Bird use of roadsides in an agricultural ecosystem

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Bird use of roadsides in an agricultural ecosystem

Abstract
Before agriculture dominated the Midwest plains, prairie grasses and other plants dominated the Iowa landscape. Today, however, most of this land is devoted to rowcrop farming. While the original prairie and early, small farms provided habitat for numerous bird species, this habitat has been lost as pastures and hay and oats fields have been eliminated. Now, fencerows, grassed waterways, railroad rights-of-way, and roadsides represent potential refuge for bird species that do not need large areas to thrive.

Keywords
Animal Ecology, Wildlife and recreation

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Background and goals
Before agriculture dominated the Midwest plains, prairie grasses and other plants dominated the Iowa landscape. Today, however, most of this land is devoted to rowcrop farming. While the original prairie and early, small farms provided habitat for numerous bird species, this habitat has been lost as pastures and hay and oats fields have been eliminated. Now, fencerows, grassed waterways, railroad rights-of-way, and roadsides represent potential refuge for bird species that do not need large areas to thrive.

While some researchers have conducted studies showing that roadsides along gravel roads can provide important nesting cover for pheasants, the suitability of such habitat for other birds needs to be evaluated. Moreover, the previous research on bird use of roadsides was done mostly along paved highways, not along the gravel roads that predominate in rural Iowa.

Thus, in a two-part project, these investigators studied bird abundance and species richness in roadsides adjacent to Iowa rowcrop fields and the density and the fate of bird nests in these roadsides. The objectives for Part 1 of this study were to (1) document the abundance and composition of bird species using roadsides and adjacent rowcrop fields, and (2) evaluate the influence of roadside vegetation type (native-mix versus exotic) and controlled burning on bird use of roadsides. Part 2 objectives included documenting the bird species nesting in roadsides and their nest densities, and assessing how vegetation and structural characteristics in roadsides influenced nest density and success.

Approach and methods
Part 1: Bird abundance and species richness
Study sites: Investigators selected 18 roadsides in 1990 and 16 in 1991 in counties that were typical of the Iowa cash-grain farming region. Because those sites are part of integrated roadside vegetation management (IRVM) programs, program personnel were available to assist in burning trials.

All sites had fences and were located along gravel roads adjacent to corn or soybean fields.

Ten of the 1990 and eight of the 1991 roadsides contained some warm-season, native prairie grasses. The remainder contained exotic, cool-season grasses, predominantly smooth brome. To compare the effects of fire on the two vegetation types, workers burned half of the native-mix roadsides in April each year and half of the exotic grass plots in March 1990. (Weather delays in 1991 prevented burning of smooth brome plots.) In addition, investigators also established field plots parallel to the roadside plots to compare bird use of each.

Vegetation measurements: Investigators measured height, density, and composition of the vegetation at a random site along each 100
Fig 1. Mean roadside contour and total number of nest of four species in each roadside position in central Iowa, 1990-1991. (n = 34).

meters of roadside. These measurements were taken at roadside foreslope (closest to the road), bottom, and backslope (see Fig. 1). From mid-May through late July, height and density were measured every two weeks with a pole graduated at 10-centimeter intervals. Investigators viewed the pole at a standardized height and distance from four directions, noting the proportion of each interval obscured by vegetation. They calculated density by averaging measurements from the four directions at each interval and summing them over all intervals. Composition, measured monthly during the same time period, was calculated by estimating the percent canopy coverage of plant species within a 0.1-square-meter area. Overall coverage of grasses and forbs was calculated by adding coverages of the individual plant species.

In field plots, crop residue was estimated visually. To determine whether differences in bird abundances between years correlated with differences in the coverage of habitat types adjacent to the studied roadides, investigators mapped a portion of each study site according to its cover. Aerial photographs by the Agricultural Conservation and Stabilization Service, combined with ground checks, allowed investigators to categorize habitats as rowcrop, hayfield, pasture, scrubland, farmstead (sparse woody cover), or farmstead (moderate-to-dense woody cover) and average the percent coverages for each habitat type each year.

**Bird abundance:** To estimate relative bird abundance, observers walked each roadside shoulder weekly from mid-May through early August at the same time of day, recording all birds in the roadside or foraging in the air above the roadside. Observers walked field plots at midline, recording birds observed within 50 meters on either side.

Investigators then statistically analyzed how vegetation type, burning, type of adjacent crop, and other factors influenced bird abundance and species richness in roadsides.

**Part 2: Nest density and fate of birds**

**Nest searching and monitoring:** Study sites and roadside vegetation measurements were essentially the same as those in Part 1, although Part 2 did not involve the field habitat. Investigators recorded nest height and nest placement in the roadsides’ foreslope, bottom, backslope, or fence, and they measured vegetation at and near the nests, again using methods described for Part 1. They took care not to disturb nests being studied.

Pairs of observers searched plots weekly for nests in all roadides from mid-May through early August of both years. They walked one meter apart along the roadside’s length, parting the vegetation with a stick and repeating passes until they had traversed the entire area. By flagging the nearby fence, they marked nests having at least one egg. Passerine nests were checked every 2 to 4 days until either the young fledged or the nest failed. Game bird nests were observed at a distance to avoid flushing hens. A nest was considered successful if it fledged at least one young; nests were considered lost to predators if their contents, whether eggs or young, had been removed.

