

Effect of Grazing Prairie Dog– Colonized Rangeland on Cattle Nutrition and Performance: A Progress Report

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On the Ground

- One objective of the ongoing Renewal on Standing Rock Reservation project is to evaluate the response of grazing steers to the level of prairie dog colonization on Northern Mixed Grass Prairie.
- We fenced four pastures to create an increasing gradient of a proportion of the pasture area colonized by prairie dogs. Pastures are stocked with yearling steers during each growing season.
- Comparing steer performance, Global Positioning System (GPS) locations of grazing, diet samples, and ingestive behavior at each proportion of the prairie dog colony per pasture allows prediction of the optimal proportion of colonization, which enables selection of the most balanced diet for cattle to meet performance goals.
- Additionally, it will allow recommendation of management options for any given level of prairie dog colonization to optimize cattle nutrient intake.

Keywords: beef cattle, grazing, prairie dogs, diet quality, forage intake, Global Positioning System.

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Bef cattle production from rangelands occupied by prairie dogs plays an important role in local food availability. In particular, potential influences of prairie dog colonization of rangelands can have a dramatic impact on local food availability and accessibility for Native American communities in the Northern Great Plains and other regions inhabited by prairie dogs. This model is similar to those in other regions of the world, where grazing-based livestock production may be impacted by indigenous populations of non-game wildlife that fills a niche similar to that of the prairie dog. Prairie dog colonization may have either negative or positive influences on grazing livestock productivity. Steer gains declined over time as prairie dog colonies expanded in shortgrass steppe pastures in Colorado.¹ However, the decline in the rate of steer gain was less than the rate of colony expansion.¹ Because prairie dogs keep vegetation clipped short to allow visual detection of predators, forage species growing on colonies are maintained in an immature vegetative state with high nutrient concentration, albeit in limited availability. We hypothesized that this may facilitate nutrient intake by grazing livestock. Overall nutrient intake and the balance of nutrients ingested may be improved if livestock are allowed to selectively mix their diets from immature and mature forages within a pasture on and off prairie dog colonies, respectively. Alternatively, dry matter intake by livestock will be limited to the point that dietary quality is inconsequential if the prairie dog colony occupies a large proportion of the pasture and severely limits forage availability. We are investigating the influence of the proportion of the pasture occupied by prairie dogs on livestock landscape and forage utilization patterns. This information, coupled with evaluation of prairie dog and bird population responses, can improve opportunities to manage prairie dog colony size and grazing management to optimize rangeland health, prairie dog population size, habitat for birds, livestock production, and food accessibility for local human communities.

The "Renewal on Standing Rock Reservation" project was initiated in 2011 based on funding from the US Department of Agriculture's Agriculture and Food Research Initiative (grant 2011-68004-30052). The overall objective of the Standing Rock project is to improve food availability for the Table 1. Grazing design for treatment pastureswith increasing proportion of pasture occupied byprairie dogs.

Prairie dog (%)	Area (acres)	Head (No.)	Stocking rate (acres/AUM)*
0	503	75	1.97
18	477	55	2.55
40	510	45	3.32
75	513	17	8.88

AUM indicates Animal Unit Month.

*Stocking rate calculated based on mean steer body weight of 787 pounds and mean grazing season length of 4.33 months.

members of the Standing Rock Sioux tribe in a culturally sensitive manner through concomitant improvement in rangeland health, wildlife habitat, beef cattle enterprise development, and beef production for local consumption. The objective of the grazing livestock research component of the project was to evaluate yearling steer responses to the impact of the spatial proportion of native rangeland pastures colonized by prairie dogs. To fulfill this objective, we measured landscape utilization patterns (particularly proportion of time spent and activities on vs off prairie dog colonies), grazing behavior, nutrient intake, and performance by grazing yearling steers in response to the proportion of the pasture occupied by prairie dogs. This article provides a report of progress, to date, toward fulfilling this objective and is intended to provide a context relative to the other articles in this special issue of Rangelands about the "Renewal on Standing Rock Reservation" project.

Cattle and Rangeland Management Approachⁱ

Four pastures of about 500 acres each were established, with a gradient of proportions occupied by prairie dog colonies (0–75%; Table 1). Boundaries of the area occupied by prairie dogs were mapped by using a handheld Global Positioning System (GPS) unit. The control pasture did not have any prairie dog colonization and has been maintained in that state through the project. The other pastures were fenced to contain initial proportions of 18%, 40%, and 75% of the area of each pasture colonized. Pasture boundaries were delineated to include similar proportions of relevant landscape features, such as ecologic sites, soil types, and topography.

Yearling steers have grazed the pastures from early June to late October during each year of the project. Pastures have been stocked to similar grazing pressure (animal unit month [AUM] of forage demand divided by amount of available forage) based on the proportion of pasture occupied by prairie dogs. Grazing pressure was calculated by using expected forage availability on and off prairie dog colonies, as determined from clipping studies on similar prairie dog–colonized rangelands in western South Dakota.^{2,3} As the proportion of prairie dog colonization increased, the number of AUM allocated per acre decreased in direct proportion to the anticipated reduction in forage availability. We chose to stock at similar grazing pressure to evaluate responses, without differing grazing pressure influencing landscape utilization and diet selection. In future research, we intend to evaluate the same response when the stocking rate is similar across pastures, yielding increasing grazing pressure as prairie dog colonization increases.

Where Do Steers Graze?

A subset of steers in each pasture has been fitted with collars containing GPS devices to record the locations of cattle through each grazing season. GPS locations have been loaded into a Geographic Information System (GIS) map layer along with layers that map important landscape features (boundaries of prairie dog colonies, fences, ecologic sites, water locations, etc.; Figure 1). A subset of GPS collars contains switches to indicate activity by steers, which allows us to estimate time spent by steers in grazing and other activities (e.g., traveling, resting) per day. We are evaluating the relationships between the patterns of spatial use by cattle and landscape features, particularly the proportion of grazing that occurs on prairie dog colonies.

What Do Steers Eat?

Ruminally fistulated steers graze with resident herds and are used to collect diet samples by using the rumen evacuation technique.^{4,5} Temporary enclosures are constructed by using electric fencing for collecting samples from representative areas on and off prairie dog colonies in each pasture to evaluate nutrient concentrations in cattle diets. Two locations on the colonies are sampled: 1) the core of the colony dominated by



Figure 1. Map of Global Positioning System (GPS) locations for a steer throughout June 2014 in the pasture that had 18% of the area colonized by prairie dogs.

ⁱ All livestock research is being conducted with the approval of the South Dakota State University and the North Dakota State University Institutional Animal Care and Use Committees, in accordance with their guidelines.

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