Avian species richness and abundance show stronger responses to bison grazing intensity than to ecosystem productivity

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Background/Questions: Intermountain grasslands of the Rocky Mountain region in North America are composed of a blend of prairie grasslands and shrublands that host grassland obligate, facultative grassland, shrub associate, and sagebrush obligate avian species. Grassland obligate birds are known to respond to differences in grass vegetation structure, with some species having preferences for short, sparse grasses, and others preferring taller, denser grasses. On the other hand, facultative grassland, shrub associate, and sagebrush obligate species responses are weaker and less consistent to vegetation changes.

Grazing by large ungulates is a key ecological process that maintains and creates the structure of grass vegetation of intermountain grasslands that are important to grassland songbirds. This guild of birds has shown long-term declines in North America. At the same time, American bison (*Bison bison*) are becoming more common through reintroductions, and they may significantly modify grassland songbird habitat. To support conservation for this avian guild, we sought to understand the importance of bison grazing and ecosystem productivity to the species richness and abundance of this avian community.

Methods: We studied a grassland songbird community in Yellowstone National Park that included five focal species - Brewer's sparrow (*Spizella breweri*), green-tailed towhee (*Pipilo chlorurus*), sage thrasher (*Oreoscoptes montanus*), vesper sparrow (*Pooecetes gramineus*), and western meadowlark (*Sturnella neglecta)*. We selected survey plots of 250×250 m^2 across three levels of expected bison grazing – low, medium, and high - using a habitat suitability index for bison. Two observers walked a transect through the center of each plot following the dependent double-observer survey method. Within each sampling plot, bison grazing intensity was measured by counting bison patties. Ecosystem productivity was measured using remote-sensed normalized difference vegetation index (NDVI) data at the plot level during the breeding season (1 April to 30 June each year).

Results/Conclusions: We found that species richness was positively correlated with patty counts and had a weak negative correlation with NDVI. Occupancy probability for four of the five songbird species was positively correlated with patty counts and negatively correlated with NDVI. However, green-tailed towhee occupancy had a negative response to bison grazing intensity based on patty counts. Abundance of vesper sparrow and western meadowlark was positively correlated with patty counts, although for western meadowlark, this trend became less positive with increasing patty counts. Based on our findings, we suggest a broad range of bison grazing intensities to ensure that vegetative conditions related to bison grazing are present for all species.