

# **Abundance and Diversity of Small Mammals Found in Forest Habitat Compared with Prairie Habitat**

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## **Abstract**

Many factors can influence the biodiversity in a particular habitat. In this study, we looked at the biodiversity of small mammals in four forested habitats and four prairie habitats. We predicted that heterogeneous habitats would be more diverse, while disturbed areas would be less diverse. We set up a 5 x 10 trap-grid in each of the eight habitats, using a combination of Sherman, Russian, and Longworth traps. We checked traps in the forest habitats once a day for three consecutive days and traps in the prairie habitats twice a day for three consecutive days. Results indicate that biodiversity of small mammals is greater in most of the forested sites than in prairie sites. We also observed that the red-backed vole and the deer mouse were present in both forest and prairie habitat while other species found were only common in prairie or forest.

## **Introduction**

Biodiversity, or the study of species richness (Krebs, 2001), is an area in community ecology important in conservation (Keller and Schradin, 2008). Fraser and Currie (1996) discuss factors hypothesized to affect biodiversity. One factor to which they attribute species richness is the condition of the environment. Harsh environments and areas prone to climatic disasters are more likely to have a smaller number of species since most species cannot tolerate such conditions. Another factor is the heterogeneity of the area. The more diverse the biota, the more

niches are available to fill. Thirdly, competition of resources and predation affect how niches are filled and partitioned. The age of the landscape is the last factor they attribute to diversification: the older the biota, the longer organisms have had to colonize and evolve (Krebs, 2001).

Here we discuss the biodiversity of small mammals in four forest habitats and four prairie habitats in northern Minnesota. We focus on the effects of habitat heterogeneity and condition and how these two factors influences the community assemblages in the 8 study areas. We predicted that the more heterogeneous habitats would be home to a more diverse assemblage of small mammals, while disturbed areas would have lower diversity of small mammals.

## **Methods**

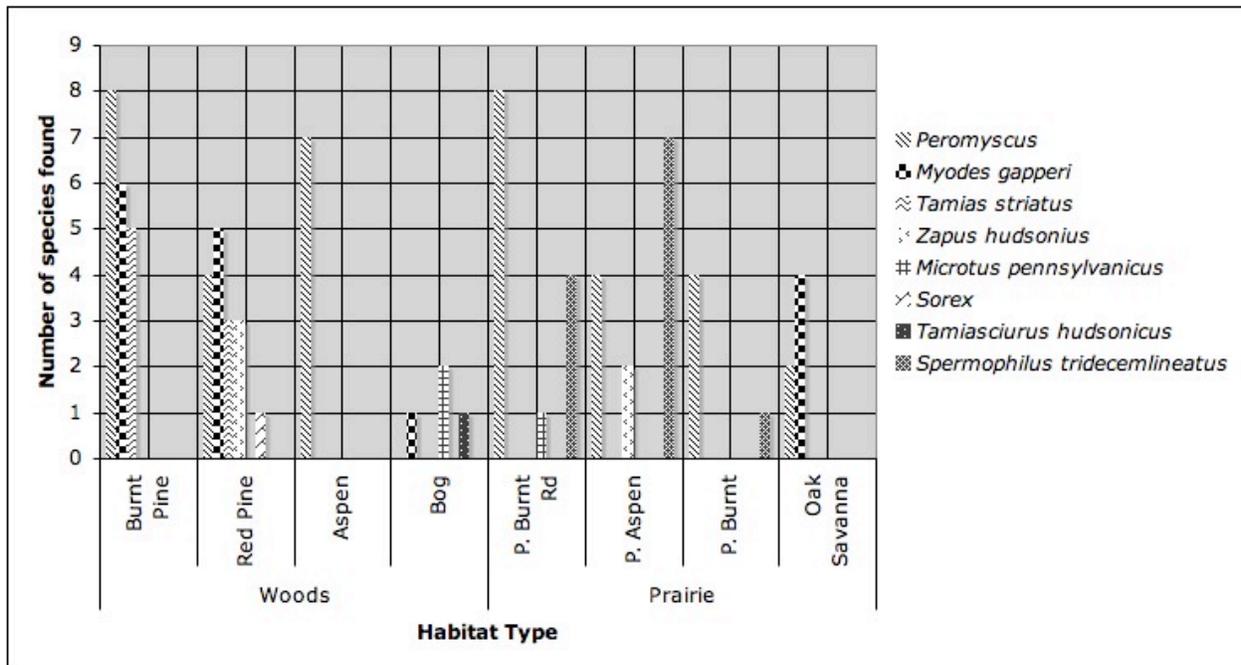
To study diversity in small mammals, we examined mammal biodiversity in eight different habits: bog forest, aspen forest, recently burnt red pine forest, red pine forest, two recently burnt prairies, oak savannah, and aspen stand within the prairie. We collected our forest site data in Itasca State Park and our prairie data from different sites within Agassiz Sand dunes. At each chosen site, we set up a 5 x 10 trap-station grid. We spaced each trap out 10 meters. Each of the five 10-trap rows was set up with nine Sherman traps and a randomly selected trap station was set with both a Russian and a Longworth trap. We checked the forest traps once per day for 3 consecutive days and the prairie traps twice per day for 3 consecutive days. This resulted in 165 trap nights for each site. We recorded species trapped, false alarms, and disturbances at each trap site.

