

## Controlling Vole Damage

Stephen Vantassel, Extension Project Coordinator-Wildlife Damage Management  
 Scott Hygnstrom, Extension Specialist-Wildlife Damage Management  
 Dennis Ferraro, Extension Educator

This NebGuide provides information about voles, the damage they cause, and ways to prevent and control damage problems.

Voles are small, mouselike rodents that exist throughout Nebraska. Though commonly called meadow or field mice, their short tails (about 1 inch long), stocky build and small eyes distinguish them from true mice. (Figure 1).

Voles can cause problems by damaging lawns, gardens, tree plantings and other plants.

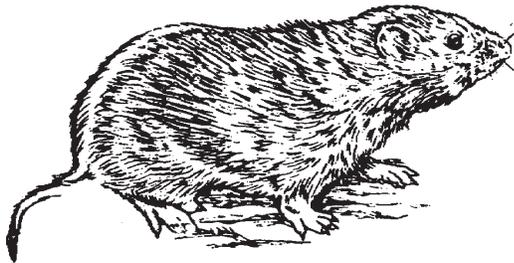


Figure 1. Prairie vole.

### Vole Facts

The prairie vole (*Microtus ochrogaster*), the most common species, occurs statewide. Meadow voles (*Microtus pennsylvanicus*) are also very common but cover a slightly smaller geographical area. Pine voles, or woodland voles (*Microtus pinetorum*), are generally confined to the extreme southeastern corner of Nebraska.

Voles are small, weighing only 1 to 2 ounces as adults. Their overall adult body length varies from 3 to 5 1/2 inches in the pine vole, to about 4 1/2 to 7 inches in the meadow and prairie voles. The three species of voles in Nebraska differ in color, general size and relative length of tail, but it usually isn't necessary to distinguish between the species to control the damage they cause.

Voles are an important source of food for many predators, including snakes, hawks, owls, coyotes, weasels, foxes, mink and badgers. Mortality rates for voles are very high. Life expectancy in the wild often does not exceed two months, and few live longer than 16 months.

The breeding season for all voles encompasses most of the year with peaks occurring in the spring and fall. Prairie

Characteristic	Prairie Vole	Meadow Vole	Pine Vole
Length (head and body)	5.4-7.0 inches	3.5-5 inches	2.8-4.2 inches
Tail Length	0.9-1.8 inches (less than twice the length of the hind foot)	1.4-2.6 inches (at least twice the length of the hind foot)	0.6-1.0 inches (less than or equal to the length of the hind foot)
Adult Fur	Dark, brownish to blackish	Coarse, dark brown mixed with black	Soft, auburn, lacking guard hairs
Eye Size	Small	Large	Small
Nest Placement	Aboveground or below about 4.75 inches	Usually aboveground, but occasionally in shallow burrows	In burrows, usually less than 1 foot deep
Food	Grasses, some tubers roots, and seeds	Grasses, sedges, seeds, grain, bark, some insects	Bulbs, tubers, seeds, and bark
Damage	Girdle tree trunks at or near ground surface; may girdle higher under cover of snow; sometimes damage roots	Girdle tree trunks at or near ground surface; may girdle higher under cover of snow; sometimes damage roots	Girdle crown and roots

Tobin, Mark E., and Richmond, Milo E. "Vole Management in Fruit Orchards." *Biological Report 5*. Washington, D.C.: U.S. Department of Interior, Fish and Wildlife Service, March 1993: 4.

and meadow voles normally have five to 10 litters per year, averaging three to five young per litter. Pine voles have one to six litters per year and average two to four young per litter. Vole gestation lasts about 21 days. One captive meadow vole had 17 litters during one year, totaling 83 young. A female from that first litter had 13 litters, totaling 78 young before turning 1 year old.

Many vole populations are cyclic and can increase from only a dozen per acre to 250 voles per acre. In North America, vole populations peak about every four years. These cycles are not necessarily regular or coupled with dramatic increases in population. Occasionally, high vole populations last about a year before crashing. These peaks occasionally result in severe crop damage.

Prairie and meadow voles inhabit pastures, roadsides, alfalfa fields and other grassy or weedy sites. Preferred habitats include areas with fairly dense ground vegetation. Meadow voles are more common in low, moist areas or upland sites near water.

