



Moles

Integrated Pest Management for Home Gardeners and Landscape Professionals

The mole, *Scapanus* species (Figure 1), is a small insect-eating mammal. Contrary to popular belief, moles are not part of the rodent family. In California, moles inhabit the Sierra Nevada, coastal range mountains and foothills, and the entire coastal zone. They aren't usually found in the dry southeastern regions of the state or in much of the Central Valley, except for moist areas where the soil is rich in humus, such as riverbanks.

IDENTIFICATION AND BIOLOGY

Moles have cylindrical bodies with slender, pointed snouts and short, bare, or sparsely haired tails. Their limbs are short and spadelike. Their eyes are poorly developed, and their ears aren't visible. The fur is short, dense, and velvety. Moles typically have one litter of three to four young per year. Because moles are territorial, you will find only one mole per tunnel, except during the breeding season, which typically occurs during later winter through early spring.

Moles live almost entirely underground in a vast network of interconnecting tunnels. They frequently create shallow tunnels just below the surface where they capture worms, insects, and other invertebrates. They may infrequently consume roots, bulbs, and other plant material, although rodent species (e.g., pocket gophers, meadow voles, and deer mice) are almost always the cause of such chewing damage. By far the greatest damage from moles occurs through their burrowing activity, which dislodges plants and dries out their roots. In lawns, the resulting mounds and ridges are unsightly and disfiguring (Figure 2).

Mounds and surface tunnels are obvious indicators of the presence of moles. The mounds are formed when moles push up soil to the surface from underground tunnels, and they are often more circular than gopher mounds (Figure 3). The excavated soil may be in small chunks, and mounds often appear in a line over the tunnel connecting them.

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Figure 1. Adult mole.



Figure 2. Moles create surface burrows when searching for insects.

Surface tunnels appear as ridges that the mole pushes up by forcing its way through the soil. Some of the surface tunnels are temporary. More permanent tunnels are deeper underground and are usually about 2 inches in diameter and 8 to 12 inches below the surface. Moles are active throughout the year, although surface activity slows or is absent during periods of extreme cold, heat, or drought. Greatest mole activity occurs usually after rainfall or watering events when digging new tunnels is easiest.

LEGAL STATUS

The California Fish and Game Code classifies moles as nongame mammals. If moles threaten growing crops or other property, the owner or tenant may control the moles using any legal means.

MANAGEMENT

Moles can cause significant problems in landscape or garden areas, especially in turf. Because mole damage can be unsightly, makes lawn maintenance difficult, and destroys valuable plants, the number of moles that can be tolerated is usually quite low, sometimes even zero. As soon as you see an active mound or surface tunnel, initiate appropriate control actions. Once you have controlled damage, establish a system to monitor for reinfestation.

Several methods of control are available. Often, no single method alone will solve the problem, so it may be necessary to use a combination of techniques.

Exclusion

Installing a vertical underground barrier may provide temporary relief. To protect existing plantings, bury hardware cloth or 1/4-inch wire mesh in a 6-inch-wide trench at least 2 feet deep with an additional 6-inch lip of mesh bent at a 90-degree angle away from the planting. This lip will help deter moles from digging under the fencing. A small length (about 6 inches) of fencing should protrude aboveground to eliminate aboveground dispersal into the exclusion area. Burying wire can be difficult and time consuming, so galvanized or stainless-steel wire is recommended to prolong the life of the fence.

Exclusionary fencing is not perfect, however, as persistent moles can eventually find a way to burrow around the fencing. Eventually, removal techniques may be required to eliminate moles that find their way into exclusion areas. Alternative exclusion approaches include wire-mesh baskets

that will prevent moles from heaving planted bulbs out of the ground and wire mesh bottoms in raised beds, which will totally exclude moles.

Trapping

Trapping is the most universally applicable and dependable method of mole control. Several different kinds of mole traps are available at hardware stores, nurseries, distributors, or directly from the manufacturer (see Figure 4 for common examples). Keep in mind that the best mole traps differ from those for pocket gophers; very few traps are effective for both species.

