

Research for the Birds: Sandhills Is the Target of Grassland Bird and Grazing Investigation

by Larkin Powell, School of Natural Resources, UNL

Nebraska's Sandhills contain the largest area of mixed-grass prairie remaining south of Canada. Our vast grassland resource supports cattle ranching – important both to the Sandhills ecosystem and Nebraska's economy, and provides unique habitat for grassland birds. Across the continent, the recent decline of some grassland birds had raised concern with biologists – especially in systems that have experienced vast habitat loss and fragmentation. The Sandhills, as a contiguous grassland, represents a unique opportunity to study bird populations.

Because grazing affects vegetation structure and diversity, cattle grazing can be viewed as a *de facto* management technique for wildlife in the region – literally millions of hectares are affected by grazing. However, not all grazing is the same; regimes range from season-long grazing in large pastures to short, intensive grazing in smaller grazing units. Biologists would like to encourage a grazing regime that results in productive, diverse wildlife communities.

Until recently, very few data from the Sandhills region were available to guide grazing management decisions with regard to wildlife. I worked with a team of other biologists at the University of Nebraska-Lincoln to investigate the relationship between grazing and grassland birds in the Sandhills. Silka (Finkbeiner) Kempema, a graduate research associate in the School of Natural Resources, and Walter Schacht, professor in the Department of Agronomy and Horticulture, collaborated on this study. Our study was supported by the Sandhills Task Force, a coalition of private ranchers and biologists with state and federal agencies. The Task Force provided contacts that led to 12 study sites on private ranches in the Sandhills. The interest and support from the Task Force is evidence that landowners in the Sandhills are concerned about wildlife populations; information on wildlife-grazing strategy interactions is indispensable for landowners as they make grazing management decisions.

Birds appear to respond differently to the various grazing systems currently in use in the Sandhills. Through preliminary observations, rotational grazing was thought to provide benefits to nesting birds because of the recovery intervals between grazing periods (e.g., 30 or more days) and higher plant diversity. Rotational grazing clips most vegetation during the grazing period, but recovery intervals may allow nesting birds to find adequate cover. Alternatively, season-long grazing provides a mix of grass lengths as cattle graze preferentially in certain spots, such as near water sources. A heavily-stocked, long-term grazed pasture could lose suitable nesting habitat early in the breeding season.

Our study's objectives were to: (1) determine the effect of vegetation structure and composition of grazed Sandhills pastures on grassland bird density, species richness, and nest



Western meadowlarks weave their covered nests into clumps of thick grass in the Sandhills. Researchers monitored their nest to assess productivity of grassland birds. (photo by Silka Kempema).

success, and (2) relate vegetation structure and composition to grazing regimes and facilitate management recommendations for ranchers in the Sandhills.

To be applicable to ranchers in the Sandhills, our research was conducted on private lands. Through the Sandhills Task Force, we contacted ranchers and received permission to work on their land. We selected 4 replicate ranches for each of the 3 grazing regimes [season-long continuous, management intensive grazing (≤ 14 days/unit), and 4-pasture deferred rotation (30-45 days/unit)], for a total of 12 ranches. We attempted to group ranches by geographic location and general habitat/elevation to ensure that the study was not confounded by ranch location, elevation, or general habitat type.

During the summers of 2002-2004, we conducted repeated bird surveys on each study site. We identified species of birds on transect surveys and estimated their density on our plots. Bird locations were documented with GPS and laser rangefinders. We also monitored bird nests on our study sites, and we measured vegetation structure and composition at the same time as the bird surveys. We measured vegetation structure with a Robel pole, a graduated device that uses vegetation height and density as an index to biomass.

We recorded a total of 32, 53 and 56 avian species in 2002, 2003 and 2004, respectively. Western meadowlarks and grasshopper sparrows comprised 60-70% of the total number of birds recorded. Bird species richness, a count of the number of species observed on each pasture, tended to be higher on

