Moles and Voles – How to Identify and Control them in your Home Landscape

By Marshall Warren – Johnston County Horticulture Extension Agent

There are certain things when thought of and spoken that just seem to go together; peas & carrots, peanut butter & jelly, stars & stripes, Romeo & Juliet, Batman & Robin, Bevis & Butthead, and moles & voles. Moles and voles can be as annoying and destructive to your home landscape as the last aforementioned in the list before moles & voles. Mole and vole control questions are one of the most frequently asked at the Johnston County Extension office and our Master Gardener Mobile Plant Clinics. Many people are confused about their differences and often moles are incorrectly blamed for vole damage. About the only thing they have in common is that their names rhyme and they both dig underground. While these two garden pests cause anxiety and an immediate desire to gain control, knowing their differences can help determine best control methods. Your first step is to distinguish which pest you have by observing the type of damage they do. It's possible to have both moles and voles at the same time causing damage on your property.

I'll make this very simple and easy to remember.

M = Mole = Meat Eaters

Moles eat earthworms, grubs, and insects. As moles tunnel, they make visible raised tunnel ridges, volcano shaped mounds of soil, and have a closed tunnel system without an entrance hole.

Eastern Mole
Photo by Pixabay

V = Vole = Vegetarian

Voles eat roots, bulbs, seeds, bark and foliage. Voles have open entrance holes, and their tunnels are not raised ridges.

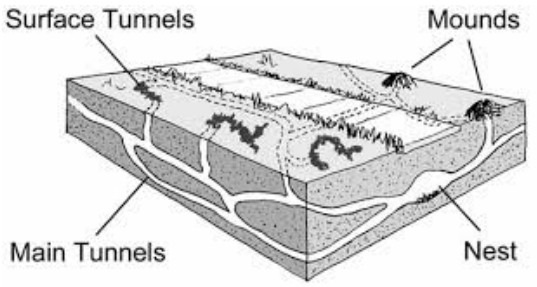
Pine Vole
Photo by Marshall Warren

The first place to start your control efforts for **moles** is to locate their **Active Tunnels**.

For **voles**, you will locate their **Active Entrance Holes**.

About Moles

Moles have both **"Foraging-Feeding Tunnels"** and **"Active Tunnels".** The interconnecting trails of visible raised tunnel ridges are feeding or foraging tunnels that often are used only once. So, you will be wasting your time if you start your control efforts in foraging tunnels. Moles also can leave volcano-shaped mounds of soil that are pushed up from their excavation of deep tunnels. Moles move back and forth several times throughout the day from their foraging tunnels back to their nesting dens to rest and groom themselves. Dens are commonly located on high, dry spots, under portions of large trees, buildings, sidewalks or driveways. The tunnel that they use most frequently that leads to their nesting den is called an **"Active Tunnel"** and this is where you should focus your control efforts. Many times this active tunnel is located beside a sidewalk or driveway.



A Mole's raised ridge active tunnel along a driveway
Photo by Marshall Warren

To determine if a mole's tunnel is an active or foraging tunnel you will do the **"Broomstick Test"**. Take a broomstick and poke a hole every 10' apart within the moles' tunnel system. Moles like a closed tunnel system and will repair the opening in their active tunnel within a couple of days whereas they will not repair their foraging tunnels. It's possible to press down all the mole's tunnel system and the tunnel that is raised will be considered active. **Control efforts should only be made in the active tunnel**.

About Moles and How to Manage them.

Before initiating a control program for moles, be sure that they are truly out of place.

Because of their extensive tunneling and length of the tunnels, it may appear that many moles occupy an area but it's rare for more than 2 or 3 moles to occupy the same burrow system. Moles eat from 70% to 100% of their weight each day. The home range of a mole is large. Three to five moles per acre is considered a high population for most areas. For the most part, moles live in seclusion in their underground burrows and rarely come to the surface. As the weather cools, moles will retreat into their deeper tunnels following their food source.

Moles causing property damage may be trapped by the homeowner under a depredation permit issued by the NC Wildlife Resources Commission. A depredation permit must be obtained prior to setting traps. To obtain a free depredation permit, contact a Wildlife District Biologist or a Wildlife Enforcement Officer in your county. Find a list online at https://www.ncwildlife.org/Have-A-Problem

Success in mole trapping depends largely on the placement and setting of the trap and should only be placed in their active tunnel. Moles are very suspicious of any foreign objects in their runways. If any portion of a trap is exposed in the tunnel opening, moles will certainly detect it and will desert that part of the runway or will tunnel around or under the trap. Success is not often achieved on the first try. You must be persistent when dealing with these critters. If traps remain un-sprung after a week or so, start the process over again.

