

Effects of Herbaceous Field Borders on Farmland Birds in the Mississippi Alluvial Valley



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Introduction

Native prairies once covered nearly a third of the continental United States. These grasslands supported a diversity of unique plants, birds, and mammals and provided fertile cropland. Today, however, less than 1 percent of historic tallgrass prairie remains. Some bird species that naturally occurred in native prairies were able to carve out a niche in the simplified grasslands of corn and wheat that replaced the prairies. Concurrently, conversion of forestlands to agricultural uses resulted in colonization by grassland birds of sites formerly occupied by forest birds. Together, conversion of grassland and forestlands to agriculture has resulted in widespread dependency of grassland birds on farmlands. For decades, many of these grassland species have persisted, some even thriving in agricultural landscapes. However, recent technological advancements and economic pressures have resulted in larger farm fields, monoculture crops, and more intensive production practices. These practices and other factors have contributed to a substantial loss in suitable wildlife habitat, which paralleled declining populations of many farmland-dependent birds. To achieve broad soil and water conservation benefits and provide wildlife habitat, the U.S. Department of Agriculture (USDA) has promoted the establishment of conservation buffers in agricultural landscapes. Conservation buffers are an effective management strategy because they provide habitat for grassland birds and enhance the health of production farms by increasing nutrient and chemical retention and reducing soil erosion. Conservation buffers may even reduce the invisibility of weeds into crop fields when established with perennial grasses.

Field borders are a particularly effective form of conservation buffer because their flexibility of location on a farm permits their establishment around an entire field margin, as opposed to forms such as riparian buffers, which must be placed on the down slope side of a field. A field border is a linear strip of intentionally managed noncrop herbaceous vegetation that typically runs adjacent to a field margin. They are often used in conjunction with existing habitats, such as fence rows and drainage ditches. Such habitat frequently represents the only year-round early successional habitat on

an entire farm and is, therefore, crucial to the survival needs of many grassland birds. Although initially proposed to benefit northern bobwhite, field borders have been documented to provide escape cover, foraging opportunities, roosting sites, travel corridors, and shelter to several game and nongame birds.

The foremost objectives of this effort were to quantify wintering and breeding bird communities, bird productivity, and nesting survival in response to the establishment of narrow and wide herbaceous field borders adjacent to wooded fence rows and drainage ditches (fig. 1).

This study was conducted on six agricultural production farms throughout Sunflower County in the Mississippi Alluvial Valley (MAV) physiographic region. Albeit the native habitat of this area was continuous bottomland hardwood forest, it is currently dominated by cotton, soybean, and catfish production farms. In the spring of 2002, herbaceous field borders (planted with native warm-season grasses, partridge pea, and kobe lespedeza) were established amid row crop fields and wooded fence rows that contained drainage ditches. Experimental field borders were established as narrow-bordered (30 ft wide) or wide-bordered (60 to 120 ft wide) field margins. Additionally, control (nonbordered) field margins that represent traditional ditch to ditch farming practices were delineated.

Figure 1 A 30-ft field border between fence row and soybean field



Avian community response to field border practices

Bird communities were examined with line-transect counts during breeding season (May to July) 2002 to 2004 and winter (February) 2003 to 2004 to detect effects of field border presence and width on avian density, abundance, and richness. No counts were conducted for wide-bordered margins during the breeding season of 2002, and species-specific analyses for wide borders were omitted due to low sample size.

Wintering bird response

There were 59 bird species and 4,083 total birds recorded within 100 feet adjacent to 13.6 miles of line-transects during the winters of 2003 and 2004 (fig. 2). The most abundant birds detected were mourning dove (18%), European starling (16%), red-winged blackbird (7%), common grackle (6%), and northern cardinal (6%). The most abundant sparrows were song sparrow (5%), white-throated sparrow (4%), and swamp sparrow (3%).

During winter, field borders in the MAV have substantial conservation potential, as many grassland sparrows' annual survival depends on the quality of their winter habitat. Furthermore, in recent years, grassland birds have undergone more serious population declines than any other bird group. Most sparrows are ground-foraging grain eaters, and their association with field borders is to feed both in the border and on waste grain in adjacent crop fields. Results indicated

sparrow densities were considerably higher in both narrow- and wide-bordered field margins than non-bordered. Total sparrow density was twice as high in narrow than nonbordered margins and even greater in wide than narrow-bordered margins. Song and swamp sparrows greatly benefited from field border presence, while more wooded cover-dependent species, such as the white-throated sparrow, were less influenced. Furthermore, wide-bordered field margins housed significantly higher avian richness than other margin treatments.

