

## Moles and Their Control

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This NebGuide describes moles and their habitat, and provides recommendations for their control, including the use of traps, food reduction, repellents, fumigants, and toxic baits.

The eastern mole (*Scalopus aquaticus*) is a burrowing mammal found throughout Nebraska. Moles are well adapted for a life of digging, with front feet wider than they are long (Figure 1). Webbed toes support strong claws and their palms turn outward. The paddle-like forelimbs move laterally, enabling moles to “swim” through the soil. They lack external ears and have tiny eyes concealed beneath their fur.

Although moles and pocket gophers are fossorial (subterranean) species, they are not closely related. They differ in structure and behavior. Moles have small, sharp incisors and canine teeth used for catching and eating grubs and earthworms. In contrast, gophers are rodents and have large incisors, like squirrels and mice, that they use to gnaw on the taproots of plants (Figure 2).

### Mole Facts

Moles have short, velvet-like fur varying in color from gray to brown. A fully grown mole is 4 to 6 ½ inches long, not including its short tail. Adults weigh 3 to 5 ounces. The eastern mole has a long naked snout with nostrils that open

upward. Moles have a voracious appetite and can eat from 70 to 100 percent of their weight daily. They feed while burrowing just below the surface of the ground where their preferred foods, including insect larvae, insects — especially ants — and earthworms are abundant. Plant parts are eaten only occasionally.

Moles live alone, but burrow systems of several moles may be connected. They burrow year-round, peaking May through June, and a single mole can create an extensive network of burrows.

Moles tend to burrow along structures, fencelines, and walkways, and may burrow as fast as 1 foot per minute when making feeding tunnels near the surface. Therefore, one animal can be responsible for considerable damage to a lawn or garden.

Breeding occurs in February and March, with young arriving 42 days later. Females produce one litter of four or five young per year. Young are independent of their mother at 1 month of age and reach sexual maturity in one year.

In the Great Plains, moles exist only where they find suitable habitat. Although moles may tunnel anywhere, they prefer areas shaded by trees, with cool, moist soils near the surface. Permanent burrows and dens are usually in areas protected by trees, stumps, fence rows, buildings, or sidewalks.

Quality habitat for feeding and the area needed for constructing permanent runways (also known as burrows and tunnels) must be available for moles to become numerous, but they rarely exceed a density of three moles per acre.



Figure 1. Eastern mole, *Scalopus aquaticus*. Image courtesy of Kevin Cornwall of Cornwall's Wildlife Control LLC.



Figure 2. Plains pocket gopher, *Geomys bursarius*. Photo by Stephen M. Vantassel.



**Figure 3a.** Burrows and tunnels tend to be long and straight. Photo courtesy of Tom Olander of Olander's Wildlife Control.

### Economic Importance

Moles can be more of a nuisance than an economic pest. Mounds and surface burrows do interfere with mowing, however, and activities of moles may disturb root systems and kill grass. Occasionally, the damage moles cause in golf greens, fairways, cemeteries, and commercial turf is economically significant.

Although moles feed on beneficial invertebrates as well as lawn pests, they rarely affect the populations of either. Moles seldom eat roots, bulbs, or other plant materials.

Unfortunately, the maze of burrows created by moles may provide cover and travel lanes for many other species of small mammals. Voles (*Microtus* spp.), deer mice (*Peromyscus* spp.), and house mice (*Mus musculus*) can live and travel in these underground corridors. By enhancing the habitat of other pests, moles may be indirectly responsible for the damage these rodents cause to bulbs, seeds, and garden plants.

### Identifying Damage

Mole damage is divided into two types, **burrows** and **mounds**.

- **Burrows** occur when moles search for food near the surface, causing the soil to be raised in ridges. Moles create two kinds of burrows — feeder burrows and travel burrows. Feeder burrows tend to wander in no apparent direction as the moles search for food. In contrast, travel burrows are long and straight (*Figure 3a*).
- **Mounds** are created when moles burrow deep or tunnel under solid objects such as tree roots or sidewalks and push the extra soil to the surface (*Figure 3b*).

