# Birds and Grazing Final Report

Experiment in Rural Cooperation
Southeast Minnesota Regional Sustainable Development Partnership

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**Abstract:** Bird watching has become one of America's most popular recreational activities. Unfortunately, a reduction of pastures and hay fields in the Midwest is correlated with steep population declines of grassland bird species. Southeast Minnesota's topographically diverse landscape is suited to grass-based, small to medium-sized farms, while the region's beauty, bounty of habitats, and proximity to the Twin Cities make it an ideal destination for wildlife viewers. If farm pastures are harboring healthy nesting bird populations, more wildlife watchers will be attracted to that region of the state. Moreover, products with eco-friendly labels like "bird-friendly beef" may increase the product's value and bolster farm profitability. Our study compared the abundance and reproductive success of grassland birds in rotationally and continuously grazed cattle pastures in southeast Minnesota. Savannah Sparrows were the most abundant species, and we found no difference in Savannah Sparrow reproductive success between grazing system types for both years combined ($P > 0.1$). Continuously grazed pastures harbored a more even and diverse community of birds (Shannon Diversity Index) than the rotationally grazed pastures. Vegetation density was the best predictor of nest success in all pastures; nests were 58 times more likely to fledge at least one chick with each 1 dm increase in the Visual Obstruction Reading (VOR) and the improvement in success was most pronounced from 0 to 1 dm VOR. We found more breeding birds in pastures with an average vegetation density $\geq$ 1 dm VOR and those birds experienced greater rates of reproductive success. Stated grassland management schemes such as 'rotational grazing' or 'continuous grazing' encompass a broad range of practices, and grazing intensities; including those that are detrimental to grassland birds. Grassland bird reproductive success cannot be tied to such broadly defined grazing practices.

## Introduction

We conducted a two-year study to determine how rotational and continuous grazing practices affect grassland bird reproductive success in southeast Minnesota. Our project focused on the relationship between farming practices and the natural ecology of southeast Minnesota, but we envision our results being extensively employed as a tool to promote local tourism, enhance farmer and community economic growth, and promote conservation.

Southeast Minnesota has a topographically diverse landscape. This can present challenges to farmers, as well as opportunities. Using rotational and continuous grazing practices on highly erodeable farmland both reduces erosion, and provides habitat for grassland birds. Additionally, because the area is so beautiful and supports a variety of different bird species, it has become a destination for birdwatchers from throughout the state. If we find that either grazing system harbors and *produces* sustainable numbers of birds, farmers could benefit through proper signage and labeling of their products. We imagine labels such as "Bird Friendly Beef", and farms designated "Bird Friendly Farms." Products labeled in this way could be marketed regionally and in the Twin Cities, and help consumers to make connections to a regional food system.

This work is especially important to small and medium sized farmers in the area looking for better ways to use their natural on-farm resources, and to resource managers seeking to enhance local grassland bird habitat.

## Methods

*Study Area* - We located grassland bird nests on six privately-owned cattle pastures in Winona, Wabasha, and Olmsted Counties of southeast Minnesota in 2002 and 2003. Sites were located in upland areas that were similar in topography, soil type, whole pasture cattle density, and vegetation. Three pastures were continuously grazed and three were rotationally grazed and all sites had vegetation; feedlot pastures and cattle loafing areas were excluded. Continuously grazed pastures were partitioned into three or fewer paddocks and each paddock was grazed at least one month continuously each summer during the nesting season. Rotationally grazed pastures were partitioned into ten or more paddocks and the cattle were moved to a new paddock every 1 - 5 days. Four pastures were grazed by beef cattle and two were grazed by dairy cattle. Vegetation at pastures consisted primarily of cool-season, non-native grasses and forbs.

*Nest Searches and Reproductive Success* - Initially we located all pasture areas that were at least 100 m. from forests and water sources and called these areas 'nest search zones'. Within these zones we randomly located approximately 5 ha (12.5 acres) of nest search plots on each pasture with most plots $\geq$ one ha (2.5 acres). We used stick searching and observation to find grassland bird nests from May 21 through August 10 during both study years. To keep track of fledging success, each nest was visited every three days, until the nest was depredated or the young fledged.

*Nest Site Attributes* - We measured vegetation at the nest site to determine whether reproductive success was correlated with certain nest site vegetation variables. We divided nest site attributes into three categories: % cover variables; plant structure variables; and distance variables. We used a Daubenmire frame (Daubenmire 1959) to measure percent cover of grass, forb, downed litter, standing litter, woody stems, soil, cow pie, and rock at the nest and one meter from the nest in each cardinal direction. Height of tallest vegetation as well as the litter depth was measured at each corner of the frame in each of its five placements. We used a Robel pole (Robel et al. 1970) to gauge vegetation density (Visual Obstruction Reading or VOR) at the nest and one meter from the nest in each cardinal direction. We estimated the distance from each nest to the first and second closest edge, the nearest shrub and shrub clump, tree and tree clump, and the distance cattle needed to travel to water.