## Results

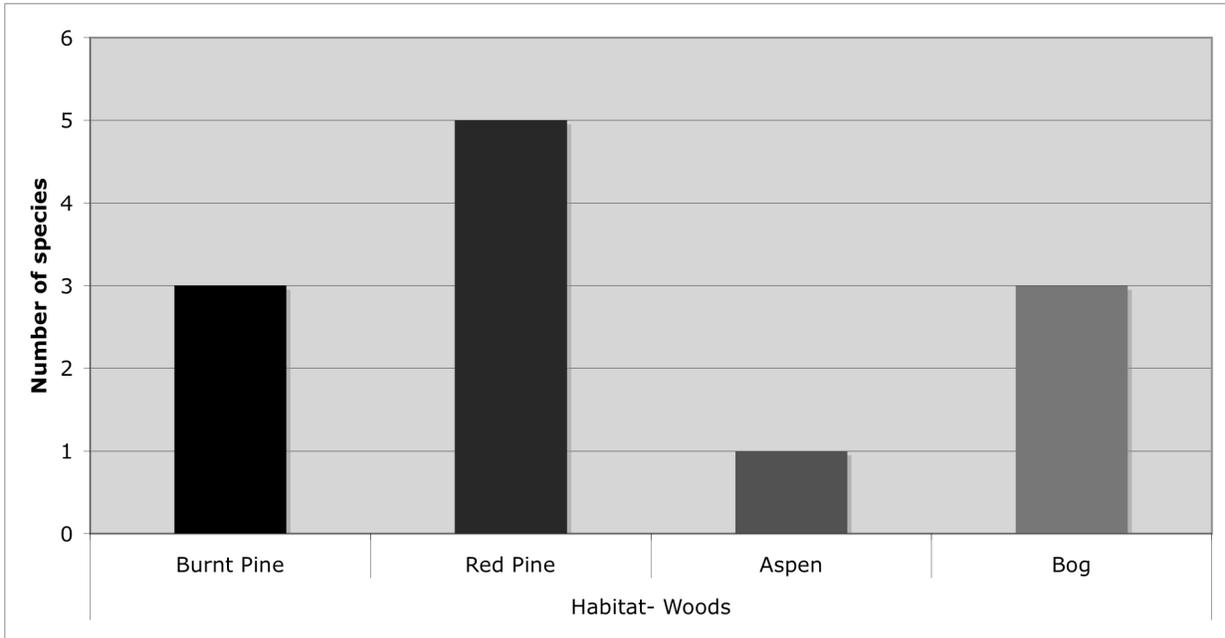
In the forest habitats we found a total of seven different species (**Fig. 2**), four of which were unique to forest sites. These four include: *Tamias striatus* (eastern chipmunk), *Microtus pennsylvanicus* (meadow vole), *Sorex* (shrew), and *Tamiasciurus hudsonicus* (red tree squirrel). In the burnt pine forest, we found three species: eight *Peromyscus* (42.1% of trap nights), six *Myodes gapperi*, or the red-backed vole (31.6% of trap nights), and five eastern chipmunks (26.3% of trap nights). During the three trap nights in the burnt pine forest, we observed five disturbed traps (3.0% of trap nights) and six false alarms (3.6% of trap nights). We found that in the red pine forest there were five species: four *Peromyscus* (25.0% of trap nights), five red-backed voles (31.3% of trap nights), three eastern chipmunks (18.8% of trap nights), three *Zapus hudsonius* (18.8%), and one *Sorex* (6.3%). During the three trap nights in the red pine forest, we observed one disturbed trap (0.6% of trap nights) and seven false alarms (4.24% of trap nights). In the aspen forest we found only one species, nine *Peromyscus*, making up 100% of species found there. During the three trap nights in the aspen forest, we observed 13 disturbed traps (7.9% of trap nights) and 12 false alarms (7.3% of trap nights). In the aspen forest, we caught two juvenile *Peromyscus* in the same Sherman trap. In the forest bog there were three different species: one red-backed vole (25.0%), two meadow voles (50.0%), and one *Sorex* (25.0%). During the three trap nights in the forest bog, we found nine disturbed traps (5.5% of trap nights) and one false alarm (0.61% of trap nights). See figure 1 for graph of results.

