

Lake States Fire Science Consortium

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SMALL MAMMALS AND FIRE IN NORTHEASTERN MINNESOTA MIXED CONIFER-HARDWOOD FOREST

Written by: Shelby A. Weiss
(Applied Sciences Program, Seney NWR)

Wildfires occurred in northeastern Minnesota in 1952 and 1955, providing the opportunity to study the changes in small mammal populations after fire in a mixed-conifer-hardwood forest and to relate those changes to plant communities. The Heart Lake Fire burned 803 acres on April 28, 1952. Small mammal populations in a 10-year-old jack pine (*Pinus banksiana*) plantation within the area had been sampled prior to the fire. Trees were completely consumed in this area. Within days following the fire, jack pine cones opened and dispersed seeds, and red pine (*Pinus resinosa*) trees were planted the following fall. The Keeley Creek Fire burned 30 acres on July 11, 1955. The forest had been a mixture of jack pine, black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), quaking aspen (*Populus tremuloides*), and paper birch (*Betula papyrifera*). Researchers compared the effects of these fires on vegetation and small mammal communities to an unburned site.

Snap-trapping was done in each site along two parallel transects 66 yards apart on 157 yards long with a total of 20 trap stations per line. Each trap station had three baited mouse traps. Trapping took place over three consecutive nights each fall from 1955-1967. Vegetation composition was measured at each study area three times for the burned areas and twice for the unburned area over the duration of the study using 30 circular plots 107 square feet in size set 33 yards apart.

Deer mice (*Peromyscus maniculatus*, consumers of insects and seeds) and red-backed voles (*Clethrionomys gapperi*, consumers of succulent plant parts, some seeds, and some insects) were most abundant on the two burned



MANAGEMENT IMPLICATIONS

- 1) Deer mice (*Peromyscus maniculatus*) and red-backed voles (*Clethrionomys gapperi*) were most abundant at two burned sites, and eastern chipmunks (*Tamias striatus*) were only present at one of the burned sites in northeastern Minnesota.
- 2) Deer mice began to decline 7 years following the fire at both sites, whereas red-backed voles began to increase during the second half of the study (the last 6 years). Their respective declines and increases were likely driven by changes in vegetation cover.
- 3) Food availability and cover are important to small mammal populations following fire; however, individual species may have different requirements.

Want to learn more?

Greg Corace, Seney National Wildlife Refuge (greg_corace@fws.gov; 906-586-9851 x14).

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sites, with deer mice generally increasing in the first seven years following the fire, then decreasing and red-backed voles increasing during the latter half of the study (Table 1). Eastern chipmunks (*Tamias striatus*) were only abundant throughout the study at the Keeley Creek Fire.

Table 1. Percent of red-backed voles, deer mice, and other small mammals trapped in each area sampled for the periods of 1955-1961 and 1962-1967.

	Area	Red-backed voles trapped (% of total trapped)	Deer mice trapped (% of total trapped)	Other small mammals (% of total trapped)	Total number of small mammals trapped
1955-1961	Unburned	84%	6%	10%	200
	Heart Lake burn	12%	56%	32%	162
	Keeley Creek burn	14%	62%	24%	271
1962-1967	Unburned	3%	9%	6%	155
	Heart Lake burn	11%	49%	30%	160
	Keeley Creek burn	30%	39%	33%	118

Post-fire vegetation differed between the two burn sites. At the Heart Lake Fire site, trees were completely consumed and seed-reproducing herbaceous species increased following the fire. These colonizers were important to small mammals immediately after the fire, but their abundance decreased after five years. No other seed- or berry-producing plant species increased in this area sufficiently to make up for this decline in the first group. Contrary to this, jack pine released seeds at the Keeley Creek Fire, and other seed-reproducing species, were also available. Though jack pine seeds were less available a couple of years after the burn, these other seed- and berry-reproducing species increased strikingly, making a supply of seeds and berries available continuously over the duration of the study at this site.

For red-backed voles it was suggested that cover density differences, rather than food preferences, accounted for changes in abundance at sites. The Keeley Creek Fire had more debris remaining from the fire than the Heart Lake Fire, potentially creating the preferred type of cover utilized by red-backed voles. At both sites, percent cover increased over time, suggesting that the decline in deer mice for both sites may have been a result of increased cover, whereas red-backed voles showed an affinity for it. Eastern chipmunks were more abundant at the Keeley Creek Fire, and were likely influenced by the presence of dispersed jack pine seed. Consumption of seeds following a fire, particularly jack pine, has the potential to influence changing vegetation patterns.

The results of this study in northeastern Minnesota suggest that food availability and cover are important to small mammal populations following fire. Individual species may have different requirements and respond in the years following fire depending on how structure and food availability change over time.

Reference

Kreftig, L. W., and C. E. Ahlgren. 1974. Small mammals and vegetation changes after fire in a mixed conifer-hardwood forest. *Ecology* 55:1391-1398