

## RELATIVE ABUNDANCE OF SMALL MAMMALS IN NATIVE AND RESTORED TALLGRASS PRAIRIE

Samuel J. Kezar and Jonathan A. Jenks  
Department of Wildlife and Fisheries Sciences  
South Dakota State University  
Brookings, SD 57007

### ABSTRACT

Relative abundance was assessed for small mammals captured on native and restored tallgrass prairie habitats. Prairie voles (*Microtus ochrogaster*) ( $n = 30$ ), meadow voles (*Microtus pennsylvanicus*) ( $n = 4$ ), deer mice (*Peromyscus* spp.) ( $n = 5$ ), northern short-tailed shrews (*Blarina brevicauda*) ( $n = 3$ ), pygmy shrews (*Sorex hoyi*) ( $n = 2$ ), and thirteen-lined ground squirrels (*Citellus tridecemlineatus*) ( $n = 3$ ) were captured using snap traps. Relative abundance of voles (*Microtus* spp.) was higher in native prairie (163.3) than in restored prairie (10.2). Relative abundance of deer mice (20.4), thirteen-lined ground squirrels (13.3), and shrews (20.4) was higher in restored than native prairie ( $< 5.1$ ) habitat. Results indicated that restored prairie habitats provide adequate components (forage, cover) to support viable small mammal communities.

### Keywords

Native prairie, prairie voles, *Microtus ochrogaster*, relative abundance, restored prairie, small mammals, South Dakota

About 2.6 million ha (6.5 million acres) of land consists of pasture or hay lands in South Dakota (Johnson and Larson 1999). In eastern South Dakota, agricultural lands represent the most abundant habitat for wildlife (Smith et al. 2002). For example, in 2002, 111,500 ha (275,500 acres) of row crops were harvested in Brookings County, South Dakota (SDASS 2003). Small mammals use these habitats and represent an integral part of wildlife populations (Sullivan et al. 2003). Pinkert et al. (2002) documented the presence of deer mice (*Peromyscus maniculatus*) and white-footed mice (*Peromyscus leucopus*) in cropland habitats in eastern South Dakota.

Limited information is available on small mammal abundance within the tallgrass prairie (both native and restored) tracts that characterize eastern South Dakota. The purpose of this study was to determine if small mammal abundance differed between native and restored tallgrass prairie habitats. We hypothesized that relative abundance of small mammals would be higher in native (undisturbed) prairie than in restored (seeded) prairie habitat.

## STUDY AREA

Habitat for this study was limited because most native tallgrass prairie is privately owned in eastern South Dakota (Higgins et al. 2000). Brookings Prairie is 16 ha in size and is owned by the City of Brookings, South Dakota. Geographical location of the prairie is North 44° 15' 09.0", West 96° 48' 39.9". Native tallgrass prairie at this site was characterized by grasses such as big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*), various sunflowers (*Helianthus* spp.), sagesworts (*Artemisia* spp.), goldenrods (*Solidago* spp.), and purple coneflower (*Echinacea angustifolia*) (Johnson and Larson 1999). In addition, non-native species (e.g., smooth brome, *Bromus inermis*) also characterize the vegetation. The restored prairie site was a 64 ha section of privately owned land located at North 44°26' 37.1", West 96° 48' 17.7". Restored prairie grasses on this site included big bluestem, Indiangrass (*Sorghastrum nutans*), and switchgrass, which was the most abundant grass at the site.

## MATERIALS AND METHODS

Sampling was conducted from 11 to 15 August 2003. Mouse-sized snap traps (Victor®, Woodstream Corporation, Lititz, PA) (Stickel 1946) were baited with a 50:50 mixture of oatmeal and peanut butter (Schemnitz 1996). Using a 7 x 7 trap grid, traps were placed 9.09 m apart as described by Pinkert et al. (2002). Assuming that each trap covered a radius of 4.55 m, the total sample area covered was 0.405 ha (1 acre) (Pinkert et al. 2002). Traps were numbered 1 to 49 and placed numerically left to right, top to bottom, starting in the northeast corner of the grid. Each site was checked twice daily; at sunrise and no earlier than 2 hours before sunset. Traps with a captured animal were replaced with new traps to reduce pheromones that could affect capture rates. Animals captured were placed on ice for later identification.