Although both moles and pocket gophers create mounds, they can be easily distinguished through close inspection. Moles build small, conical-shaped mounds (usually less than 1 foot in diameter) by pushing soil out of vertical tunnels (*Figure 3b*). Gophers build relatively large, fan-shaped mounds (greater than 1 foot in diameter) by pushing soil out of inclined tunnels.



**Figure 3b.** A large mole mound (8 inches in diameter). Photo courtesy of Stephen M. Vantassel.

### Controlling Damage

Before starting a management program, determine the significance of the damage that is occurring.

#### Food Reduction

Many assert that mole damage can be stopped by eliminating the presence of grubs. Grubs, however, make up only a portion of the mole's diet, so eliminating grubs will only stop mole damage if the lawn lacks other nutrients — sufficient worms, ants, and other soil-borne insects to justify digging. Before they move on, though, moles may increase foraging and burrowing activity for several weeks.

Using soil insecticides can be expensive, with no immediate reduction of damage, and little likelihood of long-term control. In the process, soil insecticides may cause the loss of beneficial soil invertebrates and be a hazard to songbirds and other desirable wildlife.

#### Mole Barriers

Physical barriers can be installed to prevent moles from entering a given area. Barriers offer long-term protection, but are only practical for small areas and unique situations, such as high-value production land. Barriers can be constructed of 36-inch wide aluminum sheeting or ¼-inch mesh galvanized hardware cloth. Bury to a depth of 24 to 30 inches and allow 6 inches to extend above the ground surface.

#### Trapping

Trapping is the most effective and practical means for controlling problem moles. Success is highest in spring and fall, especially after rains. In winter and summer, burrows are deeper in the soil and more difficult to locate. If you decide to trap or use toxicants, avoid crushing the tunnels; this will keep the moles from accessing the trap or bait.

The most popular types of mole traps include the harpoon (Victor® or AnneMissille®), scissor-jaw (Out O' Sight®), choker-loop (Nash® or Victor®) (*Figure 4*), and NoMol® traps. Each can produce excellent results. Mole traps usually result in quick kills and with reasonable caution, are safe for the user, pets, and other wildlife.



Figure 4. Mole traps clockwise starting from the top: Victor® (harpoon), Out O' Sight® (scissor-jaw), and Nash® (choker-loop).

Traps are usually set in surface burrows. Some of these burrows are used frequently by moles and others are traveled in only once. Avoid burrows in disrepair or which meander around the soil surface. Success is highest when traps are set in active travel burrows (*Figure 3a*).

To find frequently used burrows, look for fresh signs of soil upheaval and burrows running in straight lines, connecting two mounds, or following concrete sidewalks or other structures. Avoid twisting surface ridge runs.

If you're not sure whether a burrow is active, flatten a small section with your foot and check it within 24 hours to see if it has been pushed back up. If it's hard for you to identify the travel runs, flatten all tunnels with a lawn roller and trap when new tunnels appear.

During dry conditions, irrigate the landscape prior to setting traps. This encourages the moles to use their surface tunnels.

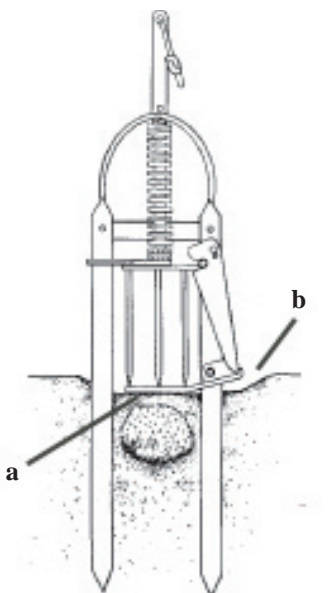


Figure 5. Setting a harpoon trap. Pack down a portion of the surface burrow (a) and push the set trap over the burrow until the trigger-pan rests firmly on the depressed ridge (b).

When setting harpoon traps, flatten the ridge of an active surface burrow and push the trap into the ground until the trigger-pan rests firmly on the depressed ridge (*Figures 5a, 5b*). Depress the ridge no more than the width of the trigger. Do not use your foot as the depression will be too wide. Set and fire the trap several times to clear a path for the harpoons.

