welling (1999) observed greater utilization on uplands when LMB was placed on moderate terrain compared to rough terrain. Low-moisture block supplements are more effective at altering grazing distribution and increasing cattle utilization on uplands compared to other supplementation methods such as conventional dry mineral mixes (Bailey and Welling, 2007) or range cake supplement cubes (Bailey and Jensen, 2008). When vegetation is actively growing and forage quality is high, consumption of LMB by cattle is typically much lower and the effectiveness of LMB as an attractant is reduced compared to periods when vegetation is dormant and lower in quality (Pollak, 2007; Stephenson, 2014).

Herding on horseback is another recommended management tool to modify cattle grazing distribution patterns and increase utilization on areas that typically receive little grazing use (Skovlin, 1957; Butler, 2000; Cote, 2004; Bailey, 2005; Bailey et al., 2008). Low-stress herding (LSH) is, in part, the process of moving livestock to a desired location using calm and consistent pressure and release herding techniques (Hibbard, 2012). Low-stress herding differs from conventional herding by limiting practices that may cause cattle unnecessary stress (i.e., loud vocal cues, erratic movements, excessive pressure, etc.). Cattle are trained through positive reinforcement of correct movements to readily move to desired locations and remain settled once there (Cote, 2004; Hibbard, 2012). Proponents of LSH anecdotally report that when LSH is properly conducted a livestock manager can keep livestock together as one herd, place and keep cattle on upland positions away from riparian areas, and keep cattle away from previously grazed areas without fences (Cote, 2004). However, research has indicated that a combination of LSH and LMB supplement may be more effective at increasing cattle utilization on upland areas compared to using LSH alone or with only salt placed at strategic locations (Bailey et al., 2008; Bailey and Stephenson, 2013).

The objectives of this study were to 1) examine the effectiveness of LSH and LMB to target cattle grazing locations and reduce the standing biomass of dormant vegetation on south central New Mexico rangelands, 2) evaluate differences in vegetation cover, structure, and quality within targeted and non-targeted areas during the growing season following LSH and LMB treatments, and 3) evaluate grazing distribution behavior of cattle with LSH and strategic LMB placement. It was hypothesized that targeted cattle grazing using LSH and LMB would effectively reduce fine fuels, alter vegetation cover and structure, and increase time cattle remained in previously underutilized target areas on extensive rangelands.

2. Methods

2.1. Study sites

Research was conducted at the Chihuahuan Desert Range Research Center (CDRRC) located 37 km north of Las Cruces, NM (Latitude: 32° 32′ N, Longitude: 106° 48′ W) and on the Lincoln National Forest in the eastern Sacramento Mountains (Mayhill) near Mayhill, NM (Latitude: 32° 56′ N, Longitude: 105° 28′ W). Temperatures at the CDRRC typically range from 16 to 36 °C during the summer months and −3 to 13 °C during the winter months. Long-term mean annual precipitation and monsoon season (July through September) precipitation at the CDRRC is 234 mm and 124 mm, respectively. At the Mayhill site, temperatures typically range from 7 to 28 °C during the summer and −7 to 12 °C during the winter. Long-term mean annual precipitation at the Mayhill site is 419 mm and mean monsoon season precipitation is 223 mm.

Topography at the CDRRC is characterized by sloping hills and low-lands. Dominant grass species within the study pastures are mesa dropseed (*Sporobolus flexuosus* [Thurb. ex Vasey] Rydb.), spike dropseed (*Sporobolus contractus* Hitchc.), and bush muhly (*Muhlenbergia porteri* Scribn. ex Beal). Overstory vegetation consists of scattered honey mesquite (*Prosopis glandulosa* Torr. var. *glandulosa*), fourwing saltbush (*Atriplex canescens* [Pursh] Nutt.), creosote bush (*Larrea tridentata* [DC.] Coville) and Mormon tea (*Ephedra viridis* Coville). Topography at the Mayhill site is characterized by steep slopes and ridges greater than 100 m from narrow valley bottoms. Dominant grass species include bull muhly (*Muhlenbergia emersleyi* Vasey), blue grama (*Bouteloua gracilis* [Willd. ex Kunth] Lag. ex Griffiths), and sideoats grama (*Bouteloua curtipendula* [Michx.] Torr.). Overstory vegetation consists of oak brush (*Quercus turbinella* Greene) and alligator juniper (*Juniperus deppeana* Steud.) (USDA, 2014).

Research was conducted within 2 pastures (Pasture 13 = 3770 ha and Pasture 16 = 2875 ha) at the CDRRC (see Fig. 1) in December 2011 and January 2012 (year 1) and in December 2012 and January 2013 (year 2). At the Mayhill site, research was conducted within the western portion of the Carr Gap Allotment pasture (3048 ha) in March and April 2013 (Fig. 1). Prior grazing management on the study pastures at the CDRRC was characterized by light stocking rates on both pastures. Pasture 16 had not been grazed since 2009. Previous grazing management at the Mayhill site was light to moderate grazing up to May 2011 when cattle were removed from the allotment because a wildfire burned the southeastern portion of the study pasture. In early 2012, only 22 cow/calf pairs were allowed to graze on the allotment and in early 2013, 55 cows were placed on the allotment, which resulted in light stocking rates.

2.2. Target and non-target study areas

Paired target and non-target study areas were selected at the CDRRC (~5 ha; 125 m radius from LMB supplement placement) and Mayhill (~3 ha; 100 m radius from LMB supplement placement) study sites. Areas were selected based on observed similarities in plant community, standing crop, herding distance from water, aspect, and slope in both pastures (Table 1; Fig. 1). Study areas at the CDRRC and Mayhill sites were selected in portions of the pastures that typically received little cattle grazing. Study areas were greater than 600 m from each other or separated by dividing ridges and gullies. Study areas were smaller at the Mayhill site because grazing was focused on or near relatively narrow ridge tops compared to rolling slopes at the CDRRC.

In year 1 of the study, paired study areas were randomly assigned to either target or non-target treatments. In year 2, treatments on the paired study areas were reversed in a crossover design to account for the limited number of experimental units and inherent variability in the study areas. For example, paired study areas 1 and 2 in pasture 13 at the CDRRC were randomly assigned as target and non-target areas, respectively, in year 1 (Table 1; Fig. 1). In year 2, study area 1 was switched to the non-target area and study area 2 was treated as the target area. Initially, the study plan was to have 2 separate 2-by-2 crossover designs, one at the CDRRC and one at Mayhill, but grazing opportunities were limited in Mayhill following the wildfire in 2011 and data were only collected for one year (i.e., 2013).

2.3. Cattle

In year 1, study pastures at the CDRRC were stocked with 33 Brangus and 8 Angus cows. In year 2, 41 Brangus cows were used in the study. All cows were pregnant and not lactating at the time of