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THE EFFECTS OF SUBURBANIZATION AND HAYING ON THE REPRODUCTIVE SUCCESS OF GRASSLAND BIRDS BREEDING IN HAYFIELDS

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Kerri T. Vierling

EPO Biology, CB 334

University of Colorado

Boulder, CO 80309-0334

Abstract. Grassland bird populations are declining across the United States. In this study, I report the effects of landscape context and timing of haying on birds breeding in hayfields during 1997 in Boulder, Colorado. Birds breeding in hayfields located near suburban edges had significantly lower reproductive success (12%) than birds breeding in hayfields remote from such edges (32%). Predation caused 88% of all nest failures in hayfields adjacent to suburban edges and caused 59% of all nest failures in hayfields remote from suburban edges. Mowing occurred in early-mid July and caused minimal losses.

INTRODUCTION

Grassland birds are experiencing population declines across the United States and the population declines may be due to a number of different factors (Robbins et al. 1986, Askins 1993). Increased populations of predators, nest parasites, and/or habitat loss/degredation may all contribute to declining populations of grassland birds (Reynolds et al. 1993, Askins 1993, Vickery 1994). An additional factor affecting population declines may be related to the mowing of hayfields during the breeding season (Frawley 1989, Bollinger et al. 1990).

Birds nesting in hayfields face a unique situation in that hayfields are mowed during the middle of the breeding season, often causing complete nest failure. The amount of impact from haying depends on the duration of the breeding cycle of the species, the phenology of breeding, and the propensity of the species to renest (Frawley and Best 1991). Bollinger (1990) documented the negative effects of haying on the nesting activities of the bobolink (*Dolichonyx orizyvorus*) and attributes the population decline of this species in part to haying activities.

Landscape context may also affect the reproductive success of birds breeding in hayfields. Breeding areas near suburban edges may experience different levels of nest success compared to those which are remote from human activity. For instance, Wilcove (1985) demonstrated that predation rates were higher in forest lots near suburban edges compared to remote forest lots and suggested that this was the result of higher densities of human commensal predators in suburban areas. The results of his study suggest that a similar trend may be true for grassland birds; proximity of a hayfield to a suburban edge may also negatively affect breeding activities of the avian community.

The overall objective of this study is to examine the effects of mowing and landscape context on the breeding success of grassland birds in Boulder. The specific hypotheses to be tested are the following:

1) Landscape context affects the breeding success of grassland birds.

Prediction: Breeding success is higher in areas remote from suburban edges and lower in areas near suburban edges.

Prediction: Predation rates are lower in areas remote from suburban edges and higher in areas near suburban edges.

2) Early mowing negatively affects breeding success of grassland birds

Prediction: Nest success will be higher in hayfields mowed later in the summer.

MATERIALS AND METHODS

Study sites

Sixteen hayfields in Boulder were chosen for this study: eight of these hayfields were located adjacent to suburban edges while eight of them were remote from such edges. While 16 study sites were included in the nest searches, breeding birds were only found in 10 of these sites; 5 of these sites were adjacent to suburban edges and 5 were remote from such edges. The other sites were commonly used for foraging by a variety of avian species but no breeding activities were recorded at those sites.

I monitored the activities of 7 species of birds in the above hayfields. The breeding bird assemblage included Red-winged blackbirds (*Agelaius phoeniceus*), Bobolink, Savannah sparrow (*Passerculus sandwichensis*), mallard (*Anas platyrhychos*), Killdeer (*Charadrius vociferus*), Common Snipe (*Gallinago gallinago*), and Wilson's Phalarope (*Phalaropus tricolor*). A total of 39 nests were monitored over the course of the breeding season; 17 occurred in hayfields near suburban edges while 22 occurred in hayfields remote from suburban edges.

Measurements of reproductive activities

Nests were found using the rope-drag technique (Rodenhouse and Best 1983) and by observing parental activity. Once nests are found, an orange flag was placed 5m north of the nest; the flag was not placed at the nest because predators may use flags as cues to find nests (Picozzi 1975). I monitored nests every 2-3 days and recorded nest contents. If the nest contents disappear prior to fledging, I recorded a predation event.

Data analysis

I determined reproductive success (the number of nests successful in fledging at least one young) using the Mayfield method (1975); this method calculates the average daily survival and overall survival rate based on nest monitoring data. While sample sizes are very low for some species (only one nest in many cases), the Mayfield method calculates reproductive success by comparing the amount of time the nest survived to the number of days the nest would need in order to successfully fledge young. Reproductive success between remote and adjacent hayfields was compared using the CONTRAST program (Sauer and Williams 1989). Predation was compared among habitats using a chi-square contingency test (Zar 1984). No statistical tests were performed to compare reproductive success with mowing dates for two reasons. First, mowing was relatively synchronized throughout the study sites and generally occurred in a span of 2 weeks from late June-mid July. In addition, only 2 nests at one site were active during mowing, making a statistical comparison of mowing dates irrelevant.