When setting a scissor-jaw or choker-loop trap, excavate a small portion of a burrow and construct a soil barrier just below the trigger mechanism (*Figures 6a, 6b*). The barrier should be firm; this encourages the mole to push the soil out of the way and spring the trigger. Be sure the jaws or loops straddle the burrow

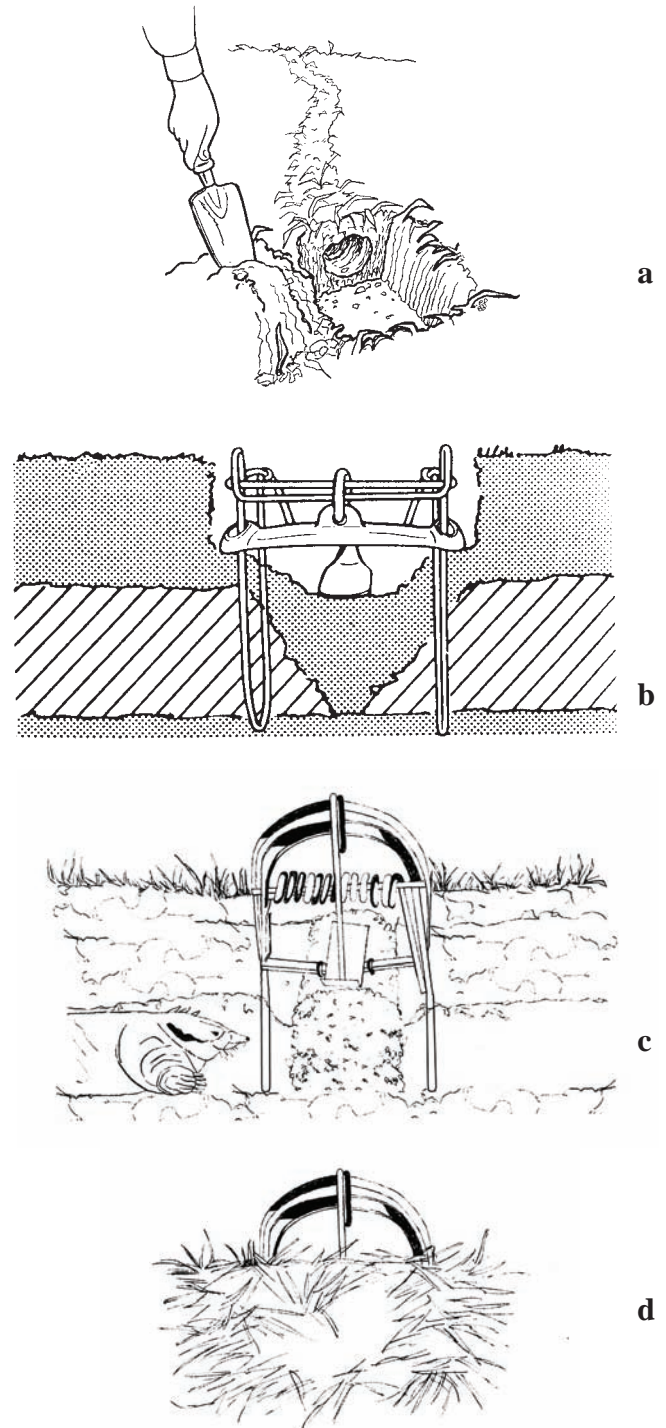


Figure 6. Setting a scissor-jaw or choker trap. Excavate a section of the burrow (a) and replace soil loosely in the excavation (b). Set the trap in the loosely placed soil so the jaws straddle the burrow or choker loops encircle the burrow (b, c), and cover set to ensure that the tunnel remains dark (d).

(*Figures 6c, 6d*). If the jaws or loops encroach on the tunnel, the mole will dig around it and avoid the trap. Cover the trap with loose grass or soil to keep the tunnel area dark.

