

Biology and Behavior

The two species of moles found in Michigan are the eastern moles (*Scalopus aquaticus*) and the star-nosed mole (*Condylurea cristata*). Correct identification is vital to mole damage control. Both species of Michigan moles have large shovel-like front feet with long claws. The eastern mole has a naked red nose and a short tail; the star-nosed mole has a large red nose with 22 finger-like projections and a long tail. The eastern mole makes many shallow tunnels that rail the soil into long winding 2-inch high ridges. The few mounds it makes are low, rounded and often have bits of turf on them. It prefers well-drained soils. The star-nosed mole makes many deep tunnels not evident on the surface, but it pushes up soil from these tunnels into many conical mounds of raw earth. Some mounds may be more than 6 inches high and 12 inches wide. It prefers moist soils.

Moles are not rodents, but insectivores. They lack the rodents' longer incisor teeth for gnawing. Thus, their main diet consists of earthworms, grubs and other insect larvae. Occasionally they eat plant seeds, roots, and bulbs, but most damage is done while burrowing for insects when they uproot the plants and grass roots.



Moles are active day and night throughout the year but they are most active in spring or fall on damp days or following rain showers. When the ground becomes frozen in the winter or very dry during the summer months, moles use only the deeper burrows. Daily peak activity periods are during the morning hours, although they may be seen working off and on throughout the day and night. They have a very extensive underground tunnel system, including travel tunnels (which are used daily) and foraging tunnels (rarely reused).

Mating occurs during February and March, with a single litter of three to five young born later in the spring following a 6-week gestation period. Young moles grow rapidly and leave the nest to fend for themselves at about one month of age.

The number of mounds or surface ridges seen in a yard is no indication of how moles may be present. Generally, one acre of land will support no more than two or three moles at one time. However, yards surrounded by or adjacent to large tracts of forested areas or weedy fields may be subject to continual invasions by moles because such areas may support many moles.

Despite the damage done by moles around yards and gardens, there are aspects of this creature which are very beneficial. Moles make soils healthier because their tunnels permit air and water to penetrate deeper soil levels. Moles feed voraciously on all types of insects found in the soil, some of which are serious pests of lawns, gardens, and horticultural plants. They are also part of the food chain in the wildlife community, providing food for some hawks, owl, and snakes.

However, when moles become obnoxious or destructive, landowners often feel that the disadvantages outweigh the advantages. At this point control is often desired. The following methods can be used to control the damage.

Population Reduction

- 1. Direct Killing** - Although eastern moles may burrow at any time, they are usually most active at certain times, depending on the season. Most activity occurs when flattened ridges or mounds are repaired. Once you have determined when the eastern moles are most active, look during those times to see the long winding ridges being pushed up by the eastern mole tunneling just below the surface of the ground. With practice you can quickly and quietly approach the tunneling mole and kill it by smashing the ground down with a shovel or similar instrument just behind where the earth is being lifted up. Repeated application of this method can rapidly remove eastern moles from an area. This method rarely works for the star-nosed mole because it usually burrows too deeply.
- 2. Trapping** - Trapping is the *MOST* reliable method of mole control. The key to success is patience, practice and persistence. Eastern moles are easy to trap provided that the trap is placed on a tunnel that is actively being used every day and that problems with function of the trap are noted and resolved. Moles have an uncanny ability to detect and spring improperly set traps. So place carefully and keep trying until experience leads to success. Locate active tunnels of eastern moles by gently mashing a short section of every ridge that you can find with your foot and marking it in some way. Any ridge that has been pushed back up within 12 to 24 hours is over an active tunnel. Traps on these ridges should catch a mole every 24 to 48 hours until all using the tunnel beneath are caught. If a trap hasn't caught a mole in three days, it is in the wrong location, or it has caught all the moles in that particular tunnel and should be moved to a new location.

There are three types of traps, the harpoon type trap, the choker type trap, and the scissor type trap.

Of these three types, the choker type seems to be the easiest for most people to use successfully on the eastern mole. In heavy clay soils, the frame of the harpoon trap will sometimes rise up out of the ground rather than impale the moles. If this happens, use coat hangers and small pieces of wood or metal to stake the trap to the ground. With all types of traps, work the harpoons or jaws of the trap back and forth or up and down through the soil to insure smooth penetration of the soil. If any trap is sprung prematurely so that the mole is not caught, remove a small piece of sod from under the trigger pan so as to delay the action of the trap. If moles burrow around a trap, then either the soil has been flattened too tightly, or part of the trap is projecting into the tunnel and alarming the mole.

To trap star-nosed moles, locate active tunnels by scattering the soil of each mound until it is flat. Mounds that are pushed back up in 24-48 hours are over active tunnels. To set the trap, it is necessary to dig a hole beneath one of the mounds of earth. The hole should extend to the bottom of the mole's tunnel, usually 4 to 6 inches below the surface of the ground. Refill the hole with enough earth to cover the top of the mole's tunnel with approximately 2 inches of earth. Set the harpoon-type trap in the hole.

