

# Grassland bird, rangeland vegetation and prairie dogs on grazed mixed-grass prairie

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*The objective of this study was to identify ecological community interactions and species associations on grazed rangeland relative to the presence of prairie dogs. Results indicated distinctive plant and bird communities exist on and off prairie dog towns. However, some bird species utilize rangeland on and off prairie dog towns. These findings support the idea that prairie dogs contribute to landscape heterogeneity, which, in turn, helps sustain robust bird and plant communities on mixed-grass prairie.*

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## Summary

Black-tailed prairie dogs and many grassland bird species have undergone substantial population declines in recent years. The objective of this study was to identify ecological community interactions and species associations on grazed rangeland relative to the presence of prairie dogs to improve management. Bird and plant communities on and off prairie dog towns were surveyed in rangeland pastures stocked with Angus steers, with a goal of achieving 50 percent forage disappearance. In both years of the study, distinctive communities of birds and vegetation existed on and off prairie dog towns. The percent of cover of bare ground and low vegetative structure are indicators of prairie dog presence. The percent of cover of bare ground was correlated most strongly with the arranged vegetation and bird abundance data, so differences were represented among transects. Horned larks were correlated positively most strongly with the percent of cover of bare

ground and low vegetative structure that existed on prairie dog towns. Grasshopper sparrows were correlated most negatively with the percent of cover of bare ground and vegetation structure and typically were on transects off the prairie dog towns. Some bird species utilized colony and off-town sites, making heterogeneity an important landscape component for maintaining diverse, robust bird and plant communities at the landscape scale.

## Introduction

Black-tailed prairie dog populations have declined substantially since European settlement of the Great Plains (Hoogland, 1995). Large-scale eradication efforts, habitat loss and plague are among the primary reasons for these declines. Ranchers and other landowners generally believe that prairie dogs compete with livestock for forage and cause potential harm to livestock due to their burrowing activities.

Past research shows that livestock and prairie dog diets can overlap up to 60 percent in mixed-grass prairie (Uresk, 1984, 1986). However, other research shows prairie dog activities can increase livestock

forage quality, perhaps reducing the negative effects of partial diet overlap (Miller et al., 2007). Regardless, much debate continues regarding the interaction of livestock and prairie dogs.

Prairie dogs are considered keystone modifiers due to the disproportionately large effect they have on the landscape relative to their body size (Mills et al., 1993). Prairie dogs create a unique habitat that is attractive to many wildlife species, including several grassland birds. Grassland birds have been declining, with many populations declining at unprecedented rates (Peterjohn and Sauer, 1999). Researchers suspect these declines are due to the loss of suitable habitat through the reduction of native grassland and habitat degradation.

The majority of grasslands in the western U.S. are used for livestock production. Little scientific research has focused on identifying the major influences shaping grassland bird communities in the presence of prairie dogs and cattle. Few studies have examined the communities of grassland birds, vegetation and prairie dogs in a completely grazed context. Studying the interaction of these species in a grazed area should result in widely applicable information important to managers of livestock, rangelands and wildlife. Therefore, the objective of our study was to examine ecological community interactions among grassland birds, rangeland vegetation and black-tailed prairie dogs on grazed mixed-grass prairie.

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## Experimental Procedures

This project was approved by the NDSU Institutional Animal Care and Use Committee. Research was conducted in four 550-acre pastures of mixed-grass prairie near McLaughlin, S.D. Pastures were stratified for different levels of prairie dog occurrence and included 1) 0, 2) 18, 3) 40 and 4) 75 percent of the total area. Each pasture was stocked with Angus-cross yearling steers (approximately 664 pounds) with a goal of achieving 50 percent forage disappearance.

Cattle were placed in their respective pastures in early June and removed in mid-October 2012 and 2013. Bird surveys were conducted three times each breeding season (May to July) along 984-foot fixed-width belt transects. Each pasture had nine transects, with transects occurring on and off prairie dog colonies.

Along with bird surveys, the vegetation along each transect was sampled annually using: 1) 3.28-foot<sup>2</sup> frames for canopy cover of each species, 2) a robel pole to estimate visual obstruction and vegetation height and 3) 10-pin point frames for basal cover estimates. Community data was analyzed using nonmetric multidimensional scaling in PC-ORD version 6 (McCune and Mefford, 2011).

