Spatiotemporal factors affecting occupancy and phenology of a declining songbird

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Introduction

Understanding the relationship between a species and its habitat is paramount to its conservation.

Bachman's Sparrow (*Peucaea aestivalis*) is a pine savanna habitat specialist (**Fig. 1**) that has experienced significant population declines in the last 50 years. Texas lists it as a high priority Species of Greatest Conservation Need.

Little information exists on spatiotemporal covariates of Bachman's Sparrow occupancy and phenology in Texas. Knowledge of significant vegetative habitat variables is vital for appropriately managing habitat. Similarly, understanding seasonality is important for monitoring efforts as detection of a species may vary depending on abiotic factors.

Fig. 1: Bachman's Sparrow (L) and pine savanna habitat (R) at Angelina National Forest in eastern Texas.

Objectives

The goal of this research is to determine the habitat covariates of Bachman's Sparrow occupancy as well as the abiotic factors that affect its singing phenology and thus its detectability.

Specifically, we predict:

1) Occupancy of Bachman's Sparrow will be associated with increased grass cover and reduced shrub layer, canopy cover, and basal area (**Fig. 2a**) due to the nesting and advertising behavior of the species.

2) Singing phenology will be positively associated with warm temperatures and long days, consistent with the breeding cycle of Bachman's Sparrow, and negatively associated with wind and rain due to reduced activity **(Fig. 2b).**

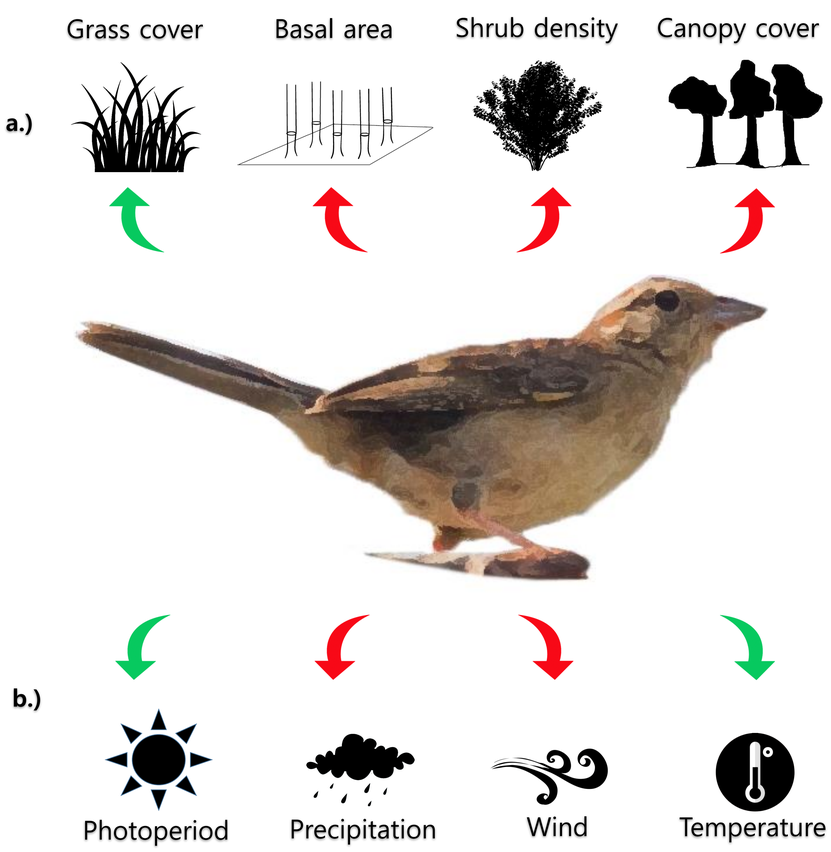

Figure 2: **a.)** Bachman's Sparrow rely on grasses and forbs for nesting sites and cover and prefer open park-like landscapes to advertise and defend territory. Occupancy is therefore predicted to be positively correlated (green arrows) with extensive grass cover and negatively correlated (red arrows) with shrubs, canopy cover, and basal area. **b.)** Bachman's Sparrow are not territorial in fall and winter and typically do not sing during these months. We predict singing activity to increase with warm weather and longer days and decrease with precipitation and heavy wind.

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Methods

To determine occupancy, automated recording units (ARUs; Wildlife Acoustics Song Meter SM4s, **Fig. 4a**) will be placed at 240 sites of low, medium, and high probability of occurrence based on a species distribution model produced by Andersen and Beauvis (2013) .

Ground cover, foliage and shrub density, canopy cover and height, tree DBH, and basal area will be measured at each site and compared with occupancy to identify significant habitat covariates.

Singing phenology will be assessed by monitoring at sites of known Bachman's Sparrow occupancy for two years with ARUs. Abiotic factors such as weather (wind, precipitation, temperature) and photoperiod will be evaluated to determine associations with detections.

We will analyze recordings for Bachman's Sparrow songs using Wildlife Acoustics Kaleidoscope and Adobe Audition (**Fig. 4b**).

a.)

b.)

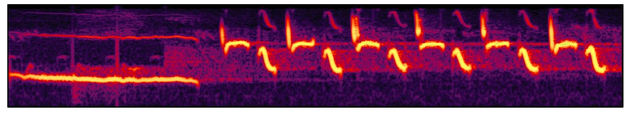

Fig. 4: **a.)** Wildlife Acoustics Song Meter SM4s will be used in this study to detect Bachman's Sparrow by recording 30 minutes each day. **b.)** Recordings will be analyzed in Wildlife Acoustics Kaleidoscope for singing birds.

Significance

These results will provide insights on Bachman's Sparrow habitat preferences in Texas and inform landowners and state agencies on how to best manage habitat for this declining species. This information will also be used to improve the species distribution model produced by Andersen and Beauvis (2013). The phenology results will guide future monitoring efforts to develop protocols on how Bachman's Sparrow detectability varies across seasons and weather conditions.