*Treatment Vegetation* - We randomly located twenty permanent vegetation monitoring sites in the 'nest search zone' in each of the six pastures to assess how birds are affected by vegetation changes at the field scale. Vegetation variables were measured at these 120 sites within four days of June 1, July 1, and August 1 in 2002 and 2003. Before conducting statistical analyses on each of these vegetation characteristics, we averaged the subsamples from each point, and again for the 20 subsamples in each pasture (i.e., we used these nested subsamples to increase the accuracy of our estimate for the entire pasture).

Toward the end of each field season we spent a day on each pasture identifying as many plant species as possible to roughly determine how similar the pastures were in species composition.

To characterize how paddock vegetation changed in response to rotational grazing, we randomly chose 6 to 8 paddocks (located in the 'nest search zone') per pasture to perform matched pairs density measurements. We chose ten random points per paddock and each paddock was measured within 1-3 days before it was grazed, and 1-3 days after it was grazed.

*Bird Abundance Surveys* -The purpose of breeding bird abundance surveys was to determine the number of each species of grassland birds that have established territories on each pasture site. This number may be different from the number of each species whose nests are monitored because nest finding depends in large part on nest searcher ability, and the relative secretiveness of different bird species.

Transects to detect breeding birds were located in the 'nest search zone' and were 100m wide and 500-1000m long. Each pasture had a transect. Each pasture was surveyed four times during the 2002 season (within four days of June 7, June 23, July 12, and July 28) and three times during the 2003 season (concurrent with whole pasture vegetation data collection in the 2003 season, within four days of June 1, July 1 and August 1). All surveys began at sunrise and ended before 9:00am, and were recorded at a pace of 5 minutes per 50m. Birds located on the edge of the area (i.e., on the fence or a pole) were counted as in the area.

*Farmer Surveys* - Before the first field season we asked farmer cooperators to fill out a brief survey about their grazing operation. We gathered information on farm acreage, amount of farm used for grazing, number of cattle grazed, size and number of paddocks, etc. (Appendix A).

*Statistical Analyses* - One unique feature of our statistical analysis is our inclusion of pastures with very low numbers of nests. Although we found zero Savannah Sparrow nests in the DI pasture, and only four Savannah Sparrow nests in the KOR pasture, we believe there were no other nests to find in these pastures and that these two pastures' low reproductive success is a direct reflection of the available habitat and not a result of nest search effort. Throughout we report arithmetic means and either standard deviations (SD) or standard errors (SE).

## Results

*Species Present* - We found very little difference between the two grazing systems in the number of passerine species found at least once during the two-year study ($P < 0.1$). Rotationally grazed sites had 8.33 +/- 1.33 (SE) species per pasture and continuously grazed sites had 9.00 +/- 2.65 (SE) species per pasture. Eastern Meadowlarks, American Goldfinches and Eastern Bluebirds all occurred numerically more often on continuously grazed pastures (Table 1). Our application of the Shannon Community Diversity Index found that the continuously grazed pastures harbor a more even and diverse community of birds than the rotational pastures.

*Daily Survival and Reproductive Success* - We located 76 nests, including 61 Savannah Sparrow nests, 8 Bobolink nests, 2 Eastern Meadowlark nests, 1 Western Meadowlark nest and 1 Mallard nest. We limited statistical analyses of daily survival to Savannah Sparrow nests found with at least one Savannah Sparrow egg or chick. We found no difference in Savannah Sparrow reproductive success between treatments for both years combined (daily survival rate = 0.92 and 0.92 for rotational and continuous grazing, respectively, P > 0.1, Table 2).

**Table 1**. Bird species density (number / 5 ha survey area) and standard error in rotationally and continuously grazed pastures in SE Minnesota, 2002-2003. We averaged the density of all 6 breeding bird survey time periods (over the two years) for each species on a pasture, and then averaged the pastures of a treatment together. Grassland species in **bold**