In adjacent crop fields, sparrow densities were similar between non- and narrow-bordered margins. However, there was considerable increase in sparrow use of adjacent fields with wide-bordered margins. Hence, it seems wide field borders provide more effective escape cover and, therefore, increase forage opportunities on waste grain for sparrows in nearby crop fields (fig. 3).

In winter, these borders frequently represent the only herbaceous standing vegetation in the MAV landscape and, therefore, are particularly important habitat for wintering birds. Food supply is often a limiting factor for wintering bird survival, and field borders may provide the crucial difference between survival and starvation.

Figure 2 Densities of wintering sparrows within 30 ft of field margins in Sunflower County, 2003 to 2004

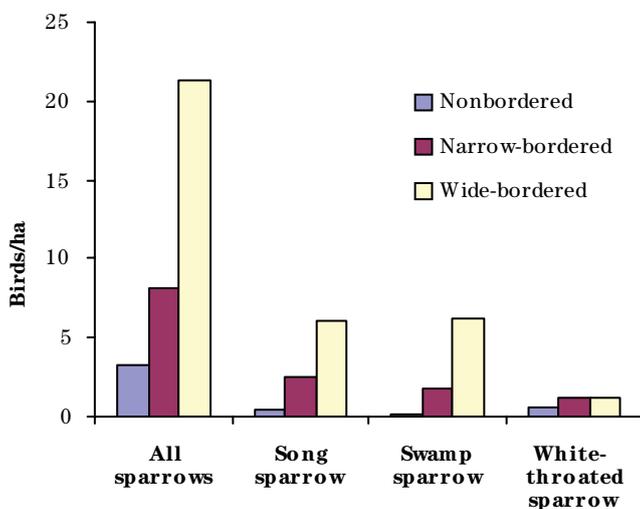
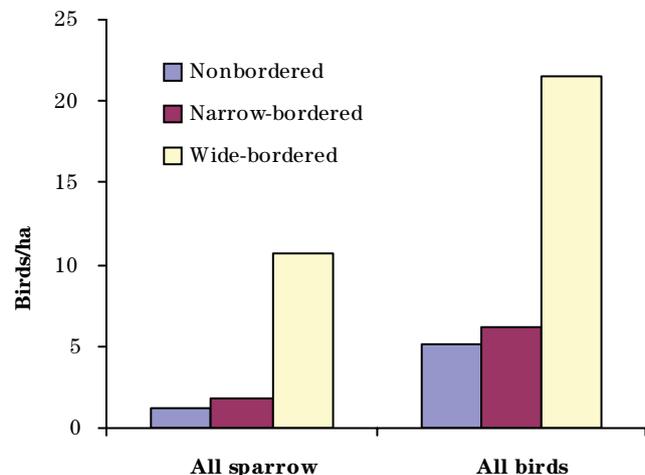


Figure 3 Total densities of wintering sparrows and all birds 30 ft in crop field adjacent to field border in Sunflower County during winters 2003 to 2004



Breeding bird response

During the summers of 2002 to 2004, 73 species were recorded and 8,727 individuals counted within 100 feet adjacent to 13.6 miles of surveyed line-transects (fig. 4). The most abundant birds counted were red-winged blackbird (30%), northern cardinal (10%), common grackle (8%), mourning dove (5%), blue jay (5%), indigo bunting (5%), and dickcissel (5%).

Dickcissel, northern cardinal, and indigo bunting all were considerably more abundant in narrow field margins. Indigo buntings and northern cardinals were three times more abundant in bordered margins. Despite being forest birds, these two species exploited field borders for cover, nesting, and foraging. Dickcissel, a species of concern in Mississippi (3.68%/yr population decline based on Breeding Bird Survey, 1980–2003), was completely absent from field margins without field borders. Another declining species, then northern bobwhite (5.04%/yr), was also never observed using nonbordered margins. These absences suggest

field borders provide crucial habitat for ground-foraging grassland birds.