Understanding mole behavior helps improve the efficacy of trapping. To be effective, the trap must be set to catch the mole underground. When a mole's sensitive snout encounters a foreign object in the burrow, the mole is likely to plug off that portion and dig around or under the object. Therefore, traps should be set to straddle or encircle the tunnel or be suspended above it.

Moles are undeterred by soil blocks in the tunnel, which occur naturally from cave-ins, and will continue digging through them rather than around them. The upward pressure of the mole's body or the movement of soil against a triggering plate springs the trap.

Moles are active throughout the year and can be trapped at any time. Before setting mole traps, determine which tunnels are currently in use. Moles dig a system of deep tunnels that are permanently used as well as a network of surface runs used for feeding. Some of the surface tunnels are only temporary, so they may not make a good trap set. Moles are more likely to be trapped in the deeper tunnels, which they reuse almost permanently.

To determine where moles are active, tamp down short sections of surface tunnels and mounds. Observe these areas daily and retamp any raised sections, making note of the areas of activity. Selecting a frequently used tunnel is very important to the success



Figure 3. Top view of a mole mound; the margin tends to be circular, as compared to mounds of pocket gophers, which tend to be crescent shaped.



Figure 4. Common mole trap designs include scissor-jaw, harpoon, and pincer (from left to right).

of your control efforts. Set traps at least 18 inches from a mound and only in those tunnels where observations indicate moles use frequently. You can locate deeper tunnels by probing between or next to fresh mounds with a pointed stick, slender metal rod, or gopher probe. When the earth suddenly gives way, the probe has probably broken through the burrow.

Although a few mole traps may solve the problem, increasing the number of traps will increase the speed and overall success of the trapping program. In California, commonly used mole traps include scissor-jaw type, harpoon type, and pincer-style. Trap manufacturers often provide detailed instructions, which should be followed carefully.

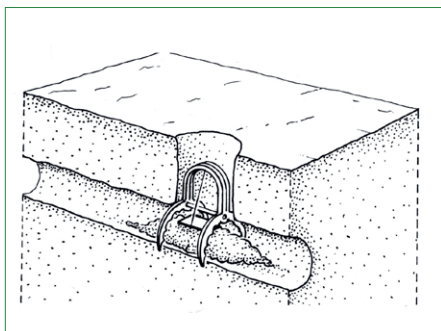


Figure 5. A scissor-jaw trap placed in a mole's main tunnel.

Scissor-jaw traps. Set the scissor-jaw trap in the mole's main underground tunnel, which is usually 8 to 12 inches below the surface (Figure 5). Using a garden trowel or small shovel, remove a section of soil slightly larger than the trap width, about 6 inches. Build a plug of soil in the center of the opened tunnel for the trigger pan to rest on. Moist soil from the opened tunnel or from a nearby fresh mound can be squeezed together to build the plug. With the safety catch in place, set the trap, and wedge it firmly into the opened burrow with the trigger placed snugly against the top of the soil plug. Next, scatter loose soil onto the set trap to about the level of the top of the tunnel. This excludes light from the opened burrow and probably makes the mole less suspicious of the plugged tunnel. Release the safety catch, and the trap is completely set.

Harpoon traps. The harpoon trap (Figure 6) will work in deeper tunnels if you set it on a soil plug as described for the scissor-jaw trap. It can also be set on the surface over an active tunnel ridge that has been pressed down under the trigger pan.

Pincer-style traps. Pincer-style traps (Figure 7) are set in a similar manner to those used for pocket gophers. However, pincer-style traps designed for moles are smaller given that moles are typically smaller than pocket gophers. Success with these traps is again generally greater if setting in permanent tunnels. Use a probe to find the tunnel as described



Figure 6. A harpoon trap installed in a mole tunnel.

previously. Then use a garden trowel or small shovel to dig down to the tunnel. Place traps deep into each tunnel so that none of the trap sticks out of the tunnel and stake them down with a wire flag. Cover the opening with loose soil, a sheet of canvas, a piece of plywood, etc., to exclude light and air from entering the tunnel system.

