

Fire, grazing, and bird diversity in tallgrass prairie

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Introduction

- Tallgrass prairies have dramatically declined.
- Important for carbon storage, biodiversity, and ecosystem stability.
- Fire and grazing maintain grassland structure and limit woody plant growth.
- Woody encroachment may negatively impact grassland biodiversity.
- Understanding these dynamics supports effective conservation and management.

Hypothesis: Areas with greater intervals between burns will have greater woody cover leading to lower bird species richness.

Methods

- Surveys conducted at Konza Prairie Biological Station (**Figure 1**).
- Collection method: point-count surveys (**Figure 2**)
 - 5-minute observation period
 - 200 m radius per point
 - n= 15 surveyed points
- Recorded all avian species (**Figure 3**).
- Survey locations were generated randomly in ArcGIS Pro (v 3.5.2).
- Analysis completed in R (v 4.4.3).

Point Count

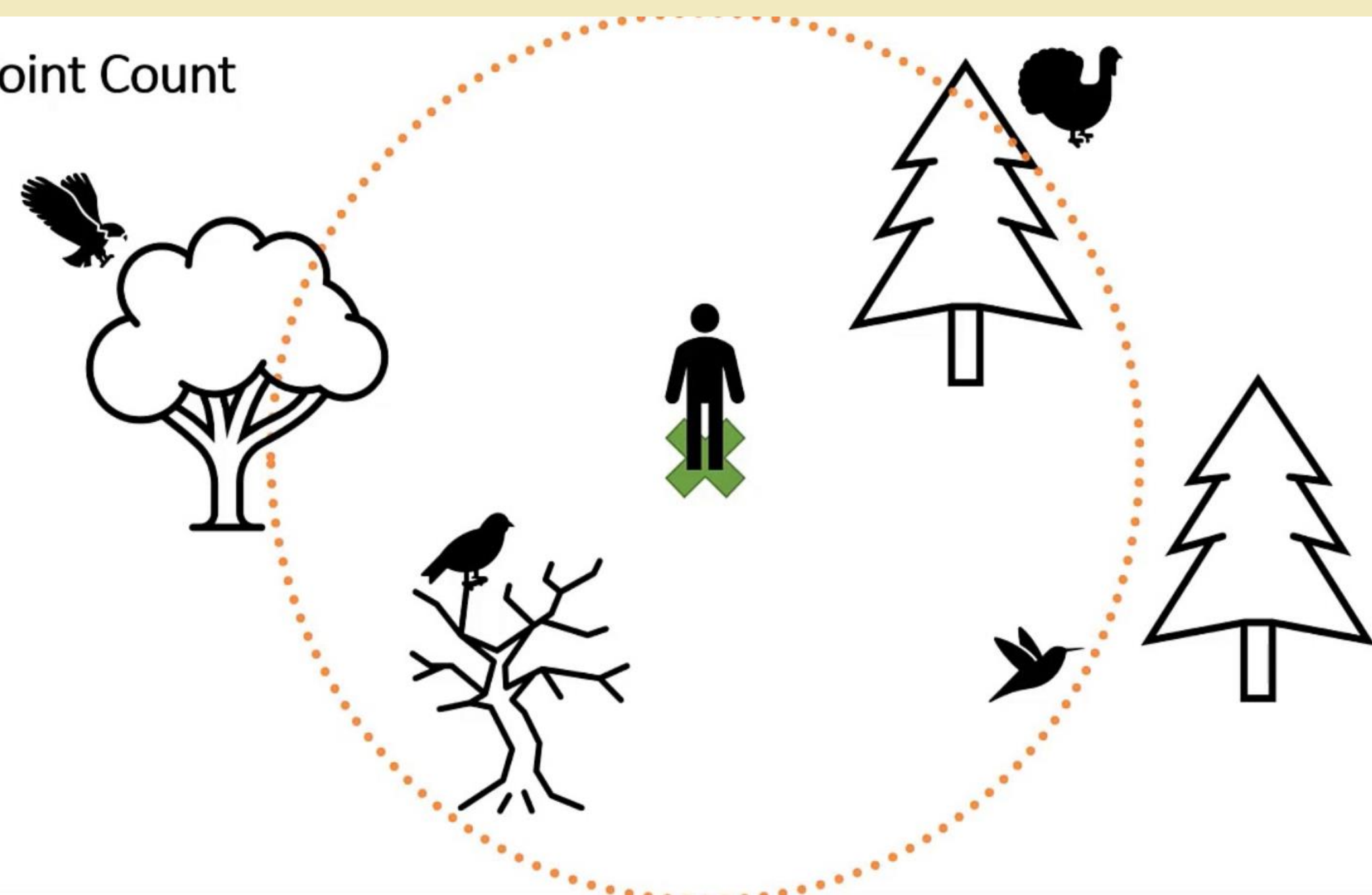


Figure 2: Conceptual figure of a point count survey. The observer stands on a coordinated point showing species within a fixed radius (orange dotted line). All individuals must be within the fixed radius to be counted. Image from storage.googleapis.com.