RESULTS AND DISCUSSION

Reproductive success differed significantly among birds breeding in hayfields near to suburban edges and those breeding in hayfields remote from suburban edges ($\chi^2 = 11.56$, $p < 0.0007$) (Table 1). The average nest reproductive success for birds breeding in hayfields near suburban edges was 11.7% while nest reproductive success for birds in remote hayfields was 31.8%.

Table 1. Overall % reproductive success (the # of nests successful in fledging at least one young) for birds breeding in hayfields near suburban edges in Boulder, 1997. Bobolink reproductive success based on observations of their breeding behavior and not on actual nests observed. Sample sizes are in parentheses

Hayfields adjacent to suburban edges		Hayfields remote from suburban edges	
Species	% reproductive success	Species	% reproductive success
Bobolink (3)	0.1	Bobolink (6)	42.4
Common Snipe (1)	0	Savannah Sparrow (1)	2.8
Killdeer (1)	23.8	Wilson's phalarope (1)	0.02
Red-winged blackbird (11)	12.5	Red-winged blackbird (14)	28.9
Mallard (1)	12.5		

Predation differed significantly among hayfields adjacent to suburban edges and remote from adjacent edges ($\chi^2 = 4.6$, $p < 0.05$). Predation was highest in adjacent habitats, accounting for 88% of all nest failures. In contrast, 59% of the nest failures in remote hayfields were caused by predation. Hayfields are noted to support higher than normal densities of predators (Andren et al. 1985) which may account for the relatively high predation rates in all hayfields. However, the proximity of some of these

hayfields to suburban edges may increase the densities of human-commensal predators even more (Wilcove 1985) and cause higher predation rates in hayfields near suburban edges. Brood parasitism by Brown-headed cowbirds (*Molothrus ater*) did not occur in any of the nests monitored during the field season.

Unlike previous studies which documented severe impacts of mowing on breeding bird success (Frawley 1989, Bollinger et al. 1990), mowing caused little impact on this breeding bird community in 1997. Approximately 5% of the nests were lost due to mowing (2/39), probably because mowing at most sites was not started until late June. By the time most of the fields were mowed (mid-July) most of the breeding birds had either fledged young or had failed and not renested. Mowed fields were monitored into August to determine if renesting occurred, and no birds were found to breed in the hayfields after they were mowed. Therefore, the results of this study support mowing to occur in early or mid July in order to decrease the impacts of mowing on breeding birds in hayfields.

LITERATURE CITED

Andren, J., P. Angelstam, E. Lindstrom, and P. Widen. 1985. Differences in predation pressure in relation to habitat fragmentation. Oikos 45: 273-277.

Askins, R.A. 1993. Population trends in grassland, shrubland, and forest birds in eastern North America. Current Ornithology 11: 1-34.

Bollinger, E.K., P.B. Bollinger, and T.A. Gavin. 1990. Effects of hay-cropping on eastern populations of the Bobolink. Wildl. Soc. Bull. 18: 142-150.

Frawley, B.J. 1989. The dynamics of nongame bird breeding ecology in Iowa alfalfa fields. M.S. Thesis. Iowa State Univ., Ames, Iowa.

---------- and L. B. Best. 1991. Effects of mowing on breeding bird abundance and species composition in alfalfa fields. Wildl. Soc. Bull. 19: 135-152.

Herkert,J.R. 1995. An analysis of Midwestern breeding bird population trends: 1966-1993. Am. Midl. Nat. 134: 41-50.

Mayfield, H. 1975. Suggestions for calculating nest success. Wilson Bull. 87: 456-466.

Picozzi, N. 1975. Crow predation on marked nests. J. Wildl. Manage. 39: 151-155.

Reynolds, R.E., T.L. Shaffler, J.R. Sauer, and B.G. Peterjohn. 1994. Conservation Reserve Program: benefit for grassland birds in the northern plains. Trans. No. Am. Wildl. and Natur. Resour. Conf. 59: 328-336.

Robbins, C.S., D. Bystrak, and P.H. Geissler. 1986. The breeding bird survey: its first fifteen years 1965-1979. U.S. Fish and Wildl. Serv. Resour. Publ. 157. 196 pp.

Rodenhouse, N.L. and L.B. Best. 1983. Breeding ecology of vesper sparrows in corn and soybean fields. Am. Midl. Nat. 110: 65-275.

Sauer, J. and B. Williams. 1989. Generalized procedures for testing hypotheses about survival or recovery rates. J. of Wildl. Manage. 53: 137-142.

Vickery, P.D., M.L. Hunger Jr., and S.M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Cons. Bio. 8: 1087-1097.

Wilcove, D. 1985. Nest predation in forest tracts and the decline of migratory songbirds. Ecology 66: 1211-1214.

Zar, J. 1984. Biostatistical Analysis. Prentice Hall, New Jersey.