Using Small Mammal Population Analysis to Examine Efficacy of Prairie Restoration

Olivia Vergin, Faith James, Kelly Lorenz, Zachary Buchholz, Peyton Lehman, Dr. Joseph Whittaker

CONCORDIA COLLEGE
MOORHEAD, MINNESOTA
URSCA

Introduction

Agricultural and industrial land development destroys remnant prairie habitats and contributes to declines in grassland species. Today, North American remnant prairie habitats comprise less than 1% – 2.4% of their original area (Larson et al. 2011). Restored prairies provide a solution for prairie fragmentation, offering vital habitat for rare prairie species. Small mammals are vital to these ecosystems, consuming plant material and invertebrates, dispersing seeds, and being prey sources for larger species. By monitoring small mammal populations, we can evaluate ecosystem health and management success. Identification of rare species like *Perognathus flavescens* and *Onychomys leucogaster* can indicate the effectiveness of prairie management techniques. Further, monitoring fluctuations in common species can help predict and inform diseases we see in humans (ex. *Peromyscus* spp. carry Lyme disease & hantavirus).

Purpose: Evaluate prairie management techniques by surveying mammalian community biodiversity in remnant and restored prairies and documenting occurrences of rare prairie mammals

Methods

Small mammal trapping

- We set 2-3 grids per location
- Each grid consisted of five rows with 10 traps in every row, all set about 10m apart (50 total per grid)
  - Trap type (Small Sherman, Large Sherman, and Longworth) and bait (peanut butter and oats) were alternated every row
- Identified mammals to species; weighed (g), measured (mm), and sexed; marked for recapture
- Recorded GPS location
- Took saliva samples from *Peromyscus* spp. for enzymatic analysis



Results

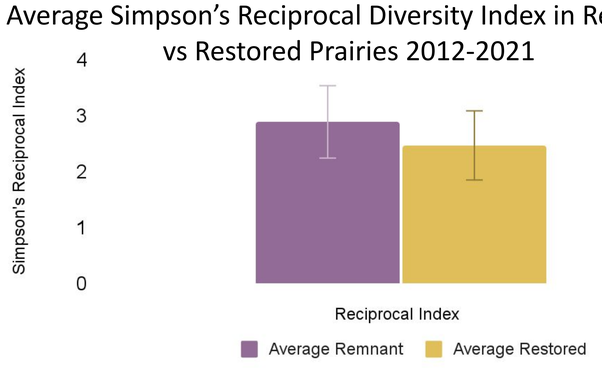

Figure 1. Simpson's Reciprocal Diversity Index for averaged remnant versus restored prairies across all years: 2012 to 2021. The difference between remnant and restored was not significant ($t = -2.42$; $df = 15.97$; $p = 0.18$).

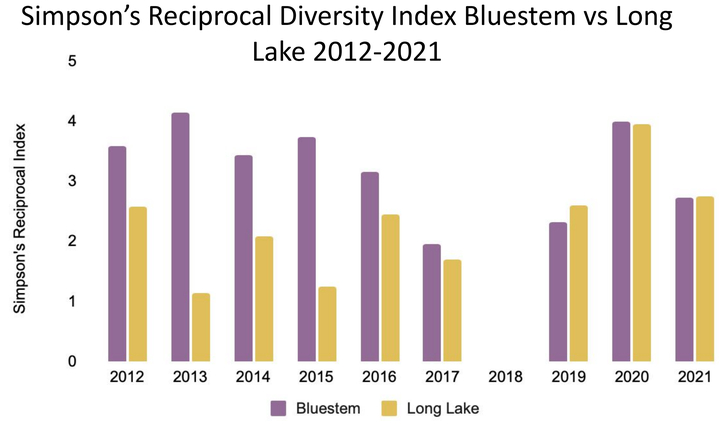

Figure 2. Simpson's Reciprocal Diversity Index for Bluestem (remnant) and Long Lake (restored) prairies from 2012 to 2021.

Table 1. List of commonly trapped prairie species and which ones are frequently found in the same years and locations as rare species *Perognathus flavescens*.

Commonly Trapped Species	Frequently trapped with *Perognathus flavescens*
Blarina brevicauda	
Ictidomys tridecemlineatus	X
Microtus pennsylvanicus	X
Peromyscus spp.	X
Sorex spp.	
Zapus hudsonius	
Urocitellus franklinii	X

Discussion

Simpson's Reciprocal Diversity Index

- No significant differences when averaging Simpson's Reciprocal Diversity Index (SRDI) over time
  - Remnant have a higher species richness and evenness, but the trends are becoming more similar, suggesting restoration success
- Bluestem (remnant) and Long Lake (restored) SRDI become more comparable over time
  - This may suggest that Long Lake's restoration/management techniques are creating suitable prairie habitat

Rare Species

- *Perognathus flavescens* were all captured within four years of a fire
  - Prescribed burns are an important management technique for certain rare species
- Our team captured *Onychomys leucogaster* for the first time

Future Directions

- Continue to monitor prairie mammals over time and document rare species occurrences
- Examine changes over time in a rapidly changing climate
- Spatially analyze the role of fragmentation between sites
- Examine the interplay between management techniques (fire, grazing, mowing) and mammal communities

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Literature Cited

Larson DL, Bright DB, Drobney P, Larson JL, Palaia N, Rabie PA, Vacek S, Wells D. 2011.
Effects of planting method and seed mix richness on the early stages of tallgrass prairie restoration. Biol Conserv. 144: 3127-3139.