Figure 1: Landcover classification and study sites at Konza Prairie. Outlined polygons represent watershed boundaries for the four, bison grazed study sites under different burn frequency treatments. Shaded regions show the landcover types, and the purple points show the bird survey locations. Image created using ArcGIS Pro (v 3.5.2).

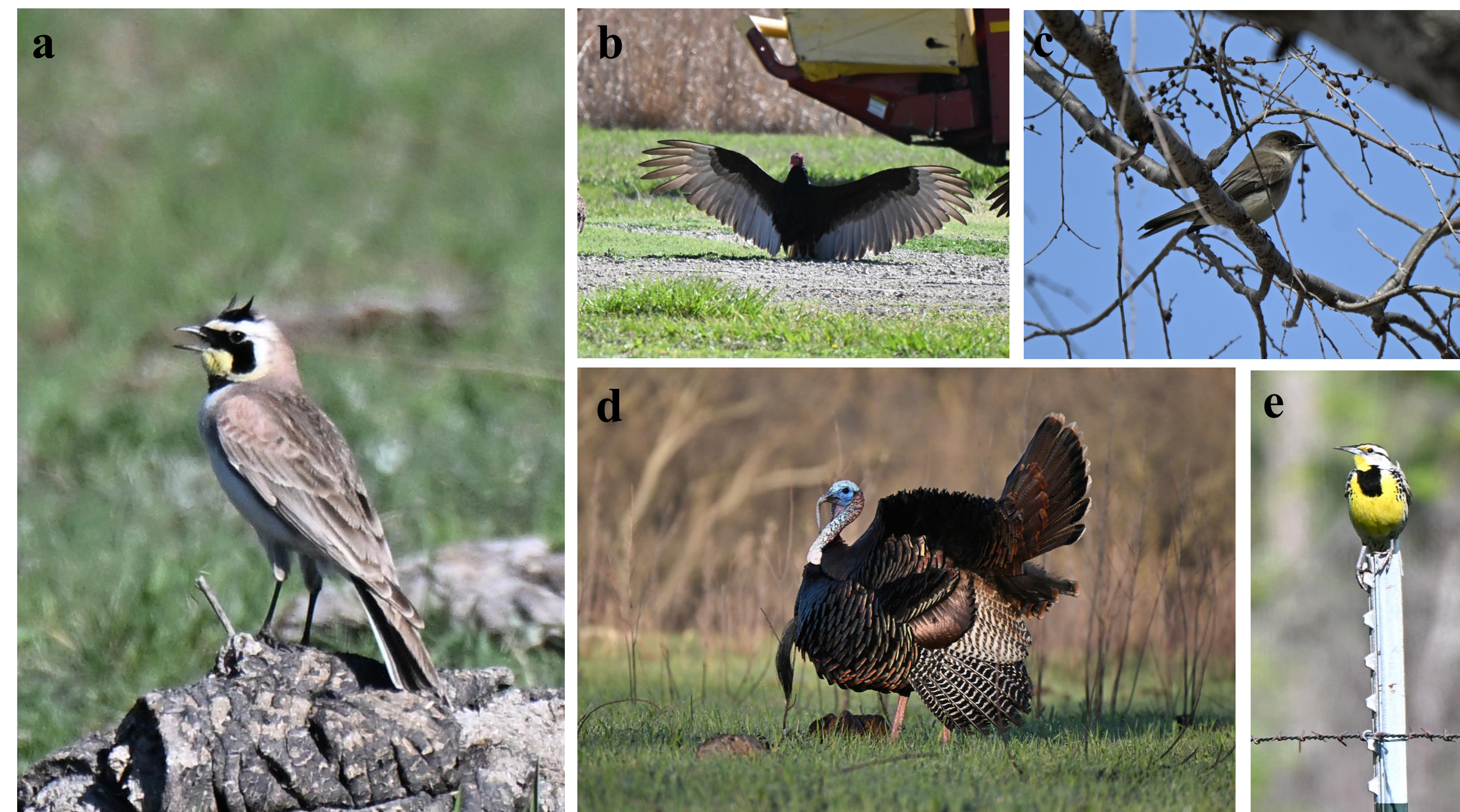