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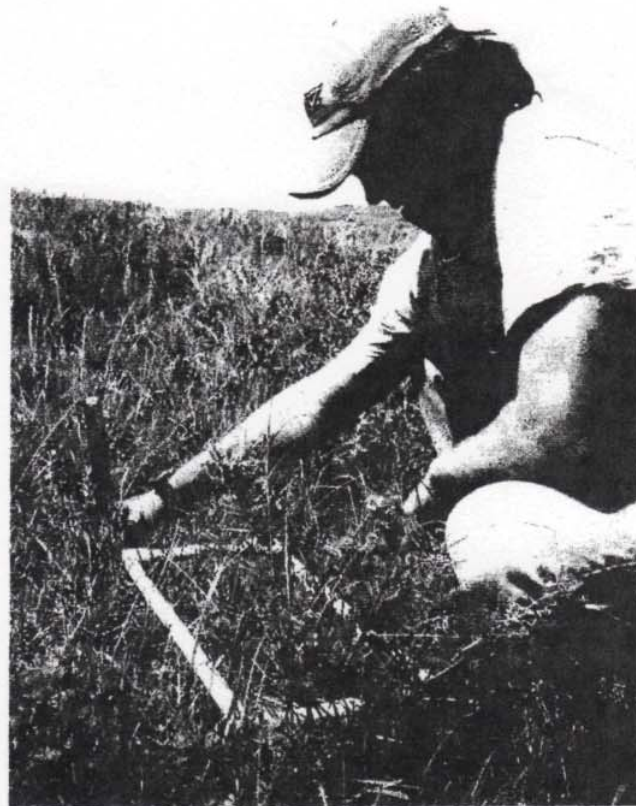
long-duration systems (50 species detected). During all years of the study, we noted that species counts tended to be higher on continuous, long-duration grazing systems and lower on medium (4-pasture) and short-duration (management intensive) systems. This trend was especially true during the years of drought stress (2002 and 2003).

We used our survey data to estimate density (birds/100 ha) for grassland bird species. As noted above, grasshopper sparrows and western meadowlarks were the most common birds on our surveys; these species had the highest densities (grasshopper sparrow: 93.6 birds/100 ha, western meadowlark: 37.9 birds/100 ha). We also found high densities of brown-headed cowbirds (21.0 birds/100ha), a nest parasite that lays its eggs in the nests of other birds, reducing the host's productivity. Other birds in our study included lark sparrow (18.2 birds/100 ha), mourning dove (5.9 birds/100 ha), field sparrow (1.9 birds/100 ha), and upland sandpiper (4.9 birds/100 ha). Our study did not find a clear effect of grazing system on density of any species.

Biologists use the probability of daily nest survival to assess risk of nest failure from predators. Daily nest survival is the probability that a nest will survive a 24-hour period. It is not uncommon for only 30-40% of bird nests to survive from egg laying to fledging of young – approximately 25 days for most songbird species. Snakes, small rodents, mid-size carnivores, avian predators, and even deer, cattle, and box turtles have been documented as nest predators in other studies on the Great Plains. Thus, biologists are very interested in factors that may increase or decrease the risk of predation of eggs or nestlings.

We used our nest monitoring data to test for potential effects of year, bird species, grazing system, cattle stocking rate, parasitism by brown-headed cowbirds, and vegetation structure. Daily nest survival did not vary by grazing system. Our analysis suggests that year and parasitism were the most important factors for predicting the outcome of a nest. Nests parasitized by brown-headed cowbirds suffered lower survival rates compared to unparasitized nests. Year may serve as a surrogate variable for drought conditions, as climate was very different during the three years of our study. In our sample of nests, lark sparrows and upland sandpipers had highest estimates of daily nest survival (about 93%), and mourning doves had the lowest daily nest survival (89%).

Our analysis of vegetation structure during the growing season indicated that long-duration pastures developed a more heterogeneous structure: that is, as the growing season progressed, areas within the pasture developed very different structures, as predicted. We believe this trend may be responsible for the increased diversity of birds on long-duration pastures. In contrast, short-duration pastures tended to become more homogeneous with time. So, short, intensive grazing periods resulted in patches within the pasture that had similar vegetation structure. We documented considerable variability in vegetation structure on the ranches we studied. This vari-



Field research technician, Josh Jordening, records vegetation cover data on a Sandhills study site using a Daubermire frame (photo by Silka Kempema).

ability is not unexpected, as site-specific factors (e.g., soil and slope) may facilitate response to annual weather variations. In addition, ranchers employed a wide range of options for stocking rates, cattle densities, and grazing duration within grazing system treatment.

Our study provides evidence that grazing affects vegetation structure in the Nebraska Sandhills, and that the structure of the vegetation can influence bird community composition. We suggest that biologists should not assess the merit of a grazing management strategy for wildlife based on the grazing system category alone. Grazing system was not a consistent predictor for grassland bird species richness, density, or productivity. Other parameters, such as stocking rate and cowbird nest parasitism, had a stronger effect on grassland bird productivity than grazing system.

Our results suggest that grassland birds in the Sandhills can be managed best by focusing on manipulations of grazing intensity, rather than on grazing system. Private ranchers will continue to make unique decisions, and our future research will target the impact of grazing timing and duration on vegetative structure and composition.