Small Mammal Diversity in Variable Vegetation and Land Management Types

Seth Goreham

30 June 2009

Abstract

Species richness and diversity of many small mammals vary depending on the vegetation type and density. In June 2009, we trapped small mammals in six different types of forest and six different locations in the prairie using Sherman, Russian, and Longworth traps. Grids that had been burned in the past tended to yield a higher total number of animals caught in traps; however, species richness was not as heavily influenced by burning. Unburned red pine forest showed the highest number of species collected. We found that species richness and the overall number of species is greatly influenced by the forest type, vegetation, moisture and land management methods used in these areas.

Introduction

Over the history of northern Minnesota forests and prairies, fires have played a major role in maintaining and regulating natural ecosystems (Frissell 1973). Fires in the past were started by lightening strikes and would exterminate themselves. This pattern of burning the understory came to dictate the diversity of plants and animals residing in this area (Frissell 1973). By burning away the young growth, white and red pines prevailed and established the dominant vegetative type for this region. Since present fire prevention has halted most of the wildfires that occur, prescribed burns have been implemented to try and replicate historic ecology based on the prevalence of wildfires.

Based on this, areas that have undergone prescribe would be expected to contain species that are adapted to living in and recolonizing burned habitats. These species should be a representative of historic diversity in the region. The same can be said for the prairie region which historically experienced similar events. For this project, we are looking into several different grids on burned and unburned habitats to determine if there is a significant difference in the species diversity.

Methods

We choose locations based on vegetation type and management type. For the red pine forests, we chose both an unburned location and one that had experienced a controlled burn several years earlier. The same is true for the deciduous forest and Frenchman's Bluff in the prairie. The grids consisted of 5 lines each with 10 traps in each line. In each line, one trap site contained a Longworth and Russian trap while the other 9 were Sherman traps. The Longworth and Russian traps were placed at random in each line. The trap grids were laid out in the same manner for each site. Each trap was placed 10m from each adjacent trap and the lines were 10m apart. We labeled the lines alphabetically (A-E) and the traps numerically (1-10). We baited the Sherman traps with a seed mixture and the Russian and Longworth traps with canned cat food (Special Kitty). Once in place, we checked each once daily for 3 days except for the Frenchman's Bluff sites (FBB and FBU) which were required to be checked twice daily.

We measured the weight and recorded the location, sex, and trap number of each animal that was caught. For the Peromyscus (PEXX), we took saliva samples by washing their mouths out with sterile water and collecting for later to determine the species (either leucopus or maniculitis). We also measured the tail, hind foot, and ear length.

Results

For the forest grids, the burned Red Pine location had the highest number of animals captured while the bog was the lowest. The unburned Red Pine and burned deciduous forests had the highest number of species captured (see Chart 1). The unburned Red Pine grid had the highest number of different species with 4. The aspen grid reported only one animal and none were captured in the bog. In the prairie, Frenchman's Bluff had the highest number of animals captured with 27 in the burned grid and 13 in the unburned (see Chart 2). There were 4 sites that had 3 different species, Frenchman's Bluff (both burned and unburned), Rush North, and Wauban dry.