| | Treatment | |
|---|---|---|
| | Rotationally Grazed (n = 3) | Continuously Grazed (n = 3) |
| Species *Scientific name* | Mean +/- SE | Mean +/- SE |
| **Savannah Sparrow *Passerculus sandwichensis*** | **10.00** +/- 2.30 | **6.78** +/- 3.55 |
| **Grasshopper Sparrow *Ammodramus savannarum*** | **0.11** +/- 0.06 | **0.08** +/- 0.08 |
| **Bobolink *Dolichonyx oryzivorus*** | **1.64** +/- 0.73 | **1.28** +/- 0.72 |
| **Red Winged Blackbird *Agelaius phoeniceus*** | **0.39** +/- 0.39 | **0.36** +/- 0.36 |
| **Eastern Meadowlark *Sturnella magna*** | **0.03** +/- 0.03 | **0.28** +/- 0.15 |
| **Western Meadowlark *Sturnella neglecta*** | **0.17** +/- 0.10 | **0.53** +/- 0.34 |
| **Brown-headed Cowbird *Molothrus ater*** | **0.06** +/- 0.06 | **0.25** +/- 0.25 |
| **Killdeer *Charadrius vociferous*** | **0.06** +/- 0.06 | **0.17** +/- 0.17 |
| **American Goldfinch *Carduelis tristis*** | **0** | **0.11** +/- 0.03 |
| American Robin *Turdus migratorius* | 0.53 +/- 0.17 | 0.31 +/- 0.23 |
| Eastern Bluebird *Sialia sialis* | 0.08 +/- 0.08 | 0.25 +/- 0.05 |
| Chipping Sparrow *Spizella passerine* | 0.17 +/- 0.17 | 0.06 +/- 0.06 |
| Tree Swallow *Iridoprocne bicolor* | 0.06 +/- 0.06 | 0.17 +/- 0.10 |
| Song Sparrow *Melospiza melodia* | 0.11 +/- 0.11 | 0.06 +/- 0.06 |
| Eastern Kingbird *Tyrannus tyrannus* | 0.06 +/- 0.06 | 0.03 +/- 0.03 |
| House Sparrow *Passer domesticus* | 0.06 +/- 0.06 | 0 |
| Common Grackle *Quiscalus quiscula* | 0 | 0.06 +/- 0.06 |
| Eastern Wood Peewee *Contopus virens* | 0.06 +/- 0.06 | 0 |
| American Kestral *Falco sparverius* | 0 | 0.03 +/- 0.03 |
| Grey Catbird *Dumetella carolinensis* | 0.06 +/- 0.06 | 0 |
| Shannon Diversity Index | 0.98 +/- 0.11 | 1.35 +/- 0.01 |

**Table 2.** Daily survival rate (DSR) and interval survival rate (ISR) of Savannah Sparrow Nests on continuously and rotationally grazed pastures in southeast Minnesota, 2002-2003. Interval survival is the probability of an egg surviving the 20.5 day laying, incubating, and broodrearing periods.

| **Grazing System** | **2002** | | | **2003** | | | **Both years combined** | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | DSR and SE | ISR and SE | N | DSR and SE | ISR and SE | N | DSR and SE | ISR and SE |
| Continuous* | 8 | 0.9402 +/- 0.00084 | 0.2827 +/- 0.0319 | 15 | 0.9055 +/- 0.00074 | 0.1306 +/- 0.00643 | 23 | 0.9181 +/- 0.00041 | 0.1737 +/- 0.00617 |
| Rotational** | 15 | 0.9138 +/- 0.00085 | 0.1576 +/- 0.0106 | 23 | 0.9213 +/- 0.00038 | 0.1862 +/- 0.00653 | 38 | 0.9188 +/- 0.00026 | 0.1763 +/- 0.00407 |

*Nests were found on two of the three continuously grazed pastures
**Nests were found on all three of the rotationally grazed pastures

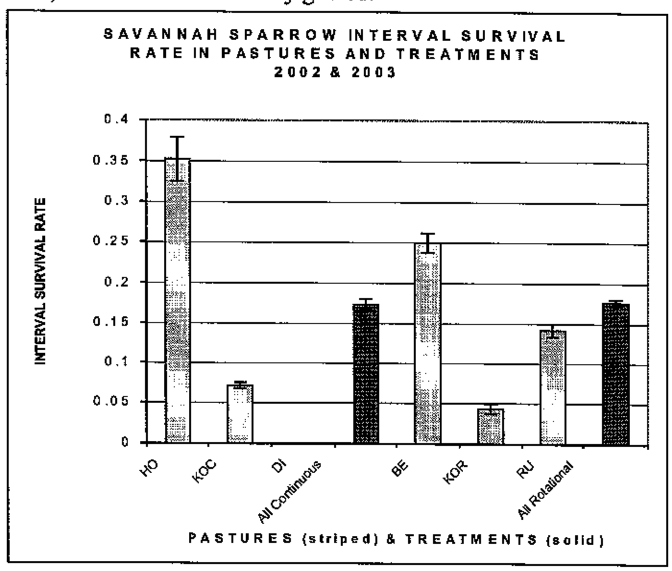
We compared reproductive success between all pastures, (except the DI and KOR pastures that had sample sizes less than five nests) regardless of treatment and found no differences (all P > 0.1, Figure 1).

