Integrated Pest Management Program
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MANAGEMENT OF MOLES IN CONNECTICUT SCHOOL LANDSCAPES

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In the early spring, after snow melt and in advance of the upcoming spring sports season, grounds managers annually assess the overall health of their athletic fields and school properties. It is at this time of year when damage from mole activity is most prevalent. Usually, moles are not a major concern in the landscape and are often considered little more than a nuisance. However, these mammals can cause substantial damage in managed turf areas, and can be problematic, particularly in school property landscapes that must be managed as pesticide-free.

IDENTIFICATION

The eastern or common mole, *Scalopus aquaticus*, is a small mammal, slightly larger than a mouse, and not a member of the rodent family. Moles have short, pale gray fur and a long, pointed snout. The palms of their distinct, wide, clawed forefeet face outwards and are designed for digging. Their nose and feet are pink; their tail is short. Moles live in darkness, almost entirely underground. With vision unnecessary, their eyes are sealed shut and usually hidden under fur.

BEHAVIOR

Moles mate in February and March, and produce one spring litter of 3-4 young, usually in May. Adult moles prefer a solitary existence, and typically co-exist with more than one mole during the breeding season. Moles are insectivores; their primary diet consists of insects and invertebrates that feed at and within the soil surface, including grubs of problematic Scarab beetle pests such as Japanese, Oriental, and June beetles. They rarely consume roots, bulbs or other plants. Moles also are an important part of the food chain as they are a common diet staple of hawks, owls, and snakes. Digging activity by moles can enhance soil health, aerating the soil and allowing air and water to move deeply into soils. While moles are active year-round, activity near the soil surface slows during extreme heat, cold, or drought. Moles are most active in spring and fall particularly after a rain event, when the ground is soft and digging new tunnels is easiest. Trails of rounded mounds or small holes at the surface of the soil are indicators of mole activity in the landscape. Mounds are formed as moles move and push up soil during the formation of underground tunnels or runways. The network of tunnels and runways often can be quite extensive. Moles have been observed to tunnel aggressively within short durations of time and even excavate soil in small chunks.

Besides runway tunnels that are used for navigating to new locations in search of food, moles also dig deeper passages, at least 8 to 12 inches beneath the surface, primarily used in the cold winter months to raise their young. These passageways and burrows may be used by several generations of moles. Occasionally, other burrowing animals, such as shrews or voles, may also use mole tunnels.

Active Mole Holes

It may be difficult to determine how many moles are living within an active burrow system. Generally, one acre of land will support two to three moles at a time (Missouri IPM). Properties near large forested areas or weedy fields may be continually invaded by these mammals, because those healthy soils may support many moles.

DAMAGE

Mole damage in landscape bed or turf areas is the result of tunneling in search of worms, insects and other invertebrates. Burrowing can dislodge plants and dry out their roots. In turf areas, mounds and ridges created by moles are formed when the moles burrow at the interface between the turf and the soil. This burrowing makes the ground bumpy and uneven, particularly if many moles are active in one area. Since turf roots are dislodged and separated from the soil as they tunnel, moles can dry out or cause death of the turfgrasses above the tunnels. On parks and school properties, this uneven mounding can affect the safety of students or athletes where recreational activity occurs, even to the point of becoming severely uneven and dangerous. Children can easily lose footing, or trip or twist their ankles as they fall into the burrows.

Maintenance of school grounds and athletic fields that must be managed as pesticide-free, with severe mole damage, can be extremely problematic. Mowing of turf areas can be difficult and lends to scalping of turf. This is critical, as uniform mowing is an extremely important cultural practice to maintain safe playing fields. Mowing keeps turf density consistent and weed populations in check. Wheels of turf equipment can lodge in the burrows and either add to the uneven playing surface, or create pockets of open soil that are prone to grassy and broadleaf weed invasion. This presents an added complication to school properties that are already challenged to maintain weed-free playing surfaces. On dry, non-irrigated fields, tunnels that dry out get "kicked away" as divots by students playing on the fields, again creating open voids of soil that must be overseeded in an attempt to reduce weed populations. Away from recreational sports fields, moles can tunnel throughout surrounding turf and landscape planting beds, and can dislodge plantings around the school properties.

MANAGEMENT AND CONTROL

Mole Tunneling

When mole activity destroys landscape plants, make lawn maintenance difficult, or impact player safety, their presence in the municipal or school landscape may not be tolerable. For those school properties that are pesticide-free, and unable to control moles with chemical products that can eradicate these mammals, the challenge to reduce mole populations becomes more burdensome. Several methods of control are available, with no single method guaranteed to be successful on its own. A combination of techniques may be necessary, depending on the number of moles present. Control or eradication should begin as soon as active mounds or surface runways are evident, to keep damage to a minimum.

Once control is achieved, as part of the school's IPM plan, regular scouting to monitor for re-infestation is recommended. Products that contain ingredients that meet the approved CT DEEP's definition of allowable EPA minimum risk (25b) may be considered. However, there may be limited proof of product efficacy. Success with remedies that include placing irritating materials or vibrating devices in moles' burrows to antagonize or frighten them is questionable. Ultrasonic and electronic devices, which vibrate soil or produce sound, are also commercially available, but offer limited proof of success. Drowning moles by flooding the burrows also is ineffective and wastes water.

