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# PINE AND MEADOW RESEARCH IN PENNSYLVANIA RELEVANT TO CONTROL IN ORCHARDS

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## INTRODUCTION

Results from field studies and questionnaires mailed to commercial orchardists in Pennsylvania indicate use of orchards by wildlife poses management problems for orchardists, horticulturists, county extension agents, and wildlife managers. Data substantiate the detriment of wildlife to orchard trees and fruits as viewed by commercial orchardists. In addition, existing control methods are often inconsistent and ineffective and necessitate use of toxic substances which may have far-reaching environmental effects. Consequently, a need for sounder management of wildlife in orchards is apparent.

Studies at The Pennsylvania State University have focused on: (1) surveys on the extent and severity of wildlife damage in orchards (Anthony and Fisher 1977), (2) relationships between soils and pine vole populations (Fisher 1975), (3) densities, movements, and activities of pine voles (Gettle 1975), and (4) population characteristics of meadow voles in relation to habitat type (Stump 1976). This paper summarizes the results of these studies and their relevance to damage control in orchards.

## RESULTS OF STUDIES CONDUCTED

Mail questionnaires received from commercial orchardists in Pennsylvania show that the severity of damage to fruit orchards by birds, small mammals and deer varies over the state. For example, deer cause the most problems in mountainous regions where croplands are sparse and forests extensive. Small mammals are most detrimental in flat agricultural areas, and birds cause the most damage in cherry orchards and vineyards. Damage by woodchucks and cottontail rabbits is less, on the average, than by birds, small mammals and deer (Anthony and Fisher 1977).

On the basis of acreage treated and cost of control, small mammals cause most concern on a statewide basis (Anthony and Fisher 1977). Two species of small mammals (meadow voles and pine voles) apparently cause the most damage. Their trunk and root girdling behavior, respectively, affects the health and productivity of fruit trees. If their activity goes unchecked or undetected, fruit trees may die when subjected to high vole populations.

Population studies of pine voles in Adams County indicate inconsistent and ineffective control of this species with rodenticides, herbicides, poison baits and cultural practices (Anthony and Fisher 1977). Populations at the Tyson Hill site declined from November 1973 to March 1974 following applications of endrin but increased over the same period of 1974-1975 after a similar application. Populations were high throughout the study, except August 1974, even though endrin was applied and mowing and herbicides used to reduce ground cover.

Additional studies on meadow voles in Centre County indicate that high mortality rates due to endrin spray is compensated for by higher reproductive rates than for other habitats. Chemical control is, therefore, only temporarily effective (Stump 1976).

Information on behavior and population ecology of small mammal populations provides insight for better management in orchards. For example, pine voles spend most of their lives underground and their distributions are restricted by soil textures that make burrowing difficult. Research suggests that these voles require soils with greater than 35 percent gravel and 20 percent clay and 25 to 48 percent sand (Fisher 1976). Knowledge of which orchards constitute suitable habitat will allow for more efficient and economical application of control techniques. In addition, pine vole populations were highest in autumn but less mobile, whereas spring populations were low and most mobile (Gettle 1975). Consequently, fall application of control methods are often necessary to reduce high populations and spring application to prevent a population increase. Pine vole movements are generally concentrated within the dripline of orchard trees, so controls should be applied accordingly.

The most commonly used controls for small mammal populations are toxic sprays or poison baits which have environmental effects beyond target species (Anthony and Fisher 1977). Resistance to some of these substances (e.g., endrin, Webb and Horsfall 1967) may very well account for inconsistent and ineffective control. Obviously, there is a need for more research on problems involving wildlife in orchards, so more efficient and acceptable control methods, hopefully biological or cultural, will be devised to manage wildlife in these environments.

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