Bird abundance was significantly enhanced in both narrow and wide field borders compared to nonbordered margins, but wide borders had a greater influence on avian abundance than did the narrow borders. Also documented was an increase in abundance of experimental borders over the study period, which likely reflects the vegetative maturation these borders underwent from 2002 to 2004 (fig. 5). Avian richness was positively impacted by field border presence; however, there was minimal difference in richness between narrow and wide-bordered field margins.

Figure 4 Average abundance of birds commonly observed within field borders in Sunflower County during summers 2003 to 2004

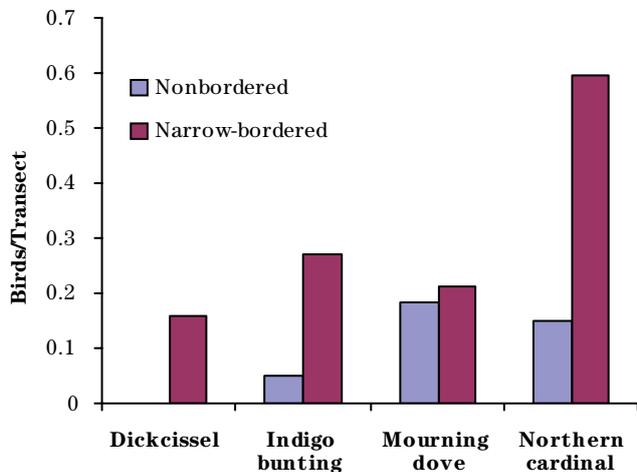
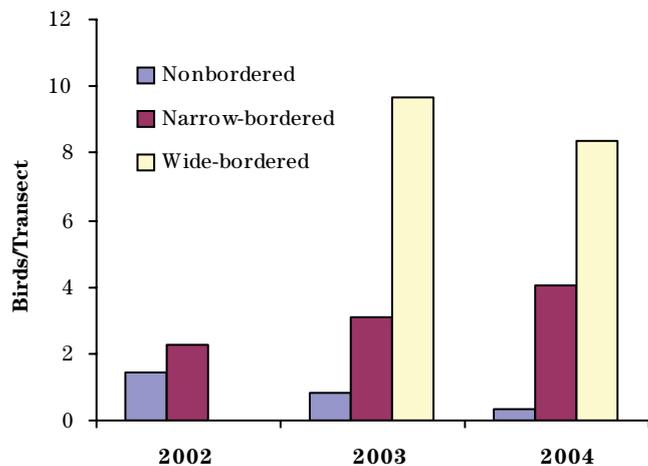


Figure 5 Average bird abundance per field margin treatment during breeding seasons 2002 to 2004 in Sunflower County



Avian nesting density and success

Nonbordered, narrow-, and wide-bordered field margins were systematically nest searched during the summers (May 1 to August 1) of 2002 to 2004. Once found, nests were monitored every 2 to 4 days to determine outcome. Apparent nest success (total nests survived/total nests) was calculated to determine nest survival per treatment. Nest data was omitted for 2002 from paucity of sample size, as field borders required 1 full year of growth before providing potential nesting habitat (fig. 6).

A total of 434 nests of eight bird species over three breeding seasons (2002 to 2004) were found. Red-winged blackbird (78%) and dickcissel (19%) represented the majority of nesting occurrences. Other birds that nested in field borders include northern cardinal, blue grosbeak, yellow-billed cuckoo, indigo bunting, mallard, and northern mockingbird.

Birds nested in both narrow and wide field borders, but had disproportionately higher nest densities in wide-bordered margins. Over the 3-year duration, no

nests were found in the control sites, likely due to the lack of vegetative substrate and/or diversity.

The exceedingly low nest density of narrow-bordered field margins implies that increased border width substantially enhanced the attractiveness of field borders as nesting habitat. Furthermore, the failure of narrow borders to attract dickcissel reduces their conservation benefit compared with wider field borders.

Overall, nesting success in all field borders was low at 22.4 percent (all years combined). Birds nesting in narrow borders experienced greater nesting success (29.2%) than wide borders (21.6%). This potentially resulted from increased predation pressure in wide borders, as more nests likely attracted more predators (fig. 7). The primary causes of nest loss were predation (89%) and abandonment (7%). Another important component to nest survival in the MAV is the collaboration of farmhands, as several nests (n=7) were lost due to untimely field border manipulations.