Flag the scissor and Nash® traps to reduce the risk of accidentally hitting them with your lawnmower. If they are not successful in two to three days, move traps to a new location. We recommend homeowners employ at least three traps when trapping for moles to increase the chances of success.

Moles can also be trapped alive. A simple “pit-fall” trap can be installed by burying a 2- to 5-gallon bucket in the path of an active burrow. The top rim of the bucket should be level with the bottom of the run. Cover the bucket and small portion of the interrupted run with a board. A mole may re-open the run and fall into the bucket. If successful, however, you must either euthanize the mole, or release it within 100 yards from the site of capture, as Nebraska regulations require. Since releasing it will result in renewed damage to your property, we do not recommend live trapping.

### Repellents

Castor oil and castor oil products, such as Mole-Med® or MoleChase®, have shown minor effectiveness in repelling the eastern mole. In one study, Mole Med successfully reduced mole activity in an area for over 30 days.

To be effective, the castor oil product must be thoroughly watered into the lawn. Irrigate the area to be treated with one-half inch of water before applying the repellent solution, and follow up with 1 inch or more of water.

Areas that receive extensive irrigation will quickly lose the repellent to leaching. For best results, spray the entire area to be protected. Moles will burrow under a perimeter treatment.

Homeowners can prepare their own repellent concentrate by mixing 6 ounces of 100 percent unrefined castor oil (refined is suitable, but expensive) with 2 tablespoons of liquid detergent in 1 gallon of water.

This mixture, like the commercial product, is diluted at a rate of 1 ounce per gallon of water and applied liberally with a sprayer (covers about 300 square feet). Preliminary studies on granular materials containing castor oil have shown less effectiveness than the liquid repellents.

Gopher purge (*Euphorbia lathyris*), also known as “mole plant,” has been promoted as a mole repellent, but the effectiveness of this plant is doubtful. Further, gopher purge is poisonous to humans and may become a problem weed. It is not recommended.

### Predators

Domestic cats and dogs may be effective at catching moles. Some cats and dogs stalk and dig up moles after seeing the movement in the soil. They may damage the turf, however, and harm wanted wildlife. We do not recommend using dogs or cats to control moles.

### Fumigants

Fumigants can successfully control moles in some situations, but a number of legal restrictions relate to their use. Follow the label carefully as the label is the law. Fumigants are usually ineffective where soils are porous and dry, or where there are extensive feeding tunnels near the surface of the soil.

Aluminum phosphide, a Restricted Use Pesticide, is registered as a fumigant for mole burrows. Be aware that a Fumigant Management Plan must be created before using this pesticide.

Gas cartridges, which produce carbon monoxide and carbon dioxide when ignited, are occasionally effective.

For best results, place fumigants in runways of the burrow system, especially where they run to dens — deep underground — and tightly seal the openings.

### Toxic Baits

A 0.5 percent formulation of strychnine grain-based bait is federally registered as a Restricted Use Pesticide for controlling moles. Since moles feed mostly on insects and earthworms, however, they rarely eat grain-based baits.

Two other bait products, Kaput® and Talpirid®/Tomcat®, show more promise. (Tomcat, as the retail version of Talpirid, is a General Use Pesticide). Both claim that the mole is attracted to bait as food.

Kaput is a gel that is squirted into the run. Talpirid/Tomcat bait is a synthetic worm replica that contains bromethalin. When using Talpirid/Tomcat, do not disturb the integrity of the worm-bait as it will interfere with its effectiveness. We have received numerous positive reports regarding the effectiveness of Talpirid/Tomcat. However, more rigorous testing of these products is needed. Carefully follow the label when using toxicants and fumigants, as the label is the law.

### Other Methods

A variety of home remedies have been tried by people frustrated with damage caused by moles. The list includes pinwheels, windmills, broken glass, castor beans, used cat litter, kerosene, flooding, cement, and even chewing gum. Unfortunately, there are no shortcut solutions, and most home remedies fail. Several electronic devices have been marketed, but none has been proven effective. It is best to use proven methods when attempting to control moles.

**This publication has been peer reviewed.**

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