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EFFECTS OF KNOWN DENSITIES OF PINE VOLES ON APPLE TREES

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Damage to fruit trees, tree seedlings and a wide array of ornamental shrubs by microtine rodents remains a widespread problem in both Europe and North America. Careful studies that quantify the levels of damage caused by a known density of rodent pests are not available. For this reason the orchard manager, Pest Control Specialist, and the researcher have a difficult time making wise decisions that are based on solid economic data.

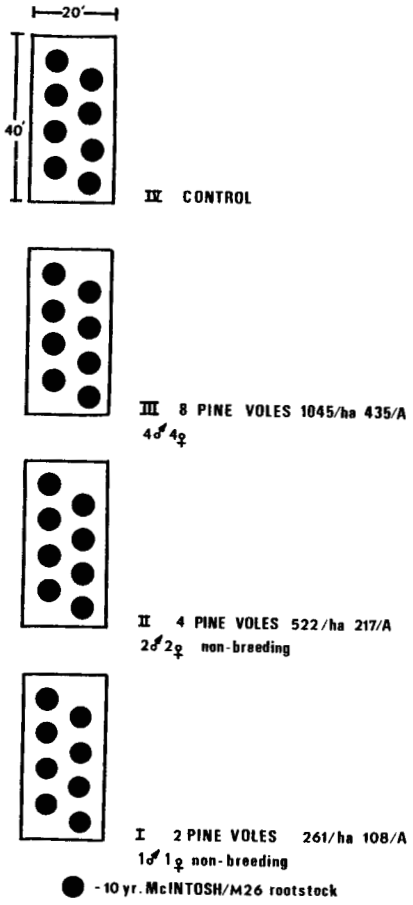
There are several reasons for this lack of knowledge. The damage done to apple trees is not easily observed, described, or measured. There is probably not a simple linear relationship between bark removal and economic damage. In addition to these difficulties and because the tree is a perennial, there is cummulative damage as well as recuperative and compensatory processes. In numerous situations, compensatory growth has been suggested and actually demonstrated (Dyer 1973, 1975, 1976, Dyer and Bokhari 1976, Harris 1974, Hutchinson 1971, Pearson 1965, Vickery 1972, Westlake 1963, and Woronecki et al. 1976).

To date, only a few attempts have been made to address the economics of pine vole or meadow vole damage in orchards. Pearson (1976, 1977) and Pearson and Forshey (1978) examined the relationship between the presence of voles and tree damage expressed as a reduction in crop value. A few authors have made some theoretical and speculative estimates of damage (Kennicott 1957, Hamilton 1938, Garlough and Spencer 1944, Biser 1967,, and Byers 1974). Recently Sullivan et al. (1980) have reported some standard survey work examining the magnitude and causes of tree mortality. This gives some concept of economic damage, but cannot be used to isolate even the benefits of current rodent control techniques. Ferguson (1980) and Luttner (1978) have also produced some very broad economic generalizations by extrapolating from rodenticide use figures. These, however, are only measures of standard acceptable orchard practice, and cannot form the basis for vole management in orchards.

Methods and Results

Construction of four 20' x 40' fenced (1/4" mesh hardware cloth) enclosures took place during September and October 1981 (Fig. 1). The 3 foot fence was buried 20" in the ground to prevent voles from tunneling out. Course gravel was used at the base of the fence to insure captivity. Aluminum tape was secured to the rim of the fence to prevent voles from climbing over. Each enclosure contains eight McIntosh trees, ten years old on M-26 rootstocks. Vole populations equivalent to 261, 522, and 1045 voles per hectare were released on Nov. 8, 1981. Female

Figure 1.


20'
40'
IV CONTROL
III 8 PINE VOLES 1045/ha 435/A
4♂4♀
II 4 PINE VOLES 522/ha 217/A
2♂2♀ non-breeding
I 2 PINE VOLES 261/ha 108/A
1♂1♀ non-breeding
- 10 yr. McINTOSH/M26 rootstock

voles released in the two lower density plots underwent tubal ligation to prevent breeding. All animals were toe clipped for future identification. Six 18" x 24" roofing paper sheets were placed between trees to provide stations for monitoring vole activity. Twenty-four hours after releasing the animals, tunnels were observed in each of the enclosures. On December 8, 1981 13 of the 14 animals were recaptured at a trapping session 4 wks after initial release. The trapping session consisted of 3 checks during a six hour period. During January and February snow cover at all times exceeded 6". In early March, melting snow revealed 5 trees completely girdled and a sixth partially damaged in the high density enclosure; 5 partially girdled in the second enclosure (522 voles per hectare) and a small area of damage on one tree in the low density plot. The most extensive girdling extended from the base of the tree to 3" above ground level. Over winter mortality claimed 4 voles (3 males, 1 female) in the high density enclosure - which have been subsequently replaced. Underground root damage will become apparent this spring as leaf-out occurs. Harvest records, shoot growth, and leaf analysis collected each year will continue on all trees within the enclosures. Shoot growth, leaf analysis and tree specific crop loads will then be correlated with the different vole densities. The root systems of dying trees will be examined this summer to quantify vole damage. By determining the actual economic losses incurred due to the pest species, a better understanding of what constitutes a cost effective management program will be gained.

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