One continuously grazed pasture was severely overgrazed and harbored no ground nesting grassland birds. One rotationally grazed pasture abuts a busy county road and the noise from cars could be the reason few nests or singing birds were heard there (see Herkert 2003). We have left these pastures in our statistical analysis because areas that do not have singing males do not have nests and thus do indeed have a low rate of productivity.

*Nest Site Attributes* - When we examined individual variables comparing successful and failed nests using two-sample t-tests, we found that successful nests had lower % cover of bare soil (P = 0.02, 22 df) and % cover of cow pies (P < 0.01, 22 df) and higher vegetation densities (P < 0.01, 22 df), vegetation heights (P < 0.01, 22 df), and litter depths (P = 0.03, 22 df) than failed nests (Table 3).

We used logistic regression and selected habitat variables using a stepwise routine to examine the relationships between habitat variables and successful vs. failed nests. The best model included vegetation density, distance to nearest shrub, % cover of downed litter, and % cover of cow pies as predictors of whether a nest successfully fledged ≥ one chick. Vegetation density is the best predictor of nest success; nests are 58 times more likely to fledge at least one chick with a one decimeter increase in vegetation density (VOR). Distance to shrubs, % cover of downed litter, and % cover of cow pies involve smaller odds ratios. For every 10 meter decrease in distance from a shrub, a nest is 9.7 times more likely to succeed. For a 10% *increase* in percent cover of downed litter or 10% *decrease* in percent cover of cow pies a nest is 1.01, and 0.87 times more likely to succeed, respectively. When we compared successful nests between treatments, we found that nests located in rotationally grazed pastures had higher % cover of forbs (P = 0.01, 7 df) and lower % cover of downed litter (P < 0.01, 7 df) than successful nests in continuously grazed pastures.

**Figure 1.** Interval survival for savannah sparrow nests on individual pastures (striped bars) and grazing treatments (solid bars) in southeast Minnesota, 2002-2003. The interval is 20.5 days including 12 days for incubation of eggs and 8.5 days for nestlings to prepare to fledge. Pastures HO, KOC and DI are continuously grazed and pastures BE, KOR, and RU are rotationally grazed.




*Whole Pasture Vegetation Attributes* - We thought that the differences found between vegetation at successful nests in the two treatments might simply be a reflection of vegetative differences between the treatments. However, when we compared the overall vegetation in both treatments (using data from pastures where nests were found), we found no significant differences between rotational and continuous pasture vegetation (all P-values > 0.05) although this is influenced by our low pasture sample size and subsequent low degree of freedom (df = 1).

We found less than 5 nests in two of the pastures and we believe these low sample sizes reflect the unsuitability of those pastures (KOR and DI pastures) for breeding Savannah Sparrows. Few or no Savannah Sparrows were heard on pastures with 0 dm VOR and the greatest increase in Savannah Sparrow numbers occurs between 0 and 1 dm VOR (Figure 2). With few or no Savannah Sparrows at 0 dm vegetation density, there will be few or no nests to locate thus our low numbers of nests are appropriate to the (degraded) habitat available. Therefore, we have included KOR and DI pastures in Figure 3 which shows a large increase in reproductive success between zero and 1 dm VOR, and then a range of reproductive successes where vegetation density is ≥ 1 dm VOR.

**Table 3.** Savannah Sparrow nest vegetation attributes on all study pastures in southeast Minnesota, 2002 - 2003. Two sample t-test (22 df) applied to each attribute to determine if successful and failed nests exhibit different vegetation values. Significant P-values in **bold**.

| Nest Site Attributes | Failed Nests (n = 38) | | Successful Nests (n = 23) | | P |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| % Cover of Grasses | 47.68 | 15.40 | 53.84 | 23.46 | 0.27 |
| % Cover of Forbs | 34.49 | 19.25 | 34.90 | 24.14 | 0.95 |
| **% Cover of Bare Soil** | 8.70 | 9.99 | 3.68 | 6.26 | **0.02** |
| % Cover of Standing Litter | 1.75 | 1.86 | 1.03 | 1.42 | 0.49 |
| % Cover of Downed Litter | 5.66 | 4.66 | 6.42 | 6.03 | 0.61 |
| **% Cover of Cow pies** | 1.68 | 2.85 | 0.13 | 0.46 | **0.00** |
| % of Nest Covered by Vegetation | 54.92 | 37.38 | 73.09 | 35.76 | 0.07 |
| **Vegetation Density** (dm) | 0.80 | 0.49 | 1.66 | 0.75 | **0.00** |
| **Height of Tallest Vegetation** (cm) | 39.79 | 15.15 | 51.43 | 12.21 | **0.00** |
| **Litter Depth** (cm) | 0.91 | 0.78 | 1.48 | 1.26 | **0.03** |
| Distance to Closest Edge (m) | 55 | 38 | 70 | 41 | 0.17 |
| Distance to Second Closest Edge (m) | 116 | 53 | 130 | 57 | 0.35 |
| Distance to Shrub (m) | 125 | 62 | 113 | 62 | 0.47 |
| Distance to Shrub Clump (m) | 171 | 87 | 140 | 70 | 0.14 |
| Distance to Tree (m) | 137 | 57 | 127 | 64 | 0.54 |
| Distance to Tree Clump (m) | 185 | 87 | 154 | 76 | 0.16 |
| Distance for Cattle to Reach Water (m) | 251 | 208 | 298 | 245 | 0.45 |