It's legal for property owners to use appropriate pesticide baits. Some mole baits mimic their food source, such as the "gummy worm" or "mole gel" type baits. Mole baits can be used on the eastern mole and hairy-tailed mole without a depredation permit. However, the star-nosed mole is considered "non-game" and a pesticide cannot be used on them. Mole baits are only effective when placed in a mole's active tunnel system.

Search link for a list of mole baits that are labeled non-restricted use for homeowners:
http://www.kellysolutions.com/nc/showproductsbypest.asp?Pest_ID=VKCCAAA01

There are some products on the market labeled to deter moles. These contain castor oil concentrate that is diluted with water and sprayed over the area moles are located. These products claim to make moles leave the area. Keep in mind that they do not remove the food source or kill moles. After treatment stops moles could return.

Perimeter barriers and exclusion methods made from sheet metal or hardware cloth can be used to prevent moles from entering unwanted areas. Some electronic, magnetic, and vibrational devices have been promoted as being effective in frightening or repelling moles. None, however, have been proven effective.

In the past, insecticides frequently were applied to lawns in an attempt to reduce populations of various beetle grubs, which are a major food of moles. The assumption used to justify this approach was that with a reduced food supply, moles would leave the area. This can give some control, however, applications of insecticide rarely were effective in removing all potential food sources.

About Voles

Voles are compact rodents with stocky bodies, short legs, and short tails and are active throughout the year. We have two species that damage turf and ornamental plants in North Carolina: pine voles, *Microtus pinetorum*, and meadow voles, *Microtus pennsylvanicus*. Pine voles have reddish brown fur, a short tail and are slightly smaller than meadow voles, while meadow voles have dark brown fur and a tail slightly longer than its hind legs. With favorable conditions, voles are perhaps the most prolific of all rodents and can produce from five to ten litters per year, with an average of five young per litter. Gestation is only 21 days, and young voles are sexually mature in a month or two and may live up to two years.

Pine voles spend most of their life feeding on roots underground in burrow systems, and may come above ground at night to feed on fruit and tender green vegetation. A pine vole tends to stay in an area as small as 1,000 square feet for its entire life.

Pine Vole
photo by Marshall Warren

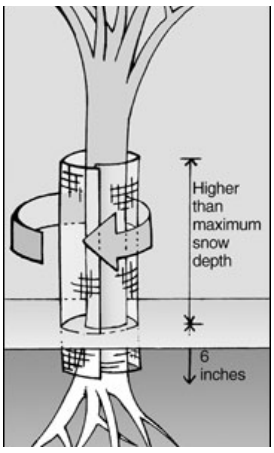
Pine voles cause damage by eating flower bulbs, stems of woody plants, and roots. Careful observation beneath damaged vegetation may reveal entrance holes, and a network of tunnels and feces. The trunks of small trees, shrubs, and perennials may be severed from the roots, making it possible to pull the top of the plant out of the soil, or the plant may fall over by itself. When the damage is extensive, the plant will be severely weakened and die due to root damage or disease organisms.

Meadow Vole
grassy pathway

Meadow Vole

Meadow voles spend most of their lives foraging above ground, chewing well-defined, visible surface runways through turf with many tunnels and burrow entrances. The typical habitat for meadow voles is a grassy meadow, particularly in places where grasses grow in clumps. Check for feces at the base of large clumps of grass. They forage in areas of about 10,000 square feet and have larger home ranges than pine voles and may travel as far as ¼-mile in a week. Most activity occurs at dawn and dusk.

Typically, meadow voles eat plant roots as well as girdle trees and saplings at the ground line. Girdling completely around the tree trunk kills the plant, so any indication of above ground damage is cause for instituting a control program. Their damage is especially evident during winter's with snow cover, where hidden from predators, they make grassy pathways, consume roots, girdle tree trunks to the point that shrubs may topple over.



Meadow Vole damage in lawn after snow melt

Testing for Voles

The first place to start your control efforts for **voles**, is to locate their **Active Entrance Holes**, as there may be burrows and tunnels in your yard that are no longer active. The **"Apple Sign Test"** was developed to detect vole populations before damage becomes severe and reduces the exposure of nontarget animals to control activities. Because the test shows where control is needed, areas without voles are not treated, saving time, money, and environmental risk.

Pine vole entrance hole within hardwood mulch
photo by Marshall Warren

Vole activity under stepping stones
photo by Marshall Warren

How to identify **Active Entrance Holes** by conducting the **"Apple Sign Test".**

- Make a map of your property to record areas of highest vole activity.
- Carefully move mulch searching for entrance holes, and narrow trenches.
- Probe gently with your fingers or a stick to locate burrows a few inches under-ground.
- Where you see signs of vole activity, (open entrance holes and runways), place ordinary plant nursery pots or similar container upside down at 10' to 15' intervals with a fresh piece of sliced apple under each pot.
- After 24 hours, remove the pot and check for signs of vole activity. If the apple has not been removed or eaten, cover the apple again and check in a few more days. If the apple has not been eaten after the second check, then you can assume there is no activity in this area. *(Note: moles don't eat apples)*

"Apple Sign" Test
photo by Marshall Warren

(Note: If ants are preventing you from having a successful Apple Sign Test, then remove the apple and substitute about a tablespoon of a mixture of various bird seeds under the pot. Re-check in a couple of days for vole activity.)