Figure 6 Total nesting density per field border type in Sunflower County from 2003 to 2004

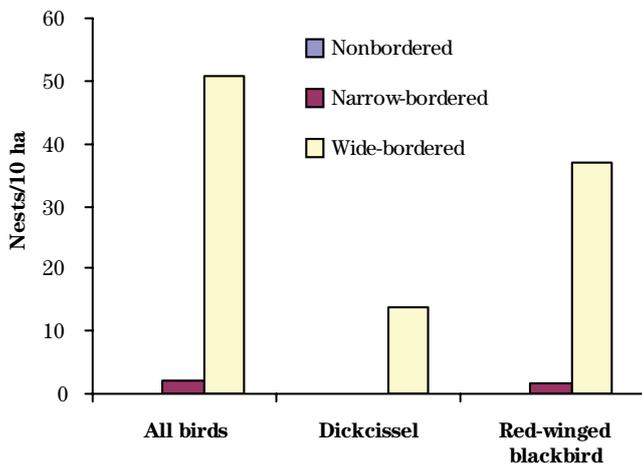


Figure 7 This indigo bunting nestling was found nesting in a field board adjacent to a soybean field



Summary

As agricultural production continues to become more efficient, it becomes increasingly important that a balance is maintained between human and wildlife needs. Field borders are an effective form of noncrop, early successional vegetation that provides essential habitat to breeding and wintering avian communities. Furthermore, field borders located along a wooded fence row have minimal impact on crop productivity. This study and previous research have documented the positive response of avian communities to narrow field borders. These borders have provided:

- escape
- foraging
- resting
- nesting
- roosting habitat

In response, local avian communities may have increased abundance, richness, and nesting density.

In winter, field borders frequently represent the only standing herbaceous habitat in a landscape. The addition of structurally complex field border habitat increases the amount of food (weed seed), as well as foraging opportunities in adjacent crop fields for birds. These additions likely enhance the carrying capacity of a region, potentially benefiting populations of short-distance migrants that overwinter in Mississippi. This is especially important in the MAV, as many sparrows of conservation concern winter there. This study confirmed positive responses of wintering birds to field border presence. Additionally, wide borders experienced enhanced abundance and richness not only within the border, but also in adjacent fields.

The breeding avian community also responded with increased abundance and richness in bordered field margins. Similar to the winter community, wide borders also experienced significantly higher abundance than narrow borders during summer; however, border width did not have much influence on species richness.

Field border width strongly dictated the attractiveness of borders as nesting habitat. Nonbordered margins harbored no nesting activity, and narrow borders had minimal activity. Wide-bordered field margins,

however, contained extremely high nest densities for dickcissel and red-winged blackbirds. Narrow borders had higher apparent nest survival than wide, but lack of nesting density caused their productivity to suffer.

Field borders have demonstrated to increase northern bobwhite populations in previous studies. Although their use of field border habitat on numerous occasions were detected, Sunflower County did not have a large enough population base to detect any population trends over 3 years.

This study clearly demonstrates the value of field borders for avian species that inhabit row crop agricultural production farms. Narrow field borders are certainly a large improvement over nonbordered field margins; however, this research also delineated the substantial advancements possible with increased widths. Results indicate that field borders intended as nesting habitat need to be greater than 30 feet wide. We recommend farm-scale management regimes to encompass a variety of wide and narrow field borders. This regime will diversify nest site and foraging habitat availability and, thereby, avoid creating an ecological trap, where predators may cue on sites of high nest densities.

Proper management of herbaceous field borders includes disturbance regimes to be conducted approximately every 3 years. Disturbance of borders on a farm should occur during late winter in annual rotations. Disturbance rotation will permit the local dispersal of wintering birds to alternative nearby suitable habitat, thereby reducing their stress of habitat loss during the food-depleted months in late winter. There is also a need for a complementary study that defines optimal field border widths for avian abundance, richness, and reproductive success.

Conservation buffers with location flexibility provide numerous environmental benefits (herbicide, pesticide, soil, and fertilizer retention) that promote a healthy ecosystem. Additionally, field borders provide habitat that is valuable to numerous avian species year-round, while having negligible impacts on farm productivity. The successful incorporation of field borders on intensively managed production farms represents a keystone relationship amid modern-day technological advancements.