Abundance was calculated as the total number of individuals caught per 1000 trap nights. Relative abundance was determined by individual species of small mammal and for total number of small mammals captured. Alpha level for comparisons was set at 0.05 and Chi-Square tests were used to compare frequencies of small mammals captured from the two habitats. Analysis was conducted at the genus level (i.e., *Microtus*, for both prairie [*Microtus ochrogaster*] and meadow voles [*Microtus pennsylvanicus*]). An index of species richness was calculated for the two habitats where;

$$\text{Species Richness} = \frac{\text{number of individuals of species captured}}{\text{total number of small mammals captured}}$$

Kruskal-Wallis One-Way Analysis of Variance was used to test for significant differences in relative abundance. Coefficient of Variance also was calculated as an index to variability in small mammal populations within the two habitats. All statistical analyses were conducted using Program Systat (SPSS 2000).

RESULTS

A total of 47 individual small mammals was captured over 392 trap nights (Table 1). Prairie voles ( $n = 30$ ) were the most abundant species captured followed by deer mice ( $n = 5$ ), meadow voles ( $n = 4$ ), thirteen-lined ground squirrels ( $n = 3$ ), northern short-tailed shrews ( $n = 3$ ), and pygmy shrews ( $n = 2$ ) (Table 1). A total of 34 small mammals was captured on the native prairie site whereas 13 small mammals were captured on the restored prairie site. Prairie voles ( $n = 28$ ) were the most abundant small mammals captured in native prairie, whereas deer mice ( $n = 4$ ) were most abundant small mammal captured in restored prairie.

**Table 1. Small mammals captured 11-15 August 2003 in Brookings County, South Dakota.**

	<i>Peromyscus</i>	Prairie Vole	Meadow Vole	Thirteen-Lined Ground Squirrel	Northern Short-Tailed Shrew	Pygmy Shrew	Total
Native Prairie	1	28	4	0	0	1	34
Restored Prairie	4	2	0	3	3	1	13
Total	5	30	4	3	3	2	47

Small mammal relative abundance differed ( $\chi^2_3 = 150.24, P < 0.001$ ) for native and restored prairie habitats. Relative abundance of voles (*Microtus* spp.) was higher in native prairie than in restored prairie (Table 2). Deer mice, thirteen-lined ground squirrels, and shrew relative abundance was higher in restored than in the native prairie habitat. Pygmy shrew relative abundance was similar across prairie sites. The index of species richness for restored prairie (0.83) was higher than native prairie (0.67). Small mammal abundance was 6.25 times more variable in native than the restored prairie.

**Table 2. Relative abundance of small mammals captured 11-15 August 2003 in Brookings County, South Dakota.**

	<i>Peromyscus</i>	<i>Microtus</i>	Thirteen-Lined Ground Squirrel	Pygmy/Northern Short-Tailed Shrew	Total
Native Prairie	5.10	163.27	0.00	5.10	173.46
Restored Prairie	20.41	10.20	15.31	20.40	66.32

DISCUSSION

Pearson and Ruggiero (2003) found that transect arrangements for small mammal trapping surveys were more efficient than trap grids. However, trap grids were used in this experiment to allow comparisons to previously published information on small mammal populations in eastern South Dakota. To mini-

mize affects of adjacent habitat, trap grids were placed at a maximum distance from edge habitat.

Native prairie was an important habitat for prairie voles. Dense vegetation and a well-developed litter layer in open prairie are common habitat components used by prairie voles (Walker 1976). Brady and Slade (2001) found that prairie vole abundance had little ecological effect on other small mammal communities, which suggests that abundance of voles captured was not an indication of dominance. Moreover, vole abundance, in itself, may not indicate habitat quality (Van Horne 1984).

There was a considerable difference in the relative abundance of the species captured (Table 2). *Microtus* species captured in the native prairie site had the highest relative abundance (163.27). However, *Peromyscus* species and shrew species had the highest relative abundance in the restored prairie site. Both Pinkert et al (2002) and Terrall et al. (2002) documented higher relative abundance of *Peromyscus* species and shrews than *microtus* species in grassland habitats in eastern South Dakota. Their results were similar to those for the restored prairie habitat in our study and may indicate that many grassland tracts of land in eastern South Dakota have small mammal populations indicative of restored prairie.