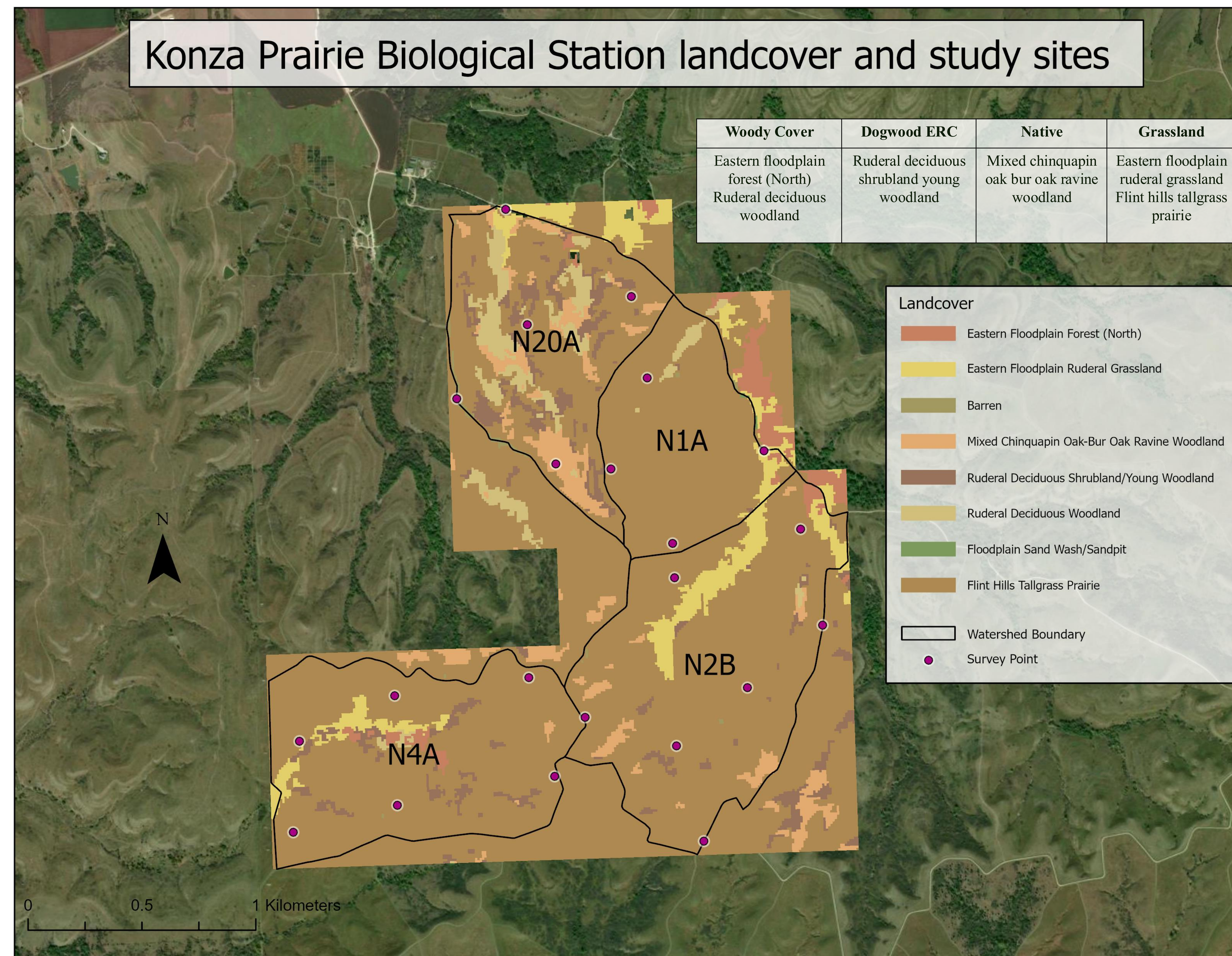


Figure 3: Images show bird species collected at survey points. (a) Horned Lark, (b) Turkey Vulture, (c) Eastern Phoebe, (d) Wild Turkey, and (e) Eastern Meadowlark. Image credits to Lacey Esau.

Acknowledgments: We want to thank the staff at Konza Prairie Biological Station for allowing access to their property.