*Vegetation Removal on Randomly-selected Rotationally Grazed Paddocks* - Two of the rotationally grazed pastures in our study were grazed by dairy cows (BE and KOR) and the third pasture was grazed by beef cattle (RU), and we found that the density of grass removed by cattle during a rotation through an average paddock reflected these two management regimes. Combining both years of the study, BE and KOR pastures' change in density averaged 1.08 dm (0.11 dm SE) and 0.75 dm (0.14 dm SE) respectively, while RU pasture change in density was 1.80 dm (0.12 dm SE) and significantly higher than the other two (P < 0.01). We also found that rotational grazers in our study each manage their vegetation in a unique way. While RU farm allowed the vegetation in an average paddock to reach a relatively high density of ~2 dm VOR and then managed the cattle so that ~0.25 dm was left after grazing, BE and KOR farms allowed the vegetation to reach between 1.0 and 1.5 dm and permitted the cattle to graze to vegetation down to ~0.5 dm (Figure 4).

*Farmer Surveys* - According to farmers, three of the pastures provided 100% of the diet (besides salt) to cattle grazing on them (RU, KOC, and HO), BE pasture provided 80-90% of the cows diet, while KOR and DI pastures provided only 62% and 50% (respectively) of cattle forage needs. Whole pasture cattle densities are 1.81 (BE) 1.88 (HO), 2.5 (KOR), 3.13 (DI), 3.43 (KOC), and 4.00 (RU) cattle per hectare (or 0.72 (BE) 0.75 (HO), 1.00 (KOR), 1.25 (DI), 1.37 (KOC), and 1.60 (RU) cattle per acre).

**Figure 2**. Savannah Sparrow densities and vegetation densities (VOR) on all study pastures in southeast Minnesota, 2002 - 2003. The trend line shows ordinary least squares (OLS).

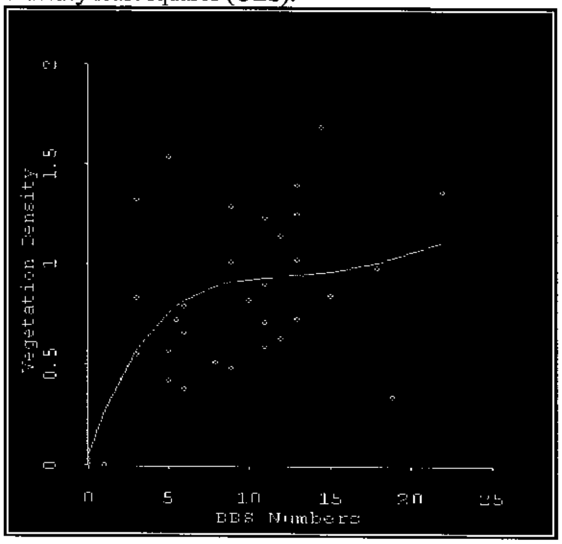


**Figure 3.** Whole pasture vegetation densities (VOR dm) and Savannah Sparrow nest interval survival rates on 6 southeast Minnesota pastures, 2002 - 2003. Data labels are interval survival rates for a 20.5 day interval.