Pine voles inhabit timbered areas, preferring a subterranean life in the soil. They can thrive under forest litter, however, and in fields surrounding timber stands, provided enough ground cover is present.

### Economic Importance

Vole damage is costliest during the winter when a shortage of preferable foods forces them to eat the inner green bark layer of trees and shrubs. The gnawing required to reach this layer can severely damage or kill many young trees and shrubs, including orchard, windbreak, and landscape plantings (Figure 2).

Voles damage field and forage crops, especially during spring when young plants are emerging from the soil. Voles clip off the young plants and dig up the seeds, sometimes causing significant reductions in stand density. Voles can damage or consume flower bulbs, garden plants and vegetables, and

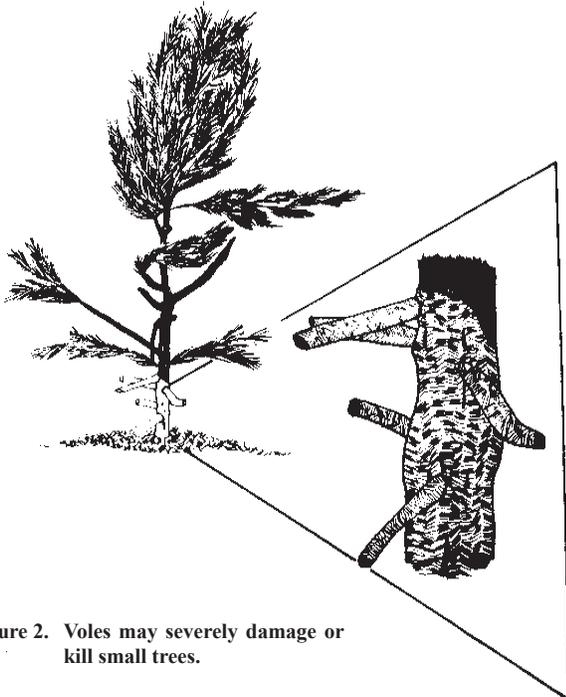


Figure 2. Voles may severely damage or kill small trees.

field and forage crops. Voles can scar lawns by constructing runways and clipping grass very close to the roots. Though the damage done is not usually permanent it may detract from the appearance of a well-kept lawn. They also eat leaves, shoots, roots, tubers, and seeds of most grasses and forbs, or broadleafed flowering plants.

### Damage Identification

Signs found at the scene will help you identify the species causing damage. The presence of prairie and meadow voles in an area is demonstrated by their characteristic surface runways, which are most visible after the snow melt (Figure 3). The runways consist of closely clipped vegetation, about 1 to 2 inches wide. Small holes lead to underground runways and nesting areas. Pine voles have extensive underground runway systems and spend little time above the leaf litter and groundcover layer. Damage that is primarily underground (versus aboveground) without surface runway systems is typically caused by pine voles.

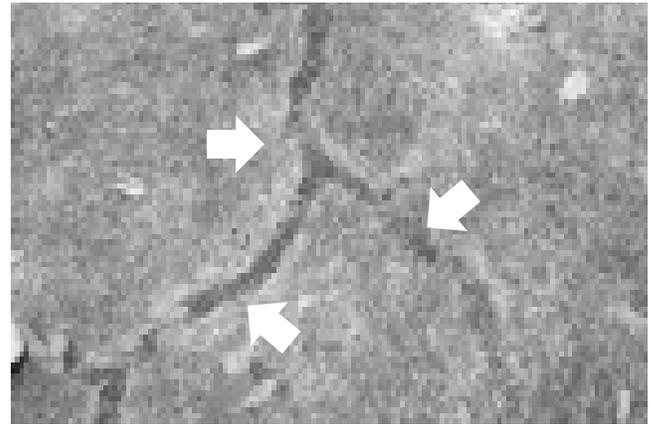


Figure 3. Surface runway system of the prairie vole.