The argument to treat a turf area with a grub control to control mole populations also is questionable. While grubs are indeed a food source for moles, they are but one food source. Also, in large expanses of turf or lawn areas, moles move freely in and out of properties regardless of grub presence. On properties that have adopted pesticide-free protocol, maintaining a dense, healthy turf, with proper nutrition and consistent over-seeding is paramount. However, if safe

playing field surfaces are challenged by grubs, then allowed biological agents such as entomopathogenic nematodes (EPN's) or state approved biological products such as GrubGone may be considered. Where synthetic grub control is allowed, use of the least toxic product should be considered. In general, care must be taken to not use insecticides indiscriminately so that beneficial microflora is not harmed.

Barriers:
Vertical underground barriers can provide temporary relief in small landscape plantings, but in large, open areas they are impractical. They can be easily constructed from galvanized hardware cloth, aluminum sheathing or wire mesh. To protect existing plantings, the barrier should be planted deep enough (18-24 inches), with an additional 6" lip of mesh bent at a 90-degree angle away from the planting, to discourage moles from digging under it.


Mole Damage on School Soccer Field

Trapping:
Traps or other control devices often are not viable options on school grounds or athletic fields as the placement of the control devices may pose a hazard to students. Trapping is, however, the most reliable method of mole control, although it does require patience, practice and persistence. A mole can easily sense foreign objects in its burrow; therefore, traps must be situated around or above the tunnel, or the mole will plug off that portion of the tunnel and dig around or under the object. Trap manufacturers provide detailed instructions, which should be followed carefully. Trapping is easiest and most effective during spring and fall when mole activity is at its peak, although moles can be trapped any time of year.

It is essential to identity the main runways and the runways that are actively used. While some of the surface tunnels are temporary, deep runway tunnels can be more effective sites for trapping. Holes can be poked into runways to identify an active pathway, as moles will quickly repair holes in the main runways. Once active runways are identified, traps can be set. An increased number of traps will increase the overall success of the trapping effort. Traps must be handled with care and moved to new locations if moles are not caught after a few days. Failure to catch moles can occur if the runway tunnels are disturbed, if traps are improperly set or are detected by the moles, or if the mole is no longer using the runway.

Baits and Fumigants:
Commercial bait and fumigant products are available for municipal properties where pesticides can be included as part of an IPM plan. With any pesticide product, the target pest should be controlled without harm to other mammals that may directly consume or come in contact with the product.

Talpirid (active ingredient Bromethalin) is registered for mole control. Talpirid bait resembles the shape of a worm and is placed into runways and tunnels. Zinc phosphide, delivered as a coated grain product, is labeled for mole and rodent control, but has limited effectiveness for control of moles, as cereal grains are not a food source for moles. Talpirid is the preferred bait to eradicate moles, as there is less potential for accidental poisoning of other mammals that may ingest the poison bait. Grain bait treated with zinc phosphide is highly toxic to birds and other mammals and needs to be placed directly into the runway tunnels, not left on the soil surface where birds and other mammals may come in contact with or ingest the grains. Baits also should always be evaluated for their capacity to harm animals that may happen upon and eat the poisoned moles. Talpirid offers less opportunity for such secondary poisoning.

Fumigants offer minimal success in control of moles. The vapors from the fumigants become ineffective in a long, extensive tunnel system. Because of the tunnels, moles might be a long distance away from where a fumigant is released.

REPAIRING MOLE DAMAGE

In The Landscape:
Tamp down tunnels that displaced plants in the landscape to ensure plant roots are again in contact with soil. Irrigate those plants to encourage rooting. If plants continue to be dislodged in prominent locations, the use of barriers around key specimen plants may be warranted.

In Turf Areas:
In the spring, if there is evidence of mole activity, the uneven areas of the lawn or athletic fields need to be rolled or tamped down to ensure that the turf roots are entrenched in the soil. Turf that is able to "re-knit" and establish healthy roots will be able to recover. If irrigation can be applied to these areas, it will encourage and enhance recovery. If damaged turf has died, the divot needs to be repaired and overseeded. Once re-seeded, fertilize and irrigate affected areas to encourage turf growth and recovery.


Mole Tunneling on Athletic Field

DETERRING MOLE ACTIVITY IN TURF AND LANDSCAPE

In general, turf areas that are regularly irrigated and have a high amount of organic matter tend to be more attractive to moles, as soils that have ample soil moisture have more microflora, insect and earthworm populations. Since moles feed on these invertebrates, they naturally seek out feeding locations that provide them with an adequate food source. If the turf does not require irrigation to help repair from intense traffic and wear, it is advisable to reevaluate irrigation schedules, and water turf areas when needed, rather than using regular, scheduled irrigation events.

If soil tests indicate that the organic matter content of the soil is adequate, it also may be prudent to limit applications of compost topdressing or refrain from using compost in landscape beds where there has been a history of mole activity. Use of compost on school grounds must always comply with regulations described in the CT Phosphorus law.

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