Observers also tried to identify predator type by the empty nests’ condition and vicinity. They attributed nest failures to weather if nests were found destroyed or empty after a storm.
Nest failures were attributable in part to parasitism by brown-headed cowbirds. Still other nests were lost to mowing or tipping of vegetation that had supported the nest. Investigators attributed five nest failures to their observation activities.

Findings

Part 1: Bird abundance and species richness

Vegetation: Investigators confirmed that various species prefer different vegetation height, density, and composition. Because so few gravel roadsides contain predominantly prairie vegetation, investigators could not assess its impact on bird use. Although efforts are under way to seed native prairie species in some gravel roadsides, it may not be economically practical or even possible to establish pure prairie stands in roadsides that are frequently disturbed. Besides, these investigators observed many bird species using roadsides of predominantly smooth brome, an exotic grass that thrives in harsh roadside environments and thus may be the best vegetation type for gravel roadsides.

Bird species composition and abundance: In roadsides, 35 bird species were seen, compared to 26 species in rowcrop fields. Major roadside species included the red-winged blackbird, brown-headed cowbird, vesper sparrow, western meadowlark, dickcissel, gray partridge, song sparrow, American robin, barn swallow, and common grackle. The brown-headed cowbird, horned lark, vesper sparrow, killdeer, and red-winged blackbird were found most commonly in the rowcrop fields. Sixteen species were seen only in roadsides; six were seen only in fields.

Part 2: Nest density and fate of birds

Of 120 nests located, 98 were used to analyze nest fates because they were active when found. The remaining 22 were used in density and site selection analysis. Results from both years were combined (because they were similar) and analyzed statistically to yield information on the effects of various roadside characteristics on selected species, daily survival and predation rates, and nest fate relative to vegetation characteristics.

Eight species were observed nesting in roadsides; red-winged blackbirds and gray partridge were the most common. In all, 120 nests were found for all species, with an estimated nest density of 1,147 nests per hectare (2,833 per acre). Predation was responsible for 76% of all red-winged blackbird nest failures; 46% of all blackbird nests were parasitized by the brown-headed cowbird.

Red-winged blackbird nest density and success was greatest in roadsides and at nest sites with tall, dense vegetation. Partridge and pheasant nest densities were greatest in areas of high residue coverage. Vesper sparrow

Investigators took care not to disturb nests being studied.
nests were most dense in areas of sparse vegetation; all their nests were found in the short vegetation of the foreslope. The blackbirds most often placed their nests in the bottom and at the fence of a roadside. Placement of nests within roadsides did not influence nesting success, although predation rates were higher in the bottom and at the fence. Blackbird nests placed in forbs (herbaceous, nongrass plants) and shrubs were more successful than those built in grass.

Bird nest density is greater in roadsides than in crop fields because the habitat in roadsides is much more suitable for birds and because nests in fields are more frequently destroyed by farming activities. Because birds that nest in roadsides can produce more young than those nesting in crop fields, improving the attractiveness of roadsides to birds should enhance bird productivity. Iowa has recently re-examined its roadside vegetation management approaches. Efforts are underway to replace exotic grasses with native prairie grasses, which, along with other plants, can provide habitat for a wider variety of grassland bird species. Such management techniques can enhance the vitality of this vegetation as bird habitat.

Part 2 of this study revealed that red-winged blackbirds were attracted to native vegetation and fences as nest sites. This type of vegetation also results in more standing residue left from the previous year, which provides more robust nesting cover for grassland birds than would a more homogeneous, smooth brome grass roadside.

Implications

Traditional roadside management can be modified to improve the likelihood of birds nesting. For example, mowing of the roadside shoulder to enhance driver safety creates a swath of short, sparse vegetation that attracts nesting vesper sparrows and western meadowlarks. Although many roadsides adjacent to gravel roads are too steep to permit mowing, deferring any mowing that does occur until mid- to late August will minimize the negative impact on nesting birds.

Prescribed springtime burns every three to five years can also help to maintain healthy vegetation. However, because fire can be detrimental in roadsides where vegetation is not well established, it should be used with caution. Farmers should be encouraged to retain fences along gravel roadsides to help prevent agricultural encroachment and therefore create more wildlife habitat.

The investigators also speculate, on the basis of earlier research by others, that adding a legume such as alfalfa to traditional seed mixes in roadsides may improve their attractiveness to game birds. Studies suggest that legumes might increase the density of game birds without diminishing nest success rates.

Some bird species that typically nest in grassland habitats, such as bobolinks, grasshopper sparrows, savannah sparrows, and upland sandpipers, were conspicuous in absent from the studied roadsides. These species may have minimum area requirements that narrow, linear roadside habitats cannot meet. Roadsides near blocks of grassland may have different nest densities and nesting success than those evaluated in this study. Studies of roadsides adjacent to habitat types other than rowcrop fields are needed to fully understand the importance of roadsides to breeding birds.

The investigators have presented their findings at the Midwest Fish and Wildlife Conference, to ISU undergraduates, to employees of the Iowa Department of Transportation, and to county conservation board roadside managers in northern Iowa. Poster displays at other conferences and meetings have also conveyed project information to ecologists, farmers, and others.

Ultimately, this research is significant because wildlife diversity is an important indicator of an ecosystem’s overall quality. Abundant wildlife species contribute richness to environments they inhabit.