Voles usually damage woody plants from late fall through early spring. Voles tunnel through snow and may gnaw on trees and shrubs up to the height that snow accumulates. Individual tooth marks (about 1/16 inch wide and approximately 3/8 inch long) may be visible on the wood after winter vole damage (Figure 4). The gnawing marks left by voles will be irregular in appearance and at various angles. In contrast, rabbits leave tooth marks that are about 1/8 inch wide and very regular. Pine voles, and occasionally meadow and prairie voles, tunnel below ground and feed on roots of trees and shrubs.

Voles have been known to travel tunnels developed by moles to gain access to flower bulbs and other plant roots. Damage of this type is often mistakenly blamed on moles. Moles feed on insects and earthworms and rarely consume plant materials.



Figure 4. Tooth marks of voles are about 1/16 inch wide.

## Controlling Damage

Voles don't always cause significant property damage. Populations of voles, however, can increase quickly and be cause for concern. Generally, a direct relationship exists between populations of voles and the expected overall level of damage. Before undertaking control, consider the extent of the problem in relation to the cost of control. For example, a few voles could damage a highly-valued tree or flower bed and warrant control. At other times, they may go virtually unnoticed, making control unnecessary.

It is usually more cost-effective to prevent damage caused by voles than to control vole populations after damage has occurred.

## Habitat Modification

Reducing the suitability of habitat for voles lessens the likelihood of future damage. High vole populations cannot become established without food and protection from predators. Grass and weeds can be controlled around young trees and shrubs through cultivation, herbicides, and mowing. Normal cultural practices employed in establishing windbreaks, orchards, and other woody plantings often are effective in reducing habitat and potentially high populations of voles. Remove bird feeders or substantially reduce spillage from feeders to help lower the availability of food for voles. Although drastic, voles are less likely to traverse weed-free zones that are 15 feet wide. Voles from adjacent areas, however, may use the cover of snow to invade even the best manicured property. Thus, although habitat modification is critically important to reduce vole damage, it is often not enough to end vole damage near woody plantings.

## Exclusion

Exclusion can be used to protect highly valued flower beds, gardens, shrubs and trees from vole damage. Install woven wire or hardware cloth fences (1/4-inch or smaller mesh) around small flower beds or gardens to reduce vole activity. The fence should be about 12 inches high and the bottom should be buried 2 to 3 inches into the ground. Where pine voles are a problem, the fence should extend about 6 inches below ground as well. Rabbits and ground squirrels will also be excluded if you make the fence 18 inches tall and bury it into the soil a few inches.

Use 1/4-inch hardware cloth or plastic cylinders to protect individual trees and shrubs (*Figure 5*). Again, the cylinder should be tight to the ground or buried slightly and should extend higher than the maximum depth of snow in winter, including drifts. The height of the cylinder should be at least 18 inches above the snow depth, if possible, where rabbits are also a potential problem. When making the cylinder, overlap the edges at least 1 inch and fasten it securely so gaps do not form that could admit voles. Cylinders of galvanized hardware cloth should last about five years, so make them large enough in diameter to accommodate expected trunk growth if they remain in place during the growing season.

## Repellents

Various repellents made with thiram and "hot sauce" are registered for controlling vole damage on ornamental plants.



**Figure 5.** A cylinder of hardware cloth or other wire mesh will protect trees and shrubs from vole damage. Solid cylinders need to be screened at the top to prevent bird entrapment.

They are not registered for use on gardens or plant parts destined for human consumption.

Repellents are relatively expensive and provide only short-term protection. Some may wash off if there is precipitation. When foods are in short supply, such as in winter, the effectiveness of repellents usually decreases. Avoid using electronic repellent devices, mothballs or other unregistered products. There is no evidence of their effectiveness on voles.

## Traps

Voles can be controlled by trapping if the damage is over a limited area (less than an acre) and a sufficient number of traps are used (three per runway and/or hole). Set single mouse snap traps perpendicular to vole runways, with the triggers in the runways, or set two traps together within the runway, with the triggers facing away from each other (*Figure 6*). No bait is needed; however, if you prefer to use bait, peanut butter mixed with oatmeal can be placed on the trap triggers. Baited traps should be covered with a box with a 1-inch hole cut in it to reduce attractiveness and access to birds and squirrels. Make sure the box is securely positioned and large enough to allow free action of the snap trap. PVC pipe and cardboard milk cartons can make good enclosures.

