



Distribution of Cattle Changes during the Grazing Season under Patch-burn Grazing

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Knowing where cattle are grazing in the pasture is a useful tool for rangeland researchers and managers alike. Tracking cattle with global positioning system (GPS) collars can give useful insights as to what areas of the pasture are used and how cattle are behaving.

During the 2019 grazing season, 40 low-cost GPS collars – two to three per replicate, four treatments, and four replicates - were used based on an open source system. We found that cattle respond to patch-burn grazing by using the recently burned patches heavily early in the grazing season. Later in the grazing season, use of the most recently burned patch remained high, but activity in other patches increased as well.

Introduction

North Dakota rangelands evolved with disturbances such as fire and grazing, which are important for maintaining disturbance-driven heterogeneity. Heterogeneity-based management offers several advantages, including stabilized livestock weight gains during drought (Allred et al., 2014). However, conventional range management seeks homogenous grazer distribution on rangeland pastures.

Patch-burn grazing management can promote rangeland heterogeneity. Patch-burn grazing is fire in discrete patches within a pasture combined with grazing aimed at mimicking the historical disturbances seen on the Plains.

Variability in forage quality, quantity and vegetation structure is created with this technique through burning a section of the pasture on a yearly rotation. This, coupled with season-long grazing, creates spatially distinct patches in the pasture (Fuhlendorf et al., 2009).

The high protein content of the forage in the recently burned patches attracts livestock to these areas, resulting in greater use (Powell et al., 2018).

The distribution of livestock in pastures also is influenced by factors other than forage quality. Distance to water, plant community type, and time of grazing season and topography all can influence where cattle will choose to spend their time.

While spatial distribution patterns of livestock on patch-burn pastures in southern areas of the Plains is well-known (Fuhlendorf and Engle, 2004; Archibald et al., 2005), questions remain on how livestock will behave on the cool-season grass-dominated rangelands of North Dakota. Knowledge of cattle responses to patch burning helps evaluate the effect this management has in the northern Plains.

Objectives

Our objective was to determine grazer distribution patterns of livestock on patch-burn grazing pastures with a four-year burn rotation. We expect that cattle will spend more time in recently burned areas than other patches.

Procedures

This study was conducted at the North Dakota State University Central Grasslands Research Extension Center near Streeter, ND. For the 2019 grazing season, 40 GPS collars (two to three per replicate) were deployed to record positions of the cattle. Three cattle had collars in each of eight patch-burn grazing pastures, two in each of the four replicates in the modified twice-over rest rotation treatment, and two in each of the season long replicates.

All pastures are burned on a four-year return interval. Four of the eight patch-burn pastures have 40-acre burns conducted in the spring.

The other four pastures have two burns per year, spring and summer, each 20 acres in size. Summer burns are included with the idea that they will provide high-

quality forage to livestock later in the grazing season when forage quality tends to decline.

The GPS loggers used to record the position of the cattle on pasture were built using hardware based on an open-source Arduino system (McGranahan et al., 2018). Hardware was soldered together and the unit was programmed to record position data for five to 10 minutes every hour.

To complete the collar setup, a charged battery and empty SD card were plugged into the logger, then placed in a waterproof case and sealed with duct tape. These collars cost about \$125 per unit.

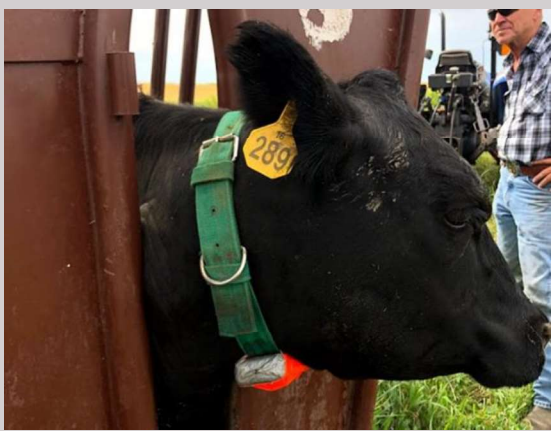


Figure 1. The GPS collar on a cow after changing batteries in the field.

Figure 1. The GPS collar came down after animals were being brought back to the field pastures in mid-May. On a monthly basis, the cattle were brought into the chute, where the collars were removed so batteries could be changed, data downloaded and any malfunctioning parts could be replaced (Figure 1). Collars stayed on animals until they came off pasture in mid-October.

Results and Discussion

Based on GPS positions from the 2019 field season, the cattle appear to spend more time in the recently burned patches early on in the grazing season (Figure 2). The high-quality forage that is produced after fire acts like a magnet to attract cattle to these recently burned patches. Cattle also spend a high proportion of their time near water sources throughout the year.

Pastures that were burned twice per grazing season had slightly different utilization patterns than those burned

in the spring only. Patches burned in the previous summer also showed high utilization at the beginning of the grazing season. This is possibly due to sustained high-quality forage from the previous summer's burn.

As the grazing season progresses, cattle are distributed in areas outside of the recent burn because the magnet effect of these patches might weaken (Figure 2). This is unlike the southern Plains, where cattle tend to use the most recently burned areas consistently throughout the grazing season (Fuhlendorf and Engle, 2004; Archibald et al., 2005).

The amount of Kentucky bluegrass in these pastures could be a possible explanation for the loss of attraction to the burned patch. This cool-season grass can cause difficulty in getting an even burn across the entire patch and generally is very palatable throughout the grazing season.

Other possible causes of distribution change are previous grazing management history and grazing hotspots causing Kentucky bluegrass to sustain high forage quality. Topography, distance to water, ecological sites, plant community and size of burn patch possibly also contribute to the increased distribution outside the recent burn patch.

Conclusions

Early in the grazing season, cattle choose to graze in the recently burned patches. However, cattle tend to use these recent burn areas less as the grazing season progresses.

With the vast amount of data, the GPS collars provide, the next steps are to see how other factors contribute to where livestock are grazing in the pastures and how this varies across management techniques. By evaluating distribution for several years, we also can evaluate how other factors, such as drought, change where cattle graze.

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