Results & Discussion

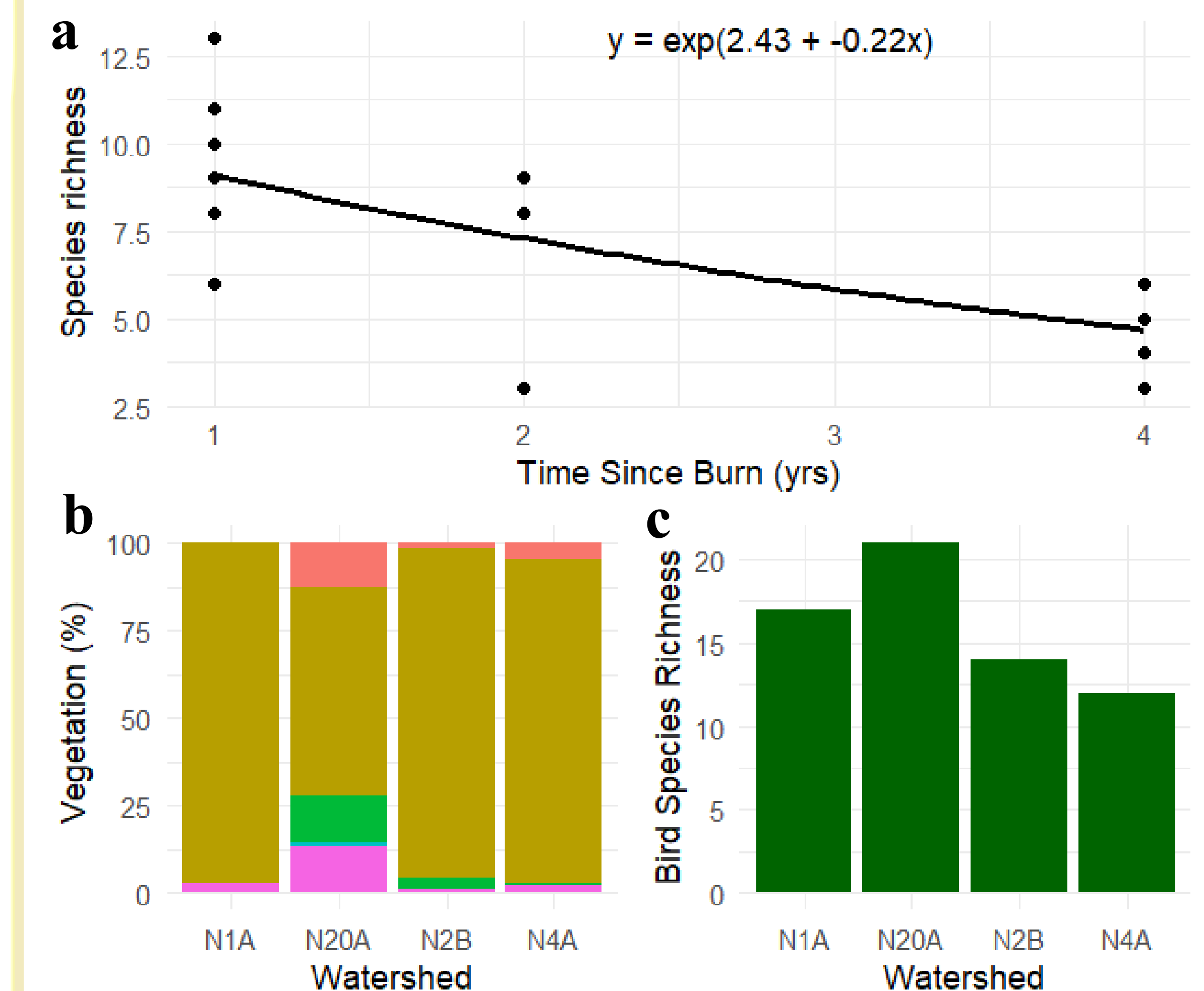


Figure 4: (a) Bird species richness declined with increasing time since burn ($\beta = -0.22$, $SE = 0.08$, $p = 0.006$). (b) Vegetation composition varied among the four study watersheds. Each color represents a different vegetation type. (c) Total species richness differed across watersheds, with variation evaluated using GLMs with a Poisson distribution.

Fire management plays an important role in maintaining prairie bird diversity.

- Time since burn showed a significant negative relationship with bird species richness (**Figure 4a**).
- Each increase in TSB corresponded to a 22% decrease in species richness
- Longer burn intervals were associated with increased woody plant cover (**Figure 4b**).
- Woody cover was not a statistically significant predictor of bird species richness, though it showed a weak negative association.
- Species richness varied among watersheds (**Figure 4c**).

Fire frequency is a major influence in shaping woody vegetation dynamics on tallgrass prairies.