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Rangeland Health Assessment: A Useful Tool for Linking Range Management and Grassland Bird Conservation?

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Abstract

Large-scale loss and degradation of North American native prairie coupled with sharp declines in grassland bird populations call for a clear understanding of the effects of livestock production on bird habitat selection. Grassland birds typically select breeding habitat based on a suite of structural and community vegetation features shaped by grazing. Rangeland health indices are a tool for assessing grassland structure and community composition that may offer biologists and range managers common language to achieve grassland bird recovery goals. We used point-count surveys, vegetation measures, and indices of rangeland health to examine bird-habitat relationships on native grassland in southwestern Saskatchewan for 10 grassland bird species. We used an information theoretic approach to compare the support of three hypotheses explaining variation in bird abundance as a function of local vegetation characteristics: bird abundance is best explained by 1) vegetation structure, 2) vegetation structure heterogeneity, or 3) plant community. Vegetation structure variables were present in top-ranking models (i.e., models within four Akaike information criterion units of top model) for eight species and solely comprised top-ranking models for Baird's sparrow (*Ammodramus bairdii*), chestnut-collared longspur (*Calcarius ornatus*), horned lark (*Eremophila alpestris*), McCown's longspur (*Rhynchophanes mccownii*), and savannah sparrow (*Passerculus sandwichensis*). Structural heterogeneity variables were present in top-ranked models for grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), and western meadowlark (*Sturnella neglecta*). Plant composition variables solely comprised top-ranking models for clay-colored sparrow (*Spizella pallida*) and were present in top-ranked models for grasshopper sparrow and vesper sparrow (*Pooecetes gramineus*). Our results indicate that vegetation structure variables, namely litter mass, vegetation volume, and bare ground cover, best explain variation in bird abundance. Although the rangeland health index received little support as a predictor of bird abundance, vegetation structure components of the index could be used to communicate grazing management guidelines that maintain grassland bird habitat.

Key Words: bird abundance, grassland birds, habitat selection, rangeland health, vegetation structure, zero-inflated models

INTRODUCTION

Temperate grasslands and the biodiversity they sustain are becoming increasingly endangered. An estimated 41% of the world's native temperate grasslands and 79% of North American grasslands have been lost to cultivation for agricultural production (White et al. 2000). Those that remain support a growing human population, expanding food and fiber production, and extensive energy-sector development. Habitat loss and degradation are considered primary causes of grassland species declines worldwide (White et al. 2000). In North America, grassland birds have declined sharply over the last four decades (Askins et al. 2007; Sauer et al. 2010). Currently, 57 grassland wildlife species are considered at risk in North America, 28 of which are grassland birds (IUCN 2011).

Since livestock production is a dominant use of remaining global temperate grassland (Samson and Knopf 1994; Ramankuty et al. 2008), grazing management plays a vital role in the recovery of grassland species.

Soils, climate, topography, and disturbance (i.e., fire, grazing, and human land use) shape grassland structure, function, and diversity, creating a mosaic of habitat patches across a landscape that is home to a variety of grassland birds (Wiens 1973; Fuhlendorf and Engle 2001; Askins et al. 2007). Grassland birds show distinct preferences for the structure and composition of the plant community (Madden et al. 2000; Fisher and Davis 2010). As a result, bird species assemblages vary along a continuum of habitat features shaped by environmental conditions and disturbance such as grazing (Bock et al. 1993; Fritcher et al. 2004; Smith and Lomolino 2004; Fuhlendorf et al. 2006). Species such as horned lark (*Eremophila alpestris*) and McCown's longspur (*Rhynchophanes mccownii*) are associated with pastures under relatively heavy grazing pressure whereas species such as bobolink (*Dolichonyx oryzivorus*) and sedge wren (*Cistothorus platensis*) are associated with lightly or ungrazed grasslands and Baird's sparrow (*Ammodramus bairdii*) and Sprague's pipit (*Anthus spragueii*) occupy grasslands with intermediate grazing pressure (Knopf 1996). Grassland generalist species, such as vesper sparrow (*Pooecetes gramineus*) and savannah sparrow (*Passerculus sandwichensis*) occupy a wider

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