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GRASSLAND SONGBIRD ABUNDANCE ALONG ROADS AND TRAILS IN SOUTHERN SASKATCHEWAN

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Abstract.—We conducted roadside and trail-side point count surveys to determine whether grassland bird abundance differs along ditched and non-ditched sampling points in southwestern Saskatchewan. Savannah and Vesper Sparrows were more abundant along roads, while Baird's Sparrows, Chestnut-collared Longspurs, and Sprague's Pipits were more abundant along trails. Clay-colored Sparrows, Horned Larks, and Western Meadowlarks were detected equally along roads and trails. The lower abundance of Sprague's Pipits along roads may be attributed to the 20–30% reduction of suitable habitat associated with the road right-of-way within a point count of 100-m radius. Larger differences for Baird's Sparrows and Chestnut-collared Longspurs (42 and 56% less abundant along roads, respectively) suggest that these species tend not to establish territories adjacent to roadside ditches. Our results indicate that roadside studies designed to estimate the abundance of grassland songbirds should either include trailside counts or interpret roadside data based on the affinity of a species for roadside habitat.

ABUNDANCIA DE AVES CANORAS A LO LARGO DE CARRETERAS Y TRILLOS EN EL SUR DE SASKATCHEWAN

Sinopsis.—Se condujeron conteos de puntos a lo largo de carreteras y trillos para determinar si había diferencia en la abundancia de aves canoras de yerbasales en localidades con zanjas y sin-sanjas en los puntos de muestreo. El trabajo se llevó a cabo en el suroeste de Saskatchewan. Se encontró que *Passerculus sandwichensis* y *Pooecetes gramineus* eran más abundantes a lo largo de carreteras, mientras que *Ammodramus* bairdii, *Calcarius ornatus* y *Anthus spragueii,* lo eran en los trillos. Por su parte *Spizella pallida, Eremophila alpestris* y *Sturnella neglecta,* resultaron con similar abundancia en ambos tipos de localidades. La menor abundancia de *A. spragueii* a lo largo de carreteras puede ser atribuido a la reducción entre un 20–30% del habitat disponible, asociado con una construcción en la carretera dentro del radio de 100 metros del punto de conteo. Las grandes diferencias en *A. bairdii* y *C. ornatus* (42 y 56% menos abundantes a lo largo de carreteras, respectivamente) sugieren que estas especies no tienden a establecer territorios adyacentes a carreteras. Nuestros resultados indican que los estudios a lo largo de los márgenes de carreteras diseñados para estimar la abundancia de aves típicas de yerbasales, deben incluir conteos a lo largo de trillos o interpretar los datos de carreteras en armonía con la afinidad de la especie al habitat marginal a lo largo de las mismas.

Roadside counts offer an effective and efficient means of collecting information on bird numbers across large areas at relatively low cost. The most familiar roadside survey is the annual Breeding Bird Survey (BBS), which covers much of North America and provides standardized data for population trend analysis (Sauer and Geissler 1990). By definition, roadside surveys provide no information about species abundance in off-road

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habitats. Comparisons between on- and off-road counts show that some bird species are more or less abundant along roads, depending on their affinity for roadside habitat (Owens and Myres 1973, Hutto et al. 1995, Rotenberry and Knick 1995, Hanowski and Niemi 1995). The BBS also tends to undersample regions where secondary road density is relatively low, as in much of the grassland areas of Montana, southwestern Saskatchewan, and southeastern Alberta (Droege 1990). The need for accurate abundance data is especially great in these areas, because populations of many grassland songbird species appear to have declined significantly in recent years (Knopf 1994, Herkert 1995, Sauer et al. 1996).

An effective and cost-efficient way to increase the coverage of a road-based survey is to include less-developed roads (i.e., trails) in the study design. This may lead to a sampling bias, however, because of structural differences between roadside and trailside habitats. On the Canadian prairies, roads used for the BBS (i.e., secondary roads; Droege 1990) are 8–9-m wide with drainage ditches that extend 11–18 m away from the traveling surface and usually end at a fence or field edge. A recommended survey technique for grassland songbirds is to count individuals within a 100-m radius circle (Ralph et al. 1995). When a 100-m radius point count is conducted from the middle of a secondary road, the 35–40-m right-of-way means that 20–30% of the habitat in the circle may differ substantially from the rest of the sampling area. Most roadside ditches are seeded with exotic grasses such as smooth brome (*Bromus inermis*) or crested wheat grass (*Agropyron cristatum*) to reduce soil erosion (W. Trenaman, pers. comm.). Also, most ditches are not grazed and are often hayed only in late summer or early fall. By comparison, trailside habitat is generally identical to the surrounding vegetation in plant species composition and structure because trails usually consist of a pair of wheel ruts with no bordering ditch or fence.

The objective of this study was to determine whether grassland bird abundance along roads differ from that along trails in southwestern Saskatchewan. Based on structural differences between roadside and trailside habitat, we expected that some grassland species would be attracted to roads while others would avoid them.