If you are having trouble finding entrance holes but can probe with your finger and find underground tunnels, create a hole in the tunnel and place a shingle or board on the ground over the hole. Wait 5 days and then place an apple slice under the shingle within the hole. Check it in a couple of days, and if the apple has been eaten or removed, then this is considered an active vole tunnel.

To monitor for meadow voles, the shingle must be rounded in a tent-like fashion or propped up 3 to 4 inches off the ground over an entrance hole or a grassy pathway, so that the animal can go under it. After five days, place a small slice of apple under each shingle. After 24 hours, check to see if the apple has been removed or eaten. You may leave the shingles in place for future monitoring. When monitoring has been completed, a control action can be directed to the locations where vole damage may occur rather than to the entire planting.

Tunnels made by pine voles under a shingle at an IPM monitoring site. NCSU

Management Strategies for Voles – non-lethal

Cultural methods include eliminating weeds, ground cover, litter, removal of excess mulch, thatch, and mowing regularly. Encourage natural predators (snakes, hawks), or provide physical barriers like hardware cloth cages, gravel or PermaTill® worked into the soil around the roots or when planting.

There are two chemicals approved for use in by EPA for repelling voles. These two repellents may contain thiram (a fungicide) or capsaicin (an ingredient that makes chili peppers hot), and act by altering the taste of plants and making them unpalatable to voles. Although these repellents may provide temporary protection for plants, their effectiveness is usually short-lived. Voles may become accustomed to such repellents and forage on plants even after treatment.

You may trap and release moles and voles to another property only if you have a depredation permit and written permission from the landowner of the property where you want to release the animal. This includes any public properties.

Management Strategies for Voles - Lethal Control

There are approved rodenticides used to control voles but must be applied in specific protected bait stations to minimize the hazards to non-target species. Bait stations should only be placed at active vole entrance holes or active runways. Some types of vole bait stations are placed on top of the ground but under the mulch for below ground vole foraging activity (Pine voles), and for above ground foraging activity (Meadow voles), bait stations should be placed on top of the ground.

For pine vole control, place bait in bait stations once a week for 4-5 weeks until no more bait is removed. For meadow voles, replenish bait in the stations every 3-4 days until no more bait is removed. Follow label directions for bait application. Complete the "Apple Sign Test" 21 to 30 days after rodenticide application to make sure all voles were controlled.

As a regular practice, complete the Apple Sign Test once in the fall and once in early spring to detect vole activity. Voles can move into an area that was previously controlled from surrounding areas after 6 months.

Voles causing property damage may be trapped by the homeowner under a depredation permit as described above with moles. Mouse snap traps can be used to control a small population by placing the trap beside active entrance holes at 10-foot intervals throughout the damaged planting, or perpendicular to an active runway with the trigger end in the runway. A peanut butter-oatmeal mixture or apple slices make good baits. The trap should be covered by a shingle or pot to prevent pets and birds from injury. Voles are easiest to trap in fall and late winter. Traps should be checked daily and reset until no voles are caught for a week. In large landscaped areas, concentrate trapping in a particular plant bed, achieve control, and then move the trapping effort to another area. If vole population is high, trapping may not be effective since meadow voles have much larger home ranges than pine voles. It is impractical for homeowners to control meadow voles by trapping.

Vole Baits registered for home use in NC that are not considered a Restricted Use pesticide:

Anticoagulant baits are slow-acting toxicants requiring from 5 to 15 days to take effect. Multiple feedings are needed for most anticoagulants to be effective. Rodenticides can be used to control voles but must be applied in specific locations out of reach of children, pets, domestic animals, and nontarget wildlife, or in tamper-resistant bait stations.

Baits Labeled for pine and meadow vole control- an antidote is available for these types of bait. (Vitamin K)

Kaput Rat, Mouse & Vole Bait - Warfarin
Kaput Combo Bait Mini Blocks - Warfarin & imidacloprid for flea control
Kaput Combo Bait Pellets - Warfarin & imidacloprid for flea control

Baits Labeled for meadow vole control - not pine voles - No antidote is available for these types of bait.
See link for full list of meadow vole baits:
http://www.kellysolutions.com/nc/showproductsbypest.asp?Pest_ID=VKGGCTA02

As with all pesticides – the label is the law. Read the label in its entirety before using any mole or vole poison products to avoid illegal usage and/or unintended harms.

Registered pesticides can be found by going to http://www.kellysolutions.com/nc or in the North Carolina Agricultural Chemicals Manual.