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Voles Damage Seedlings, But Do Deer Mice and House Mice?

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Voles Damage Seedlings, But Do Deer Mice and House Mice?

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Abstract: While it is known that voles will damage seedlings, we do not know the extent to which deer mice and house mice damage seedlings. Knowing this information can assist resource managers in better targeting problem species and implementing appropriate management actions. We planted and monitored ponderosa pine and narrow-leaf cottonwood seedlings in metal stock tanks occupied by deer mice or house mice to assess the potential for damage by these rodents. Both species damaged leaves and stems of cottonwood seedlings, but house mice did more damage. House mouse damage resulted in mortality of over half of the cottonwood seedlings, while deer mice caused a much lower level of seedling mortality. Only slight damage was done by either species to pine seedlings. Neither species damaged the roots of seedlings, despite the extensive burrowing by house mice. While voles are often considered to be the primary rodent species causing seedling damage, we have shown that deer mice, and especially house mice, could also cause substantial damage to deciduous seedlings. However, our work suggests that rodent control to prevent damage to conifer seedlings might not be warranted in general unless extenuating circumstances and the species causing the damage are identified to assist with targeting control methods more precisely.

Key Words: damage, deer mice, house mice, *Mus musculus, Peromyscus*, seedlings

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Rodents cause significant damage to a variety of resources required by a growing human population (Witmer and Singleton 2010). Damage can be especially severe when rodent population densities are high (Witmer and Proulx 2010). A variety of methods are used to reduce damage by rodents, generally framed within an Integrated Pest Management (IPM) strategy (Witmer 2007). Because rodents provide important ecosystem roles and because not all species present may be causing the damage observed, one needs to determine the role of each species.

In many agricultural settings, rodents damage seedlings. We know that voles (*Microtus* spp.) will damage seedlings both above ground and below ground. While we often assume that voles, if present, are the main species causing seedling damage (e.g., Askham 1992, O'Brien 1994), the potential for damage to seedlings by deer mice (*Peromyscus* spp.) and house mice (*Mus musculus*) has not been assessed and quantified. Knowing this information can assist resources managers in targeting problem species and implementing appropriate management actions.

We recently encountered two situations were seedling damage by rodents needed to be assessed with the potential need to develop and implement a damage management strategy. In the first case, roof rats (*Rattus rattus*) had been eradicated from Buck island in the U.S. Virgin Islands (Witmer et al. 2007). However, this was followed by an irruption of house mice. The island is managed by the U.S. National Park Service, and the agency wanted to re-introduce an endangered native tree (lignum vitae, *Guaiacum officinale*) to the island. It was not known, however, if the mice would pose a threat to the seeds and seedlings. In the second case, two former landfills on Long Island, New York, were being restored with native vegetation, to be converted into parks. Substantial losses to planted seedlings were occurring and a state agency requested assistance from the USDA Wildlife Services to identify and implement rodent control strategies. It was soon learned that the sites were occupied by voles, deer mice, and house mice.

While we know that deer mice and house mice will consume large amounts of seeds, our objective was to determine the level of damage to two species of seedlings by house mice and deer mice in a controlled enclosure setting. We hypothesized that house mice and deer would cause damage to seedlings even when other food resources were available. In this expanded abstract, we summarize the results of our seedling damage study. Detailed results and analyses are presented elsewhere (Witmer et al. 2012).

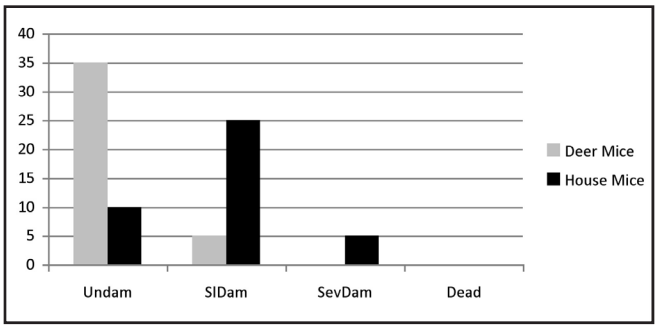
We planted and monitored seedlings of a coniferous species, ponderosa pine (*Pinus ponderosa*), and a deciduous species, narrow-leaf cottonwood (*Populus angustifolia*) in 8 metal stock tanks containing about 7 inches of topsoil and occupied by 4 deer mice or 4 house mice, to assess the potential for damage by these rodents (Figure 1). One male and 3 female mice were used in each

Figure 1. The stock tank set-up for the seedling damage trials.

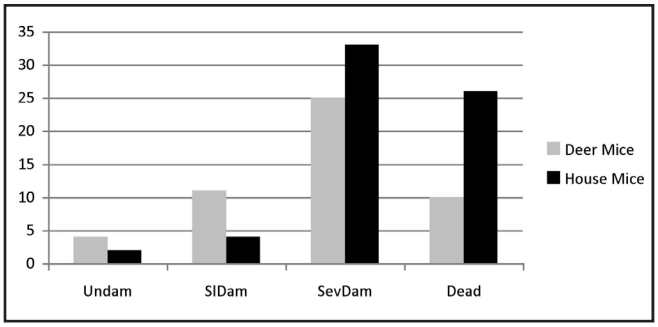
Figure 2. Number of seedlings by damage category and by mouse species.

Undam = undamaged, SlDam = slight damage, SevDam = severe damage, Dead = dead seedling

A. Deciduous Seedlings



B. Coniferous Seedlings



tank. Food, water, and den boxes were provided. Some grass hay and rocks were scattered about the soil surface. Five cottonwood and 5 ponderosa pine seedlings were planted in each tank prior to adding the mice. Seedlings were watered daily and monitored twice daily for damage over a 3-week period. The seedling damage categories included 1) undamaged, 2) slight damage, 3) severe damage, and 4) dead.

Both rodent species damaged leaves and stems of cottonwood seedlings, but house mice did more damage (Figure 2A). House mouse damage resulted in mortality of over half of the cottonwood seedlings, while deer mice caused a much lower level of seedling mortality. Only slight damage was done by either species to the pine seedlings, and there was no mortality of pine seedlings (Figure 2B). Neither species damaged the roots of seedlings, despite the extensive burrowing by house mice.

Our results suggest that damage to coniferous seedlings by house mice and deer mice is not an issue that resource managers need to address. While voles are considered to be the primary rodent species causing seedling damage in many parts of North America, we have shown that house mice and deer mice could also be damaging deciduous seedlings. We speculate, however, that deciduous seedling damage by house mice and deer mice might not pose a significant threat in unconfined areas with abundant food resources, in part because such damage has not been reported in the scientific literature. On the other hand, during times of food scarcity or drought, damage to deciduous seedlings might occur from these species. This is probably why less rodent damage to apple trees was found by Sullivan and Sullivan (1988) when supplemental food was applied to the area. During times of increased rodent densities, more damage may also occur (Witmer and Proulx 2010, Witmer and Singleton 2010). Hence, under a variety of conditions and settings, management actions to reduce that damage on regeneration sites or in plant nurseries may be warranted. Such management actions might include protective barriers, repellents, ground vegetation management, diversionary foods, or reduction of rodent populations using rodenticides or traps (Witmer 2007, Witmer and Singleton 2010).

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