Based on small mammals captured at the restored prairie site, seeded prairie did provide suitable habitat for a variety of small mammals, albeit of lesser relative abundance. Diversity of forbs at the restored site was limited when compared to the native prairie site. Yet, despite the higher variety of forbs on the native prairie site, our index of species richness was higher for the restored prairie site; an indication that the site did provide a variety of niches for small mammals. Alder (1988) and Sieg (1988) stated that habitat variability can have a profound affect on the distribution of mammals. Results indicate that restoration efforts are capable in reproducing habitats suitable for small mammal communities.

#### ACKNOWLEDGMENTS

Special thank you to South Dakota State University for support, City of Brookings and private land owner L. Carson for access to his property, Dr. G. E. Larson for peer review, and C. L. Kezar for help with field work.

#### LITERATURE CITED

- Alder, H. A. 1988. The role of habitat structure in organizing small mammal populations and communities. Proceedings of a symposium on the management of amphibians, reptiles, and small mammals in North America. Pages 289-299. in U.S.D.A. Forest Service General Technical Report. RM-166.
- Brady, M. J., and A. Slade. 2001. Diversity of a grassland rodent community at varying temporal scales: the role of the ecologically dominant species. Journal of Mammalogy 82: 974-984.

- Higgins, K. F., V. J. Smith, J. A. Jenks, J. J. Higgins and G. A. Wolbrink. 2000. A provisional inventory of tall grass prairie tracts remaining in eastern South Dakota. South Dakota Agricultural Experiment Station Report EC912, South Dakota State University, Brookings, South Dakota. 123pp.
- Higgins, K. F., E. D. Stukel, J. M. Goulet, and D. C. Backlund. 2000. Wild Mammals of South Dakota. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota.
- Johnson, J. R., and G. E. Larson. 1999. Grassland Plants of South Dakota and the Northern Great Plains. South Dakota State University, College of Agricultural and Biological Sciences, Ag. Communications, Brookings, South Dakota.
- Pearson, D. E. and L.F. Ruggiero. 2003. Transect versus grid trapping arrangements for sampling small-mammal communities. *Wildlife Society Bulletin* 31(2): 454-459.
- Pinkert, M. K., J. R. Meerbeek, G. D. Scholten, and J. A. Jenks. 2002. Impact of crop harvest on small mammal populations in Brookings County, South Dakota. *Proceedings of the South Dakota Academy of Science* 81:39-45.
- Schemnitz, S. D. 1996. Capturing and Handling Wild Animals. Research and Management Techniques for Wildlife and Habitats. The Wildlife Society. Edited by T. A. Bookhout. Fifth Edition: 106.
- Sieg, C. H. 1988. The value of Rocky Mountain juniper (*Juniperus scopulorum*) woodlands in South Dakota as small mammals in North America. Pages 328-332. in U.S. Forest Service General Technical Report. RM-166.
- Smith, V. J., J. A. Jenks, C. R. Berry, Jr., C. J. Kopplin, and D. M. Fecske. 2002. The South Dakota Gap Analysis Project. Final Report. Research Work Order No. 65. Department of Wildlife and Fisheries Sciences, South Dakota State University, Brookings, S.D.
- South Dakota Agricultural Statistics Service. 2003. Acres planted and harvested, SD., 1998-2002. South Dakota Agriculture Statistics Bulletin. U. S. Department of Agriculture.
- SPSS. 2000. SYSTAT Version 10. SPSS Science and Marketing Department, Chicago, Illinois.
- Stickle, L. F. 1946. Experimental analysis of methods for measuring small mammal populations. *Journal of Wildlife Management* 10: #150-159.
- Sullivan, T. P., D. S. Sullivan, D. B. Ransome, P. M. F. Lindgren. 2003. Impact of removal-trapping on abundance and diversity attributes in small-mammal communities. *Wildlife Society Bulletin* 31:464-474.
- Terrall, D. F., N. G. Cochran, and J. A. Jenks. 2002. Variation in small mammal richness among ecotypes in eastern South Dakota. *Proceedings of the South Dakota Academy of Science* 81:147-152.
- Van Horne, B. 1983. Density as a misleading indicator of habitat quality. *Journal of Wildlife Management* 47:893-901.
- Walker, J. A. 1976. Relative abundance and habitat preference of some small mammals on southeastern Nebraska. *Transactions Nebraska Academy of Science* 3:74-77.