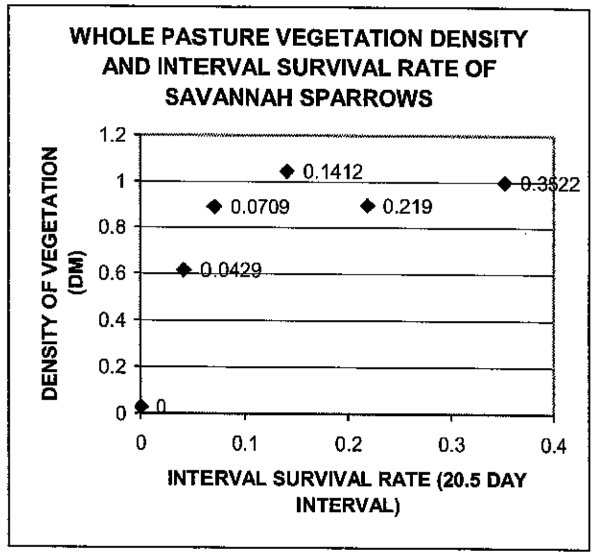
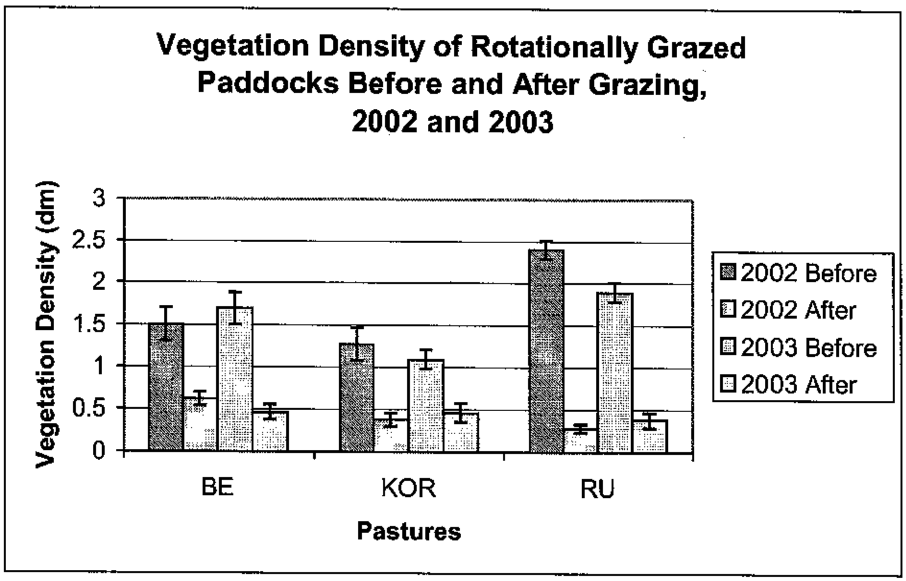



**Figure 4**. Vegetation density (VOR dm) of rotationally grazed pastures before and after grazing in southeast Minnesota, 2002 and 2003. BE and KOR are dairy operations and RU is a beef cattle operation. Bars show SE.



**Discussion** (Discussion about our data are ongoing and the following remarks are preliminary.)

Before beginning this research we supposed that rotational grazing could be beneficial for reproducing grassland birds because at any one time most of a pasture is guaranteed to be absent of cattle, and in those unused paddocks nests could not be trampled. We supposed that continuous grazing could be beneficial for ground nesting birds because the density of cattle at any time was low in comparison to occupied rotationally grazed paddocks. We found similar reproductive success between these two treatments, but a great deal of variation in nest success, bird diversity, and vegetation diversity between individual pastures in each treatment. How a farmer *labels* their pasture management practice was much less important for nesting birds than how a farmer *managed* their pasture.

Without regard to grazing treatment, pastures with successful nests were more likely to have higher vegetation density overall, less bare ground cover, less cow pie cover, greater vegetation height, more litter, and experience less mowing and clipping. Savannah Sparrows can successfully fledge young in pastures with an average density of $\geq$ 1 dm, and the increase from zero to 1 dm is more critical to success than additional decimeters (Figure 3). We recommend that any bird-friendly farm product certification program include guidelines for minimum vegetation densities and required vegetation monitoring.

Savannah Sparrow nests in our study of grazed areas had a lower daily survival rate (0.92) than Savannah Sparrow nests in ungrazed Conservation Reserve Program (0.93) and Wetland Reserve Program (0.95) areas of Western Minnesota and Eastern South Dakota (Koford 1999). Savannah Sparrows in Western Minnesota and Eastern North Dakota exhibited a range of daily survival rates seemingly unrelated to size and hostility of the landscape from 0.86 in a large hostile landscape to 0.94 in a small neutral landscape (Winter et al. 2000a).

We were surprised to learn in our study that continuously grazed pastures harbor a more diverse assemblage of birds than rotationally grazed pastures. When Temple et al. (1999) studied grassland birds on ungrazed, continuously grazed, and Intensive Rotationally Grazed (IRG) grasslands in Wisconsin, they found that continuously grazed pastures had the lowest diversity, rotationally grazed pastures had intermediate bird diversity, and ungrazed grasslands had the highest bird diversity. In our study, land used for continuous grazing was more likely to be steep, rocky, shrubby, and have more tree clumps. If these factors made it difficult to plow, pastures may have harbored a more diverse assemblage of plants that provided many different nesting niches and a more abundant source of insects, which combined to attract a more diverse group of birds (although see Pärt and Söderström 1999).