## Results and Discussion

In 2012, 31 bird and 86 plant species were found along transects, compared with 29 bird and 82 plant species in 2013. After arranging the transect information for vegetation and bird abundances to represent differences in the data, we found that the percent of basal cover of bare ground was strongly correlated ( $r = 0.99$ , 2012;  $r = 0.96$ , 2013) with the arrangement of transects. The percent of basal cover of bare ground also accounted for a high

amount of the variability in the data (0.98 percent, 2012; 0.93 percent, 2013).

The percentage of basal bare ground best differentiated on-town transects from those located off-town; however, other variables were correlated strongly with on- or off-town transects. On-town transects typically consisted of less canopy cover of litter, lower visual obstruction and reduced litter depths. Certain plant species were correlated negatively with on-town transects. Those species included black samson (*Echinacea angustifolia*;  $r = -0.83$ ) and Kentucky bluegrass (*Poa pratensis*;  $r = -0.54$ ). Others, such as western wheatgrass (*Pascopyrum smithii*;  $r = 0.55$ ) and Missouri goldenrod (*Solidago missouriensis*;  $r = 0.50$ ), were correlated positively.

Bird species typically responded in a similar fashion, with grasshopper sparrow correlated negatively with on-town transects ( $r = -0.86$ ), while lark sparrow ( $r = 0.64$ ), western kingbird ( $r = 0.50$ ), horned lark ( $r = 0.86$ ) and Brewer's blackbird ( $r = 0.60$ ) were correlated positively with on-town transects.

These findings suggest clear separation of the plant and bird communities between transects on prairie dog towns and those off-town. On-town transects tended to be forb-dominated plant communities with common species, including fetid marigold (*Dyssodia papposa*), prostrate pigweed (*Amaranthus blitoides*) and Missouri goldenrod. These are species that are able to cope with the continuous disturbances created by prairie dog grazing and burrowing activities.

In 2013, increased precipitation allowed western wheatgrass to prosper, as was evident in the high positive correlation of the species with on-town transects. Off-town transects tended to be more graminoid-dominated plant communities with

native forbs intermixed. Dominant graminoid species included sedges (*Carex* spp.), western wheatgrass, needle and thread (*Hesperostipa comata*), and green needlegrass (*Nassella viridula*). Sagewort species (*Artemisia* spp.), black samson and prairie lettuce (*Lactuca tatarica*) were common forbs on these native off-town locations.

Although plant communities showed many differences in compositional structure between on- and off-town transects, birds were more likely responding to other factors during selection of habitats. Grasshopper sparrows were correlated negatively with on-town transects, which likely stems from their requirement of areas with greater visual obstruction (higher vegetation height and density) as nesting sites (Whitmore, 1981). Likewise, dickcissels preferred areas of greater visual obstruction, which was afforded to them on off-town transects.

In contrast, other grassland birds such as the horned lark prefer areas of minimal visual obstruction (low vegetation height and density) for nesting and, therefore, they consistently were in on-town transects. While many birds select either on- or off-town sites as habitat, others were found using both. The upland sandpiper tends to nest in tall, dense vegetation but also was observed foraging along on-town transects.

The upland sandpiper and other species found on and off prairie dog towns speak to the need for maintenance of a heterogeneous landscape composed of different habitat types to support a robust bird and plant community. Further, the clear selection by some bird species of habitat afforded on prairie dog towns suggests the importance of conserving some of these areas for the long-term sustainability of grassland bird communities.

Overall, the large amount of bare ground occurring as a result of

prairie dog activities appears to be influencing the local bird and plant communities in each pasture. The continued conservation of prairie dogs and their associated habitats could have longstanding repercussions for grassland bird diversity. Proper livestock management on such habitats may help maintain ecological diversity while providing economic returns to private landowners.

While this brief synopsis focused on birds, vegetation and prairie dogs in a grazed context, more emphasis should be placed on how livestock are responding to the presence of prairie dogs if the successful conservation of prairie dogs and their associated bird and plant communities is going to be an option on private and public lands in the future.

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