5. **Smoke Fumigation** - Smoke cartridges are widely available in most retail stores in Michigan. Smoke fumigation is difficult, but can eliminate moles if a sufficient number of smoke cartridges are introduced simultaneously into active tunnels. Locate the active tunnel as described above, and insert smoke cartridges in both directions into the tunnels about every 5-10 feet. The more frequently smoke cartridges are placed along an active tunnel, the more likely they will be effective. Light all smoke cartridges quickly. After lighting, wait 5-10 minutes to see if smoke escapes from any holes along the tunnel. Insert additional cartridges at such points and plug the holes with damp wadded newspapers.
4. **Poisonous Gases and Baits** - Attempting to kill moles with poisonous gases (fumigants) generally is ineffective. Fumigating mole tunnels using tablet or pellet-type fumigants have provided only inconsistent results. Unless very large dosages are applied, or applications can be made directly to nesting areas, fumigants are not capable of sufficiently penetrating throughout the mole's extensive runway system or their killing effects are lost through the top of the surface runways.

Some success has been reported with fumigants repelling moles out of areas. But keep in mind there is no residual effect of fumigants. Thus, within a day or two following a "fumigation," the moles are free to return to their tunnels because the gases are no longer present.

Like poisonous gases, poisoned baits provide ineffective or inconsistent results since moles feed primarily on insects and earthworms. If the moles have an ample food supply they might not be attracted to the bait. Poison baits currently registered for mole control include arsenic-treated peanuts, arsenic-treated pellets and zinc phosphide-treated pellets. One of the newer baits (Mole Patrol) seems to be more effective.

As with all baits, to properly use this product an active tunnel must be found as described above. A hole is poked in the top of the tunnel and the bait is poured inside. Care must be taken not to touch the bait since the mole can detect human scent. It is also important to cover the hole with a wad of paper or a soil plug, or the mole will sense light penetration and become wary. The other important aspect is that moist soils will degrade the bait. Reapply if these conditions exist. Care must be taken with all baits to protect non-target animals such as dogs, cats, birds, squirrels and chipmunks.

5. **Reduction of Food Supply** – The use of insecticides to reduce insect larvae is not a recommended procedure for mole control. Use insecticides to control destructive populations of certain insects such as grubs. Remember, most insecticides are toxic.
6. **Repellants** – Recently, several products have come on the market that have as their basis castor oil. When ingested, it causes intestinal distress in the mole and theoretically the mole refuses to enter treated areas for this reason. Commercially sold products also have a surfactant and a sticker added. Over-the-counter castor oil is purified and does not seem to be quite as effective a deterrent. To be effective, the area to be treated cannot be dry so it is important to water the area well before applying the product. After application, water the area for at least 20 minutes. Highly infested areas may require repeat application. These products are low in toxicity, biodegradable and safe for animals, birds and humans. Results range from very effective to marginal.

7. Other Control Methods in Special Situations

- A. Any device that imparts a vibration into the ground repels moles. The range of these devices is limited (10 feet apart for effectiveness) making them practical only in small areas such as a small garden or flower bed. The more vibration the device imparts into the ground, the more effective it will be.
- B. Treatment of bulbs with 20% thiram prior to planting will repel moles for several weeks after planting.
- C. Certain plants appear to deter moles from burrowing under them. Planted singly, they are of little use, but if planted in a strip around the area to be protected, they seem to reduce invasion by surface tunneling. These plants include marigolds, asters, chrysanthemum family, castor beans, fritillaria and the mole plant (*Euphorbia*).

8. Home Remedies

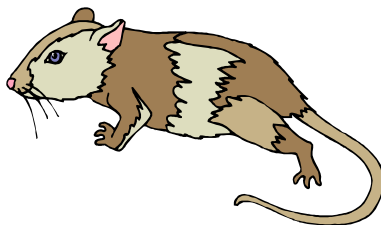
- A. Home remedies such as placing mothballs, motor oil, broken glass, razor blades, rose branches, bleach, lye and even human hair in tunnels, liming the soil and flooding are rarely effective although such actions may repel the mole for a short time. Flooding eastern mole tunnels in a dry soil using hundreds of gallons of water may drown the mole or may force it to the surface where it can be killed. Attempting to drown moles in a sand to loam soil is usually futile. Where star-nosed moles are involved, the flooding of their tunnels is beneficial to the moles, since they prefer moist soils.
- B. Cats rarely provide good mole control although occasionally a cat learns to catch them as they push excavated earth out onto the surface of the ground. Cats may learn to catch star-nosed moles because star-nosed moles will search for food on the surface of the soil. In most cases, the small gray animals that cats catch are shrews and since shrews are predatory on moles, such cats are actually contributing to the mole problem. Dogs can be taught to dig up moles without digging up the entire lawn, but it is difficult.

References

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