Multiple-catch mouse traps have also been useful in catching voles, especially meadow and prairie voles. Several voles can be captured at one time, fewer traps are needed and



**Figure 6.** With trigger side in, set trap perpendicular to the runway.

nontarget species can be released alive. Place a trap near visible burrows and adjacent to vole trails. Place a small amount of seed, either bird or grass, at both entrance points. If the location is correct, the trap(s) should contain a few voles in 24 hours. If you catch nothing after two fair-weather nights, move the trap to a new location.

### Toxicants

Large vole populations can be most effectively reduced with toxic baits. Zinc phosphide is federally registered for controlling voles and is available in formulated pellets or treated grain. It usually is a Restricted Use Pesticide that may be purchased and used by Certified Pesticide Applicators only. Contact your local Extension educator for information on becoming a Certified Pesticide Applicator. Some formulations of zinc phosphide are packaged in small containers and are registered as General Use Pesticides, which can be purchased and used by the general public. You may find that the toxicant is most effective when administered in the fall and early spring when voles have few alternative food sources. Prebaiting with untreated oats or pellets for two to three days may help improve bait acceptance and thereby increase the effectiveness at reducing the vole population. To reduce the potential for affecting nontarget species, avoid placing prebait or toxicant on bare soil or in piles. Use zinc phosphide during fair weather to protect the toxicant from moisture. Using bait stations will further decrease the risk of nontarget species and moisture from reaching the toxicant. Contact your Extension educator to find out where to obtain them.

Read all pesticide product labels thoroughly and comply with all directions given.

Zinc phosphide baits can be applied by hand in spot treatments by placing them in runways or burrow openings. Hand-baiting is the only application method that can be used in urban areas and lawns, ornamental plantings, parks, and golf courses. When placing toxicant in pine vole holes take care not to damage the hole or surrounding area. Pine voles are very fastidious. Any disturbance may result in the pine vole "sweeping" the toxicant out of the burrow during its cleaning activities.

Toxic bait also may be broadcast according to label directions. This technique is most appropriate in young woody plantings or orchards, when efforts to reduce habitat have failed to reduce vole populations. Note that broadcasting increases the amount of bait applied per acre as well as the chances of harm to nontarget wildlife. Before baiting, mow the grass so more bait can reach the trails and burrows used by voles.

Zinc phosphide pellets are also registered for in-furrow applications when planting corn or soybeans in minimum tillage systems. Specialized application equipment is required. Contact your local Extension educator for more information.

### Fumigation

Gas cartridges and aluminum phosphide tablets may be used to fumigate vole tunnels. Fumigation is very time consuming and often not very effective due to the complexity of vole tunnels. Aluminum phosphide is a Restricted Use Pesticide.

### Safety and Health Precautions

Use pesticides safely. All toxicants and fumigants used to control voles can be hazardous to humans, pets, livestock and nontarget wildlife if used improperly. Only use products that are registered for voles by the U.S. Environmental Protection Agency. Read pesticide product labels carefully and comply with all directions given. Seek assistance from your local Extension educator, if necessary.

Voies are not known to be a significant threat to human health and safety. Nevertheless, voles have been implicated in the transmission of tularemia and have been known to be hosts for agents of other infectious diseases, such as babesiosis, Lyme disease, giardia, and Rocky Mountain Spotted Fever. Reduce the risk of contracting diseases by wearing gloves, washing hands, using insect repellent, and avoiding contact with voles, including their urine and feces.

### Integrated Pest Management

As in most situations with vertebrate pests, a combination of methods may be more effective than relying on any one method for controlling vole damage. Most problems with voles in urban and backyard areas probably involve small populations of voles that can be controlled with habitat modifications, fencing or exclusion, trapping and repellents. Damage in nonurban areas may involve larger populations of voles that can be dealt with by habitat modification, repellents, and toxic baits when necessary. Finally, continue to monitor for new and renewed vole activity. Given their incredible reproductive rate, new infestations can seem to appear over night. A quick and appropriate response to new vole damage can significantly reduce the amount of effort and costs needed to control the problem. More information can be found at <http://wildlifedamage.unl.edu> or with your Extension educator.

To simplify technical terminology, trade names sometimes may be used. No endorsement of products is intended nor criticism implied of products not mentioned.

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