Species Types in Forest Grids

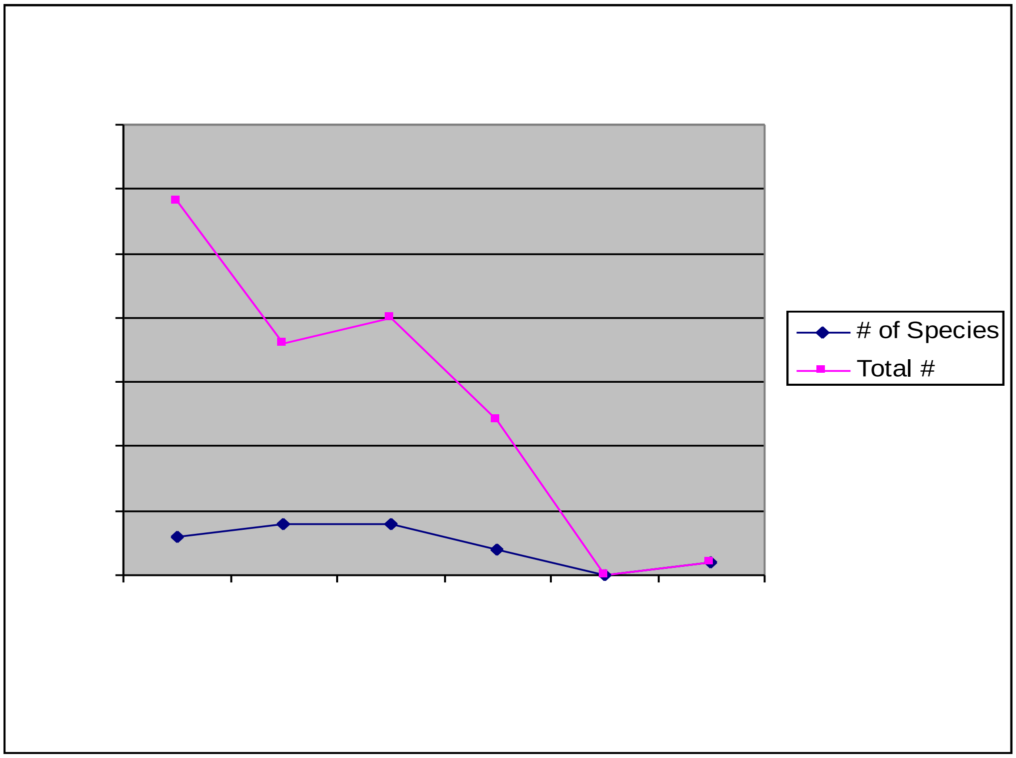
	Red Pine B	Red Pine Unb	Decid B	Decid Unb	Aspen	Bog
PEXX	9	15	8	6	1	
MYGA	16	1	10	6		
TAST	4		1			
ZAHU			1			
TAHU		1				
BLBR		1				
Total	29	18	20	12	1	0

Chart 1: This chart details the number of each species and the total number of species captured in each of the forest grids.

