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**Rodent Diversity Varies by Habitat Type and Anthropogenic Alterations in Riparian
Corridors of the Colorado Plateau**

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Abstract

As human activity continues to affect ecosystems across the world, it is important to study and understand the ecosystems that have yet to be substantially disturbed by human activity. In this study, I aim to obtain an accurate census of the local rodent population along the Dolores River Corridor of the Colorado Plateau to identify the relationships they have with their local ecosystem. I census the rodent populations by live-trapping in different microhabitats and seasons to determine if these variables influence rodent populations. Results show that different habitat types have significantly different rodent populations. The North American deer mouse was found only in the Grassland and Greasewood/Lowland transects, while the Pinyon deer mouse was found primarily in the Pinyon/Juniper transect. However, the season of census taking does not have an effect on species composition. The analysis suggests further encroachment of tamarisk along Colorado Plateau riparian corridors will impact future rodent diversity and other aspects of mammalian communities influenced by rodent population densities.

Introduction

As human activity takes up more land, few places remain with functional ecosystems. Especially rare in the North American Southwest are riparian corridors which have not been converted for agricultural production. One particularly understudied component of these riparian corridors is how rodent communities respond to anthropogenic land modification, climate change, and invasive species such as Russian knapweed (*Rhaponticum repens*) and tamarisk (*Tamarix aphylla*). To address this gap, I will initiate a seasonal small rodent census project at the Bonderman Field Station at Rio Mesa (BFS), southeastern Utah to monitor the abundance and diversity of rodent taxa in habitats variously impacted by anthropogenic development. These data will help us understand how small mammal communities in riparian corridors of the Colorado Plateau are responding to anthropogenic influences at the broadest scale, but also how the small mammals of the Bonderman Field Station are responding to the local changes occurring during the recent past and into the future.

Methods

To census the rodent population in this setting, I developed a catch and release live-trapping protocol and chose three different trapping transect sites in order to determine how anthropogenic influences are influencing rodent populations. Each transect was chosen based on differences in habitat characteristics. The first transect was a grassland field/floodplain that consisted of native grasses and scattered shrubs (Grassland Floodplain). The second transect was a lowland that contained a mix of Great Basin sagebrush (*Artemisia tridentata*), rubber rabbitbrush (*Ericameria nauseosa*), black greasewood (*Sarcobatus vermiculatus*) and non-native tamarisk trees (*Tamarix aphylla*) (Greasewood Lowland). The third site was located on a low mountain side that consisted of pinyon pine (*Pinus monophylla*), western juniper (*Juniperus occidentalis*) and Great Basin sagebrush (Upland Pinyon-Juniper woodland). For each trapping

effort, a set of 17 traps were set ~4-6 meters apart at each location during the evening and checked the following morning. Census monitoring was obtained on three occasions (August 2017, May 2018, October 2018) in different seasons. Each trapping site was previously staked with a location marker along with a corresponding GPS coordinate. For each animal caught, they would be transported out of the trap and placed into a net which would allow identification to the species level. No animals were held during this process. Once the animal was identified, it was recorded and then they were released back into their habitat. This process was repeated for each data collecting effort.

Results

A total of 13 individual rodents representing two species, North American deermouse (*Peromyscus maniculatus*) and Pinyon deermouse (*Peromyscus truei*), were identified in this study with near equal numerical distributions across the three habitat types (Table 1). However, chi-square tests show that the habitats sampled have significantly different small rodent composition. *P. maniculatus* is more prevalent in Grassland Floodplain habitat while *P. truei* is found predominantly in the Upland Pinyon-Juniper setting. No habitat however produced more individuals than the others. The most anthropogenically influenced habit, Greasewood Lowland, produced nearly identical numbers of rodents as the other less modified habitats.

Table 1. Taxonomic Composition by Habitat Type at the Bonderman Field Station (*Peromyscus maniculatus* and *Peromyscus truei*)

Taxon	Grassland	Upland P-J	Greasewood Lowland	Total
North American deermouse	5 (3.08)	0 (2.46)	3 (2.46)	8
Pinyon deermouse	0 (1.92)	4 (1.54)	1 (1.54)	5
Total	5	4	4	13

$X^2=9.831$, $df=2$, $p=0.0073$

Table 2. Taxonomic Composition by Season at the Bonderman Field Station (*Peromyscus maniculatus* and *Peromyscus truei*)

Taxon	Spring	Fall	Total
North American deermouse	1 (1.85)	7 (6.15)	8
Pinyon deermouse	2 (1.15)	3 (3.85)	5
Total	3	10	13

$X^2=1.311$, $df=1$, $p=.2522$

Chi-square tests also indicate that the observed differences in rodent taxonomic composition by habitat type were not the result of the season of the census (Table 2).

Discussion

Overall, the results suggest differences in taxonomic composition by habitat type but no clear differences in the numerical abundance of deermice between the three site types or across seasons. Although the sample is small, these data suggest continued tamarisk encroachment will alter the species composition of riparian corridor small mammal populations in the Colorado Plateau. However, with more data gathered, there is the potential to produce stronger conclusions. While I will continue to monitor the small mammal population at the Bonderman Field Station at Rio Mesa myself, I also plan to create a guide that will allow other students that visit the field station and study small mammals around the property and contribute to this research project. The guide will help students learn skills in small mammal identification and ecology. The guide will include detailed pictures and descriptions on how to identify the local species. Additionally, collecting additional data in the future before and after current efforts to remove additional tamarisk stands on the field station property could possibly show trends in the affect of tamarisk eradication on small mammal populations. Of the four species of deer mice that occur at Rio Mesa (pinyon deermouse, North American deermouse, brush deermouse (*Peromyscus boylii*), and canyon deermouse (*Peromyscus crinitus*)) two of the four species have

been identified thus far. Future work may also include censusing different habitat types in efforts to encounter all of the species. These results indicate this site is an excellent location to study the ecological controls on the distribution of deermice.

References

Adler GH. (1985). *Habitat selection and species interactions: an experimental analysis with small mammal populations*. *Oikos* **45**(3): 380-390

Calhoun, B John and Casby, U James (1958). *Calculation of home range and density of small mammals*. Public health monograph. No. 55.

Fairbairn, J Daphne. (1977). *The spring decline in deer mice: death or dispersal?* *Canadian journal of zoology*, 55(1): 84-92.

Hafner, J David., Yensen, Eric and Kirkland, Gordon. (1998). *North American rodents*. Status survey and conservation action plan, pp:171.

White A.J. et al. (2012). *Agricultural land use alters trophic status and population density of deer mice (*Peromyscus maniculatus*) on the North American Great Plains*. *Canadian journal of zoology*, 90(7): 868-874.