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Small Mammal Diversity Varies by Vegetative Cover (Greene County, Ohio)

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Introduction

Although agricultural needs are pressing and crop sales are vital for the local economies in southern Ohio, the resulting clearing of land has removed much of the state's forests and natural prairies. A variety of species depend upon these habitats for nutrition and protection, particularly small mammals near the base of the trophic period in these ecosystems. In this study, we seek to determine the species richness and diversity of small mammals in three habitats commonly encountered in the Greene and neighboring counties of southwestern Ohio. By determining the habitat preferences and species abundance at each location, the results of this study may be able to assist land managers and conservation scientists in focusing their restoration efforts on biomes that are known to be vitally important for the well-being of threatened small mammal species.

Objectives

We conducted this experiment to compare the species richness and diversity of small mammal in three distinct habitats in Greene County, Ohio. Our goal was to collect data from each of these sites in order to determine the species richness and diversity of small mammals in the area and how those values correlate with the vegetation and tree cover.

Study sites

We utilized twenty - seven Sherman traps in three sample environments for our study. The first sample environment was the tallgrass prairie (old field) in between Bridge Street and the Cedarville campus. The second site was the forest grove across Bridge Street from the prairie. Finally, the third sample site was the short grass prairie (lawn) on the hillock directly behind the "West" dormitory. The traps were placed in a square grid, consisting of three traps on each side and one in the middle. We set the traps along a transect, each ten meters apart, and gave each trap a combined letter and numerical assignment (see figures 1 and 3).

Forest Site		
A1	B1	C1
A2	B2	C2
A3	B3	C3
Road		

Figure 1. The labelling method employed for each field site, as exemplified by the forest sampling location.

Methods

Peanut butter rolled in oats was used as the bait, and two cotton balls were placed in each trap to provide bedding and a source of warmth for animals left in the traps overnight. The traps were initially placed on September 11, 2017, and checked twice a day from September 12 to September 18. The bait and cotton balls were replaced as needed, and any trapped animals were identified and recorded by species and trap location. Every day since September 18, we have checked the traps in the mornings only, since the small mammals discovered are typically active only at night. Each individual captured was also photographed beginning on September 18 in an attempt to identify individuals, and thus prevent overestimating of the number of mammals present in a given location. We concluded our data collection on October 1.

Figure 2. Species pictured (from left to right) are woodland vole, white-footed deermouse, and Northern short-tailed shrew, the most captured species in the tallgrass prairie, forest, and shortgrass prairie, respectively.

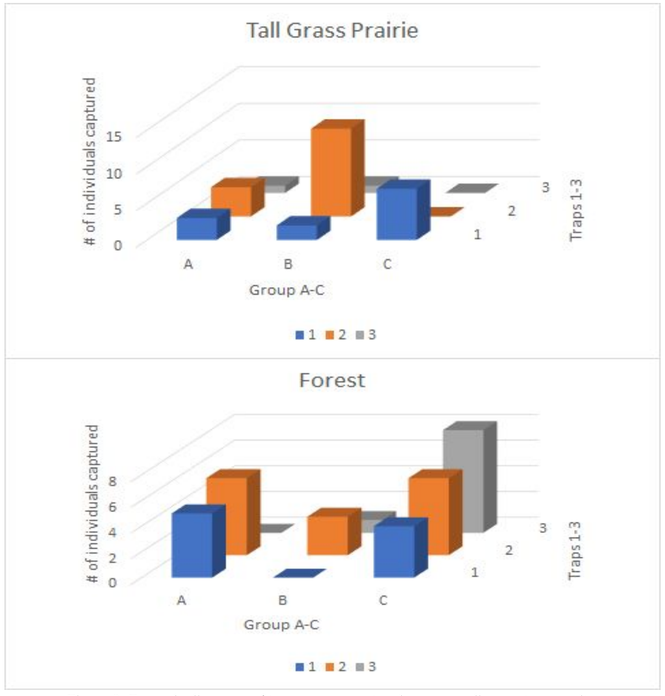

Figure 3. Example diagrams of trap arrangement and corresponding capture results.

Results

Diversity & Site Similarity

For our experiment, we conducted a Shannon Weiner analysis and a community similarity analysis. The Shannon-Wiener index is calculated by dividing the number of a species by the number of all species present, multiplying this result by its own natural log, and then summing all of these products. For our experiment, the Shannon diversity ranged from 0.49 to 2.26. For this index, a higher number indicates greater diversity. Thus, the tall grass site (old field) had a greater diversity of species than the forest site, and both were more diverse than the short grass (lawn) site (see figure 4).

We also conducted a community similarity analysis, in which community similarity is calculated using the smallest number of species that are similar between two communities. We discovered that the tall grass (old field) site was 22% percent similar to the forest site; the tall grass (old field) site was 33% percent similar to the short grass (lawn) plot. There was no similarity between the forest and short grass (lawn) locations (see figure 5).

The overall capture results for the sites with the greatest number of species (the tall grass and forest sites, respectively) are depicted graphically in figure 3. Examples of species captured are featured in figure 2.

Shannon Wiener Index			
Species	**Tall grass**	**Forest**	**Short grass**
Woodland Vole	0.306	0.000	0.000
North American Least Shrew	0.230	0.000	0.244
White Footed Deer Mouse	0.000	0.210	0.000
Allegheny Wood Rat	0.000	0.106	0.000
Meadow Jumping Mouse	0.113	0.000	0.000
Prairie Vole	0.299	0.106	0.000
North American Deer Mouse	0.181	0.310	0.000
Northern short tailed shrew	1.129	0.732	0.244
Total:	**2.259**	**1.464**	**0.488**

Figure 4. Calculated Shannon Weiner diversity indices for each of the three sites sampled.

Community Similarity		
Site	2	3
1	0.22	0.33
2	----	0

Figure 5. Community similarity analyses across the three different sites. Site 1 represents the tall grass site, Site 2 indicates the forest plot, and Site 3 stands for the short grass location.

Conclusions

The results of our experiment confirmed our hypothesis that the shortgrass (lawn) site would be less diverse than the other two sites. However, the statistical analyses indicated that the number of animals caught did not vary significantly between sites. There was also a low community similarity between the plots; thus, although some sites were more diverse than others, there were still notable differences in the types of species present. Additionally, we noticed that, in the forest, species were captured on the first day that we checked the traps; however, in the tallgrass and shortgrass prairies, species were not captured until the sixth and twelfth days of our experiment.

If the experiment was repeated, over a longer period of time, perhaps more individuals would be collected at these other two sites. This would provide a more accurate picture of each site's species diversity. We also suggest that if this experiment were to be repeated, it would be beneficial to tag each individual captured. There were several instances in which the same given species was captured multiple days in succession in the same trap; we suspect that this was the same individual returning for food. Tagging the individuals would thus reduce the likelihood of overcounting individuals for a given site.