METHODS

We used data from roadside and trailside surveys conducted on native prairie throughout the Cypress Upland and Mixed Grassland ecoregions of southern Saskatchewan (a combined area of 9,157,000 ha), from 4 Jun.–2 Jul. 1994. For our purposes, roads were defined by the presence of a drainage ditch that usually was planted with smooth brome grass and ended at a fence that was 11–18 m from the traveling surface. Trails consisted of a single pair of wheel ruts, and trailsides were visually indistinguishable from the surrounding habitat in terms of vegetation structure and plant species composition. Native vegetation in the study area is characterized by *Stipa* spp., June grass (*Koeleria gracilis*), northern wheat grass (*Agropyron dasystachyum*), western wheat grass (*A. smithii*), blue

grama grass (*Bouteloua gracilis*), sedges (*Carex* spp.), club moss (*Selaginella densa*), pasture sage (*Artemisia frigida*), western snowberry (*Symphoricarpos occidentalis*), rose (*Rosa* spp.), wolf-willow (*Elaeagnus commutata*), and various forbs (T. Harrison, unpubl. data). Plant names follow Looman (1982) and Vance et al. (1984).

Given that the species of primary interest, Baird's Sparrow (*Ammodramus bairdii*), was considered to be a grassland specialist, survey routes were located by randomly choosing townships that consisted of at least 80% grassland, as determined from 1:20,000 air-photo mosaics (Davis et al. 1999). Each route consisted of 20–25 stops that were at least 800 m apart. Samples were collected by two trained observers who conducted 100-m fixed-radius point counts at each stop over a 5-min sampling period. Each route was sampled only once by only one observer, and all surveys started 30 min before sunrise on days with winds <20 km/h and no precipitation.

We analyzed data from 381 half-circle point counts (266 from roadsides and 115 from trailsides) conducted on lightly-to-moderately grazed parcels of native prairie >256 ha. We used half-circle counts as our sample unit because habitat type and grazing intensity sometimes differed on opposite sides of a road. We randomly chose one half of each 100-m circle because counts from two halves of the same sampling area are not independent. We compared the abundance of individual bird species along roads and trails using a Wilcoxon two-sample test, because the data could not be normalized. We limited our analyses to species that occurred in over 15% of the samples: Horned Lark (45%, *Eremophila alpestris*), Sprague's Pipit (26%, *Anthus spragueii*), Baird's Sparrow (22%), Vesper Sparrow (27%, *Pooecetes gramineus*), Savannah Sparrow (17%, *Passerculus sandwichensis*), Clay-colored Sparrow (21%, *Spizella pallida*), Chestnut-collared Longspur (26%, *Calcarius ornatus*), and Western Meadowlark (27%, *Sturnella neglecta*).

RESULTS

Five of the eight bird species showed significant differences in abundance between roadside and trailside samples (Fig. 1). Baird's Sparrows, Chestnut-collared Longspurs, and Sprague's Pipits were 1.3–2.1 times more abundant along trails (Wilcoxon $Z = 3.11$, 4.85, and 2.28, respectively, $P < 0.05$), while Savannah Sparrows, and Vesper Sparrows were 2.2 and 2.4 times more abundant along roads, respectively ($Z = 2.31$ and 3.66, $P < 0.05$; Fig. 1). Clay-colored Sparrows, Horned Larks, and Western Meadowlarks showed no significant difference in abundance between roadside and trailside counts ($Z = 0.33$, 1.67, and 1.66, $P > 0.05$).

DISCUSSION

As predicted, our results indicate that some grassland songbird species differ in abundance between roadside and trailside habitats. These patterns are likely not due to differences in detectability because most grass-