Our measure of equal reproductive success between treatments may be a result of the vegetation diversity inherent in each treatment. Unlike Temple et al. (1999), we found continuous pastures exhibited a broad range of vegetation densities and heights to harbor nesting birds, and had as much variability of vegetation factors between farms within the treatment as rotationally grazed pastures. One factor that may affect how a pasture was managed regardless of the named treatment was the amount of grain and hay supplementation fed to cattle. When farmers heavily supplement pasture grass with hay or grain, they may not be as compelled to closely monitor the health of their pastures The most heavily supplemented cattle herd in our study continually and uniformly grazed the forage density to 0 dm. and we did not hear or see grassland birds on that pasture. This pasture also exhibited signs of extreme erosion and thistle infestation. Although many farmers do not graze their pastures to this extent, it is worth noting that this practice results in little or no grassland bird breeding habitat.

**Management Recommendations for Interested Farmers** based on our study results and a review of the literature.

- Keep grazing, and encourage others to graze. Grassland bird habitat is decreasing across the country and each additional pasture can provide more habitat.
- Fence off some part of the pasture for most or all of the nesting season. Wait to graze, clip, or hay that area until July 15th.
- Stock at a moderate to low density. Think of the tall grass as your insurance in case of drought.
- Reduce or eliminate clipping from your pasture maintenance routine. Some farmers have found no decrease in pasture or herd performance after eliminating clipping (DeVore 2003).
- Time cutting and clipping to avoid the nesting season. If the pasture is cut for hay, cutting should be early, say at the end of May, so that the pasture can be left uncut in June to protect bird nests during the main nesting period.
- Use a flushing bar. This can be attached to your mower and it flushes adult birds before the mower runs over the nest.
- Clip or hay only a part of the pasture at one time so that there is a refuge for nesting birds.
- Monitor birds heard, compare with other years and neighboring farms to determine how you are doing.
- Hay or graze more intensively near trees, roads, and shrubby areas first and let the center of your grassland (the better nesting habitat) go longer between mowing or grazing.
- Carefully monitor grass height and density to ensure adequate nesting habitat.
- Make sure your rotation of cattle gives birds enough time to choose a building site (2 days), build a nest (2 days), lay eggs (5 days), incubate (12 days), and feed the young until they are free-flying (9 days) = 28 days, or about a month.
- Walk out to the pasture instead of driving a vehicle.
- Resist letting your dog come out to the pasture with you, and try to keep the cat in the house.

**Additional Funding and Partnerships**

Our funding from the Experiment in Rural Cooperation helped to secure additional funding including:

- $1,000 from two Dayton grants through the Bell Museum of Natural History at the University of Minnesota,
- $10,000 from a North Central Region Sustainable Agriculture Research and Education (NCSARE) grant, and
- $7,000 from Dr. John P. Loegering at U of M Crookston to help pay for field assistants for summer 2002.

We received in-kind assistance from the Minnesota DNR, through the use of a brand new metal detector (worth about $750) for both summers, and from the Land Stewardship Project office in Lewiston through the use of their copy and fax machines. Larry Gates; Cynthia and Todd Driscoll; Jay Hambidge; Mike and Jennifer Rupprecht; and John and Pat Dittrich; all helped

provide food and organizational services for the end-of-field season cook-out at Whitewater State Park in 2003.

## Dissemination of Project Results

Project results have been presented to the Conservation Biology Seminar (U of M, St. Paul), the Society for Conservation Biology Annual Conference (Duluth, MN), and at the Women in Sustainable Agriculture Conference (Spring Valley, MN).

Future venues for presentations (or posters) include: the What's Up In Sustainable Agriculture (WUSA) forum at the University of Minnesota (April 2004), the Conservation Biology Seminar (March 2004, U of M, St. Paul), the Society for Conservation Biology Annual Conference (New York City, summer 2004), the Annual Meeting of the Minnesota Chapter of the Society for Conservation Biology (March 15-17, 2004, St. Cloud, MN) and two southeast Minnesota area clubs as yet to be determined (could include: Sierra Club, Ornithologists Union, Isaac Walton League, Rotary, Lions, Kiwanis, Elks, etc. or local libraries). The study also will be published in an as-yet-undetermined peer-reviewed journal.

In addition and as promised, we are organizing a birds and grazing field day. This will take place at John Bedtke's farm in early June of 2004. We will have 4 or 5 speakers, a simple, locally produced lunch and pasture tours. We hope to bring together a larger group of farmers, resource managers, and university researchers, to discuss techniques for practical applications of our findings, and to enjoy the birds.

## Observations about the Community/University Partnerships

The Southeast Minnesota Regional Sustainable Development Partnership (The Experiment in Rural Cooperation) has served to connect our project to resources and people that have been invaluable. We have received excellent advice, formed new friendships, and made contact with more farmers through our work with the partnership. Working with Partnership board members reminds us of the practical goals of our work, and not just the theory associated with academia.