Regardless of the trap type, patience should be exercised with mole trapping, as it can take several days for a mole to visit a trap set. Trapping success can be sped up by placing additional traps in multiple sections of mole tunnel systems.

Chemical Control

Repellents

Many home remedies have been suggested to solve mole problems. These remedies include placing irritating materials such as broken glass, razor blades, thorny rose bush branches, bleach, mothballs, lye, and even human hair in the burrow to drive moles away. "Frightening" devices such as mole wheels, vibrating windmills, and whistling bottles are also commonly recommended in garden literature as repellent techniques. Some garden literature advises using the gopher and mole plant, *Euphorbia lathyris*, as a repellent. Various electrical devices that vibrate soil, produce sound, or do both are frequently advertised for mole control, but research doesn't support their effectiveness. None of these approaches has proved



Figure 7. Pincer-style trap.

successful in stopping mole damage or in driving moles from an area.

Commercially available mole repellents, usually castor oil solutions, are also available. Research on the effectiveness of these castor oil commercial repellents has shown some efficacy for eastern moles. No published research has been done on moles in the western United States, so their effectiveness on these species remains unclear. However, repellents work by moving animals from one location to another by deterring their presence in the area where the repellent is applied. As such, they may have limited utility in residential areas, as "repelled" moles will simply move to neighboring lawns and gardens and will continue to cause damage in these areas.

Toxic Baits

Because the mole's main diet consists of earthworms and insects, poisoning with traditional grain-based baits is rarely effective. However, worm-shaped gel baits containing bromethalin (e.g., Talpirid) have been developed that can be placed directly into the tunnel, thereby better mimicking the moles natural food source. Although rigorous testing is still needed to better estimate its effectiveness, limited studies have indicated gel-type baits are more efficacious than grain baits and appear to be a viable alternative for mole control. Be sure to follow label instructions when applying these baits.

Other Control Methods

Attempting to flood tunnels with water to drown moles or force them to the surface is not recommended. Flooding is typically ineffective and wastes water, as moles have extensive burrow systems that require much water to fill.

Natural predators will not solve the problem on their own. Cats and dogs may occasionally predate on moles, but their impact is generally of limited value for mole control.

Burrow fumigation is a technique often used to manage pocket gophers and ground squirrels, but it is not often used for moles given that they live in relatively shallow burrow systems.

Reducing populations of subterranean insect larvae, such as white grubs, may make turf or landscape areas less attractive to moles, but this strategy has not been confirmed by research. To learn more about management of white grubs and other soil-dwelling insects, review the UC IPM *Pest Notes: Lawn Insects* ipm.ucanr.edu/PMG/PESTNOTES/pn7476.html.



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WARNING ON THE USE OF PESTICIDES

Pesticides are poisonous. Some pesticides are more toxic than others and present higher risks to people, nontarget organisms, and the environment. A pesticide is any material (natural, organic, or synthetic) used to control, prevent, kill, suppress, or repel pests. "Pesticide" is a broad term that includes insecticides, herbicides (weed or plant killers), fungicides, rodenticides, miticides (mite control), molluscicides (for snails and slugs), and other materials like growth regulators or antimicrobial products such as bleach and sanitary wipes that kill bacteria.

Always read and carefully follow all precautions and directions provided on the container label. The label is the law and failure to follow label instructions is an illegal use of the pesticide. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, and animals. Never place pesticides in food or drink containers. Consult the pesticide label to determine active ingredients, correct locations for use, signal words, and personal protective equipment you should wear to protect yourself from exposure when applying the material.

Pesticides applied in your garden and landscape can move through water or with soil away from where they were applied, resulting in contamination of creeks, lakes, rivers, and the ocean. Confine pesticides to the property being treated and never allow them to get into drains or creeks. Avoid getting pesticide onto neighboring properties (called drift), especially onto gardens containing fruits or vegetables ready to be picked.

Do not place containers with pesticide in the trash or pour pesticides down the sink, toilet, or outside drains. Either use all the pesticide according to the label until the container is empty or take unwanted pesticides to your local Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Hazardous Waste Collection site nearest you. Follow label directions for disposal of empty containers. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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