In the prairie, we found four species (**Fig. 3**), one that was unique to the prairie: *Spermophilus tridecemlineatus* (13-lined ground squirrel). In the burnt prairie near the road we found three different species: eight *Peromyscus* (61.5%), one meadow vole (7.7%), and four 13-lined ground squirrels (30.8%). During the three trap nights in the burnt prairie near the road, we

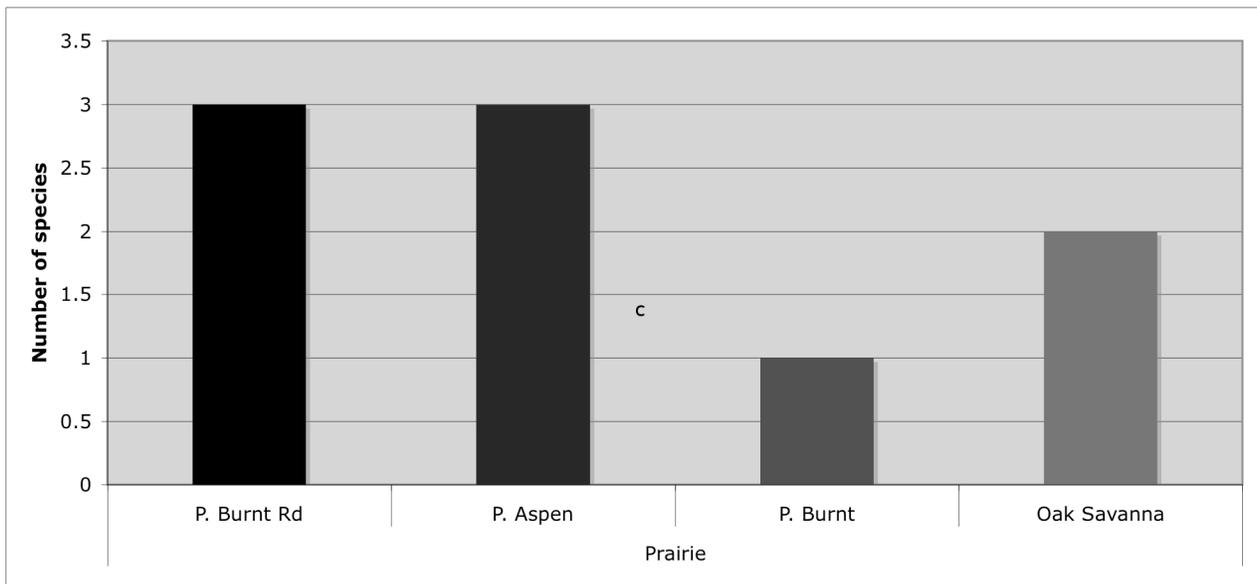
found one disturbed trap (0.6% of trap nights) and nine false alarms (5.5% of trap nights). In the aspen prairie, we found three species: four *Peromyscus* (30.8%), two *Zapus hudsonius* (15.4%), and seven 13-lined ground squirrels (53.8%). While there were zero disturbed traps during the three trap nights in the aspen prairie, we observed nine false alarms (5.5% of trap nights). We found that in the burnt prairie farther away from the road, there were two species: four *Peromyscus* (80%) and one 13-lined ground squirrel (20%). Here we also observed seven disturbed traps (4.2% of trap nights) and six false alarms (3.6% of trap nights). We found that in the oak savanna prairie there were two species: two *Peromyscus* (33.3%) and four red-backed voles (25.0%). During the three trap nights in the oak savanna we observed 15 disturbed traps (9.1% of trap nights) and 10 false alarms (6.1% of trap nights). See **Fig. 1** for graph of combined results.