The flexible nature of partnership funding was a life-saver. Throughout the project we encountered situations when other grants had been awarded but were not yet available or were still negotiating the complex University budgeting process. The partnership funding was flexible and often bridged these delays and allowed us to continue moving forward and focus on the project objectives.

The Partnership is one of the only funding sources that recognizes how important it is to perform research on private land. Most wildlife research funding sources are interested in work on public lands, which concentrates most wildlife research on less than 5% of the hectarage of the state, and limits the applicability of results to land that does not also have to produce income for its owners.

We want the Partnerships to have more access to students. Cooperation with the Partnerships connects students to civic life, gives greater meaning to their work, and helps establish professional contacts between students and rural residents that could lead to a repopulation of rural communities. One way the Partnerships could improve their visibility with graduate students is to have their board members speak at graduate program seminars. Most graduate programs hold a weekly seminar where student projects as well as interesting speakers from that particular field of study share the results of their research.

Another way to reach students is through their advisors. The graduate student on our research team (Melissa Driscoll) was encouraged by her major advisor to work with the partnership. Often undergraduate students in a major are all advised by only one or two people in that major. The partnerships could attract many more students by simply contacting these key faculty in each major or program.

**Acknowledgements**

We are grateful for field assistance from Jolene Ruf, Jay Quimby, and Tracy Sullivan. We thank committee members Tom Will and Diane Larson for their input on the study design and Driscoll's graduate program. Laura Rice and Tracy Sullivan provided field housing. We could not have completed this study without the cooperation and enthusiasm of the farmers who granted us access to their pastures; Mike and Jennifer Rupprecht, John Dittrich, John and Donna Bedtke, Jary Holst, and John Koepsell. Farmers Mike and Jennifer Rupprecht, Art and Jean Thicke, and Ralph Lentz, and biologist Arthur (Tex) Hawkins (USFWS) helped to design the project. Bill McMillan provided access to study sites and cooperators. Larry Gates (MN-DNR and ERC) was instrumental in making the field seasons run smoothly, from recommending car repair services to providing homegrown food. Dr. Dan Svedarsky provided equipment. Finally, Melissa's husband Jay Hambidge held down the fort at home every summer, designed a database, entered data, solved computer glitches, and provided moral support. Melissa Driscoll is particularly thankful for the opportunity to be involved in the work of the Experiment in Rural Cooperation and for funding this portion of her graduate education.

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**Appendix A.** Physical and agricultural characteristics reported by farmers on six pastures that were study sites for our grassland bird research project in southeast Minnesota, 2002-2003.

| **Farms** | **RU** organic beef (rotational) | **BE** organic dairy (rotational) | **KOR** dairy (rotational) | **KOC** beef (continuous) | **DI** beef (continuous) | **HO** beef (continuous) |
|---|---|---|---|---|---|---|
| **Acres farmed** | 253 | 289 | 480 | 480 | 400 | 140 |
| **Acres in grazing treatment** | 131.4 | 165 | 70 | 65 (40 hayed once then grazed) | 100 | 80 |
| **Number and size of permanent paddocks** | 70: 1.5 - 2.5 acres | 50: 2.5 acres (woods are included, 35 acres) | 10: 7 acres | 2: 50, 15 (acres) | all in one area | 3: 15, 15, 50 (acres) |
| **Are the paddocks split up into smaller units when grazed?** | sometimes when lush or full of clover | some are / some aren't | yes - strip style | no | no | no |
| **Number of cattle grazed** | 170-250 depending on calving season | 110 (130 end of season) | 70 | 110 | 125 | 60 |
| **Number of cattle per paddock** | 35,000 lbs/acre minimum (40 to 175) | up to 72 | 70 | 110 | 125 | 20-30 |
| **Time cattle spend in a paddock on average (in the summer)?** | 1-1.5 days depending on group size | 4-5 days | 3 days | all summer | all summer | 1-2 months |
| **What % of diet is forage** | 100% | 80-90% forage | 50-75% grass | 100% grass | 50% grass, 50% hay minerals, grains | 100% forage |
| **Breeds of cattle grazed** | Angus, some older have Simmental, Gelbvieh, Hereford | Holstein and Jersey crosses (85%), and 15% beef and Dutch Belted | Holstein and Jersey crosses, Brown Swiss | Short Horn Normandy | Black Angus, Semintal-Limosine | Hereford, Angus, Texas Longhorn |
| **Range of slope in the paddocks** | 0-25% | 0 - 10% | 0 - 20% | 0 - 20% | 0 - 25% | 0 - 35% |
| **Soils on farm** | silt loam, | clay loam | clay loam | clay loam | clay | loamy |
| **% of your farm that is wooded /riparian vs. grassland?** | <0.6% wooded | 22% wooded, 78% grassland? | 5% wooded | 5% wooded | 20% wooded, 80% grassland | 1% wooded |