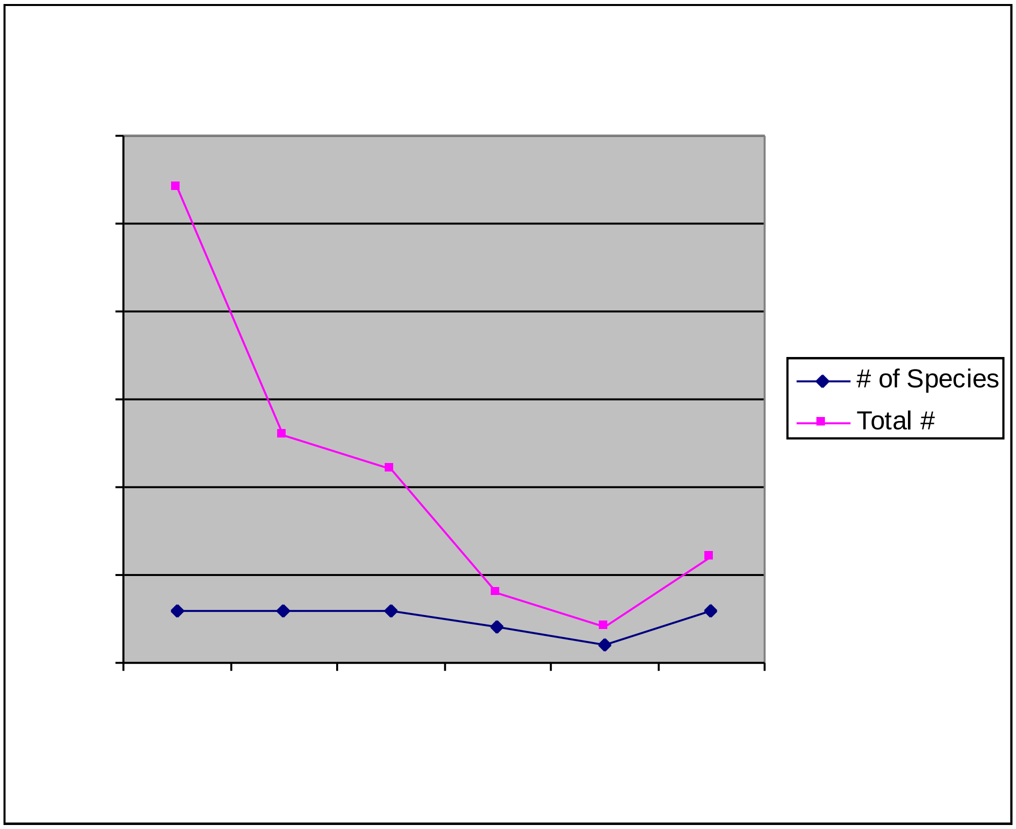
Species Types in Prairie Grids

	FBB	FBU	Rush N	Rush S	Waub Wet	Waub Dry
SPTR	23	11				2
PEXX	3					
MIPE	1	1	9	3	2	
MUER			1	1		
MIXX			1			
BLBR		1				
ZAHU						2
SPFR						2
Total	27	13	11	4	2	6

Chart 2: This details the species and total number of animals caught in the prairie grids. FBB=Frenchman's Bluff Burned, FBU=Frenchman's Bluff unburned.



Graph 1: This graph shows the comparison of species in the forest grids. Note the difference in total number of animals caught between the burned and unburned red pine forests.



Graph 2: Comparison of species and total animals caught on the prairie grids.

Discussion

The purpose of this study is to examine the species diversity between areas of differing vegetation and land management techniques. By establishing grids in different forest types, prescribed burn areas, and prairie areas with differing moisture contents, we were trying to get an even representation of the many types of habitats in this region. Traps were set in the same manner, baited with the same kind of bait, and were left in each grid for the same amount of time to avoid in variance in trapping. The exception to this was Frenchman's Bluff, which because of land use permission issues was checked twice daily rather once daily like the other sites.

According to our results (Charts 1 & 2) the sites which had undergone prescribed burns, both types of forest and the prairie, yielded the highest number of animals captured. This is consistent with what we know about fire affecting the populations of small mammals (Ahlgren 1966, Krefting and Ahlgren, 1974). Where the number of animals caught follows a pattern regarding the management type, the number of different species caught does not follow the same pattern. In the forest sites, the unburned red pine and burned deciduous sites had the greatest diversity. This would counter indicate the idea that burning specific sites helps increase species diversity within the site. Two sites (Aspen and Bog) in the forest region yielded few (1) or no animals at all. To determine if these were accurate trappings, several factors need to assessed. The ability of species to be trapped plays a key role in being able to record the diversity at these sites. It is highly unlikely that there are no mammals in these areas, instead it is more probable that the animals are trap shy or were simply not interested in the bait.

We found similar indications in the prairie sites where three sites, two of which were unburned, had three different species. Again this would show us that there is no significant difference in the diversity of species between burned and unburned sites but instead there is a difference in the overall number of animals present. These results are similar to those of blow down disturbances where diversity increases as the percent of blow down decreases (Pauli et al, 2005). The results (Chart 2) display that the dry prairie yields both more species and a higher total number of animals than the wet prairie site. Again, several factors need to be taken into consideration when assessing this information. The ability of the animals to be trapped, the bait, and also the location of the trap in regards to the amount of water present all have key roles in these results.

Peramyscus was caught in both burned and unburned forest. There is really no difference in habitat type as far as they are concerned. The same is true for Myodes gapperi, which does extremely well in burned areas but is still present in the unburned grids. Tamias straitas does well in dry prairies regardless of management type but, apparently will increase in population size after a prescribed burn.

Overall, we found that sites that had been burned contained a higher number of animals in both the prairie and forest but not necessarily a higher diversity of species. The results provide no consistent pattern or explanation for why some sites have higher number species. It is possible that predators may have an affect on this, as in the case of the short tailed weasels (Mustela erminea) being caught in our traps. The presence of these animals which prey upon smaller mammals (rodents) could deter some species from being at these sites; however, there is not enough evidence to strongly support this idea. To test this, all predatory species would need to be removed from the study area, but this is neither practical nor natural. In order to get an accurate count on the populations present, a longer trapping time period with larger grids should be implemented. Increasing the trapping time from 3 to 5 or more days could allow the trap shy animals to be trapped and provide a more accurate picture of the diversity in the area.

Literature Cited

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