**Figure 1:** Diversity of species found in each habitat during 165 trap nights in June 2008 in Itasca State Park for forest sites and in Agassiz Sand dune for prairie sites



**Figure 2:** Number of species found in different forest habitat types in June 2008 in Itasca state park.



**Figure 3:** Number of species found in different prairie habitat types located in Agassiz sand dunes prairie near Fertile, MN in June 2008.

## Discussion

In both the forest and the prairie, we found *Peromyscus*, *Z. hudsonius*, and *M. gapperi*. According to Hazard (1982), *Peromyscus* and *Z. hudsonius* are found in open and forested habitats, and while red-backed voles are more commonly found in forested habitats, it has been known to invade nearby grasslands. Hazard also noted that the 13-lined ground squirrel is an inhabitant of the prairie and open grasslands, which explains why we only found this species in our prairie sites. We only found the eastern chipmunk and the red tree squirrel in forested sites, which is their common habitat. The meadow vole is common to open habitats, but according to Hazard, when competition is fierce the meadow vole will move into nearby forests with some grass cover. Shrews tend to thrive in different habitats depending species.

There was more small mammal species diversity in the forested sites when compared with the prairie sites (**Fig. 2, Fig. 3**). A study on microhabitats by R. Dueser *et al.* (1978) suggests that species abundance and diversity are correlated to the quantity and heterogeneity of microhabitats found in the study site. In agreement with Dueser and our hypothesis, we found that the forest sites tended to have more heterogeneous niches available than did the prairie and as such, supported a greater diversity of species. This was not true, however, for the aspen forest, which had less species than all but one of the prairie sites. The low species diversity found in the aspen forest is likely due to it being more a disturbed habitat when compared with the other forests, which agrees with our predictions. Results found agree with our predictions; however, further study should be done with more trap nights.

### **Literature Cited**

- Dueser, R. D. and H. H. Shugart, Jr. 1978. Microhabitats in a forest-floor small mammal fauna. *Ecological Society of America* 59: 89-98.
- Fraser, R. H. and Currie, D. J. 1996. The species richness-energy hypothesis in a system where historical factors are thought to prevail: coral reefs. *The American Naturalist*. Vol. 148, No. 1: 138-159.
- Hazard, E. B. 1982. *The Mammals of Minnesota*. University of Minnesota Press. Minneapolis, MN. 280 p.
- Keller, C. and Schradin, C. 2008. Plant and small mammal richness correlate positively in a biodiversity hotspot. *Biodiversity Conservation* 17: 911-923.
- Krebs, Charles. 2001. *Ecology*, Fifth Edition. Benjamin Cummings, San Francisco, CA. 695 p.