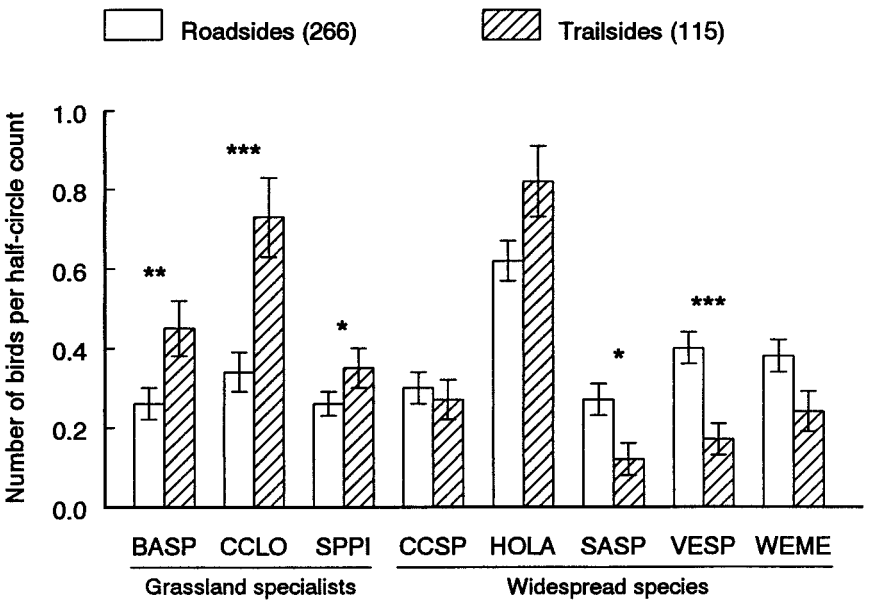

FIGURE 1. Mean abundance of grassland birds based on 100-m radius, half-circle point counts along roads and trails. Numbers in parentheses are sample sizes, and vertical lines represent standard errors. BASP = Baird's Sparrow, CCLO = Chestnut-collared Longspur, CCSP = Clay-colored Sparrow, HOLA = Horned Lark, SASP = Savannah Sparrow, SPPI = Sprague's Pipit, VESP = Vesper Sparrow, WEME = Western Meadowlark. Results of Wilcoxon two-sample tests are shown as $*P < 0.05$, $**P < 0.005$, and $***P < 0.001$. Designation as specialist or widespread is based on Knopf (1994).

land songbird species are detected easily within a distance of 100 m in open landscapes (Cyr et al. 1995).

Compared to roadside data, trailside counts are probably more representative of grassland songbird abundance in off-road areas because trails involve minimal habitat disturbance. Similarly, where counts along roads and trails are used to broaden the spatial coverage of avian surveys, estimates of species abundance should account for potential roadside (or ditch) effects. Differences in abundance between roadsides and trailsides also raise the question whether population trends derived from roadside counts reflect changes occurring in off-road areas. This possibility needs to be examined by sampling roadside, trailside, and off-road areas over time, given the importance of BBS data as a guide for grassland songbird conservation.

We expected Western Meadowlarks to be more abundant along roadsides because they are often associated with fence lines (Rotenberry and Knick 1995). The fact that we found no difference may be due to regional variation or sampling effects, given that meadowlarks defend relatively large territories (Lanyon 1956). We also found no difference in abundance between roads and trails for Horned Larks, which are often asso-

ciated with off-road habitat (Rotenberry and Knick 1995). Horned Larks may be drawn to both roads and trails because traveling surfaces offer open habitat (Owens and Myres 1973, Dale 1983; Davis and Duncan 1999).

Baird's Sparrows, Chestnut-collared Longspurs, and Sprague's Pipits all showed an apparent aversion to roadside habitat. The longspurs were likely avoiding the dense vegetation found in ditches, given their general preference for sparsely vegetated habitat (Owens and Myres 1973). While Baird's Sparrows and Sprague's Pipits are both attracted to relatively dense habitat (Sutter et al. 1995; Madden 1996; Sutter and Brigham 1998; Davis and Duncan 1999), both species tend to avoid thick swards of vegetation produced by smooth brome grass (Dale 1983, Wilson and Belcher 1989). Roadside habitat also may be unattractive to some or all of these species because of increased predation risk (Camp and Best 1994) and disturbance by vehicles (Reijnen et al. 1996).

Sprague's Pipits were 26% less abundant along roads, which closely matches the 20–30% loss of suitable habitat associated with a road right-of-way. Baird's Sparrows and Chestnut-collared Longspurs showed greater decreases (42 and 53%, respectively), suggesting that these species tend not to establish territories adjacent to ditch habitat. Also, all three of these species are grassland specialists (Knopf 1994). Perhaps specialist species are more likely to perceive roads as a break between suitable breeding areas because they have relatively narrow habitat requirements. Similarly, generalist species may be able to take advantage of habitats created by road construction because their habitat requirements are relatively flexible.

The fact that Savannah Sparrows and Vesper Sparrows were more abundant along roads is not surprising given that both of these species prefer dense, grassy vegetation and often use roadside fences as elevated song perches (Owens and Myres 1973, Best and Rodenhouse 1984). We also expected Clay-colored Sparrows to be more common along roads because of their preference for ditches containing tall grass and shrubs (Owens and Myres 1973, Munson 1992). The pattern we observed for this species likely reflects the fact that the ditches in our study contained few shrubs (T. Harrison, pers. comm.).

Overall, our results confirm that roadside sampling can lead to biased estimates of abundance for some prairie songbirds, and that trailside sampling offers potential as a rapid measure of abundance in off-road, grassland habitat. Whether our findings are robust over time is unknown, given that our study lasted only a single year. Nevertheless, the patterns we found have important implications. The differences we detected between roadside and trailside counts should be considered where roadside and trailside data are used for habitat association studies or to assess the size and spatial distribution of prairie songbird populations. It may also be advisable for the BBS to incorporate trailsides into their sampling protocol in grassland areas.

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