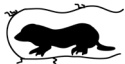




Mole Drains

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1. What are mole drains?

Mole drains are unlined tunnels (mole channels) in the clay subsoil formed by a mole plow (Figure 1). A mole plow is composed of a shank (leg) attached to a cylindrical torpedo foot followed by a cylindrical expander (Figure 2). The expander strengthens the channel by compacting the wall. The process of pulling the mole plow results in soil cracks. The effectiveness of mole drains depends on the number of soil cracks that facilitate water movement toward the mole channel.

A mole plow is similar to a subsoiler plow in that both loosen the soil and break up the plowpan and compacted surface layer, but unlike a subsoiler, a mole plow creates an intact channel for water flow.

This bulletin covers the reasons for installing, specifications, site suitability, installation timing, combining with subsurface drainage, life expectancy, and the benefits of mole drains.

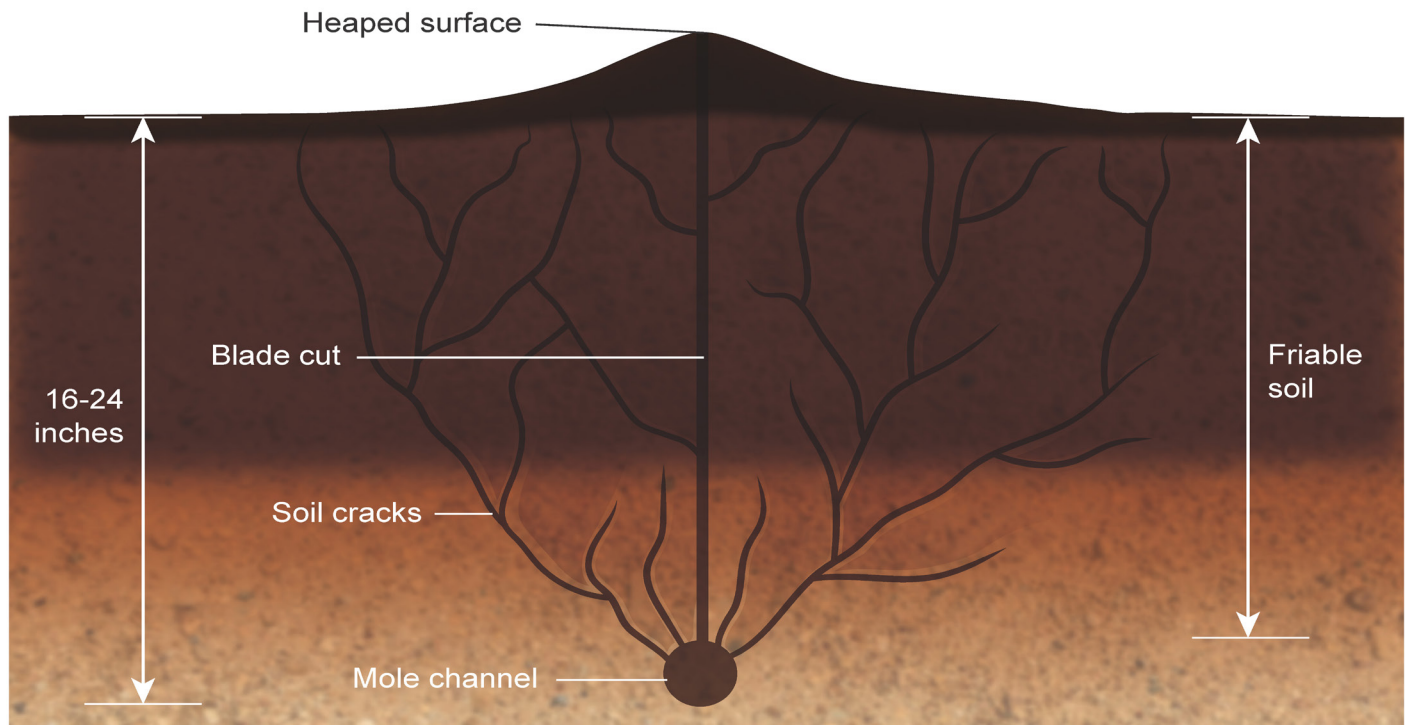


Figure 1- The process of pulling the mole plow results in soil cracks. Soil cracks facilitate water movement toward the mole channel.



3. Specification of mole drains

The expander diameter is 3 to 4 inches, with the larger size generally used at deeper depths (Eggelsmann, 1978; Schwab, 1947). Mole drains are typically installed with 3-ft to 6-ft spacing (Figure 5). Since some of the channels will fail following installation, the final spacing will be wider. For example, installing at 6-ft spacing may result in a 12-ft final spacing, assuming some mole channels will fail. As a result, plan on installing narrower spacings to achieve your final wider spacing.

The depth of the mole channel is usually between 16 to 24 inches. If tractor capacity or surface traction limits mole depth in heavy clay soil, start with a shallow mole depth, no shallower than 16 inches. As the soil structure improves over the years with better infiltration and root development, increase mole depth to around 24 inches in the following installation (Vlotman et al., 2020). Generally, mole depth should be as deep as possible for the channel to be placed in the plastic subsoil. If moling is combined with subsurface (tile) drainage, care should be taken to avoid cutting the plastic drain pipes (Section 6). Deep moles last longer than shallow ones because they

are less prone to damage by traffic, roots, animals, and shrinking and swelling of the soil.

Mole drains can be pulled in either direction, uphill or downhill (Hopkins 1947). The grade of the mole drains follows the slope of the land. A steeper land will have a steeper mole grade.

Mole length depends on soil type and land grade. Relatively flat fields require shorter mole lengths than steeper slopes. Generally, the maximum length of a mole drain should be about 300 ft for relatively flat fields and about 600 ft for sloping fields to ensure it lasts longer (Schwab, 1947). In some cases, longer mole lengths have been successful for several years (Hopkins, 2002). However, shorter mole lengths last longer.

If the mole channel flows into a ditch, make sure the mole outlet is far enough away from the bottom of the ditch to provide a continuous free flow (Hopkins, 2002). The mole outlet can be protected by inserting a 3- to 6-ft long piece of rigid pipe into the outlet to stabilize the channel and allow rat-guard installation (Vlotman et al., 2020) (Figure 6). The outlet must be regularly maintained, so the mole drains work as intended.



Figure 5- A mole drain with 4-ft spacing. Note that the 4-ft spacing may result in the desired spacing of 8 ft or wider assuming some of the mole channels will fail (Photo credit: Patrick Tuohy)

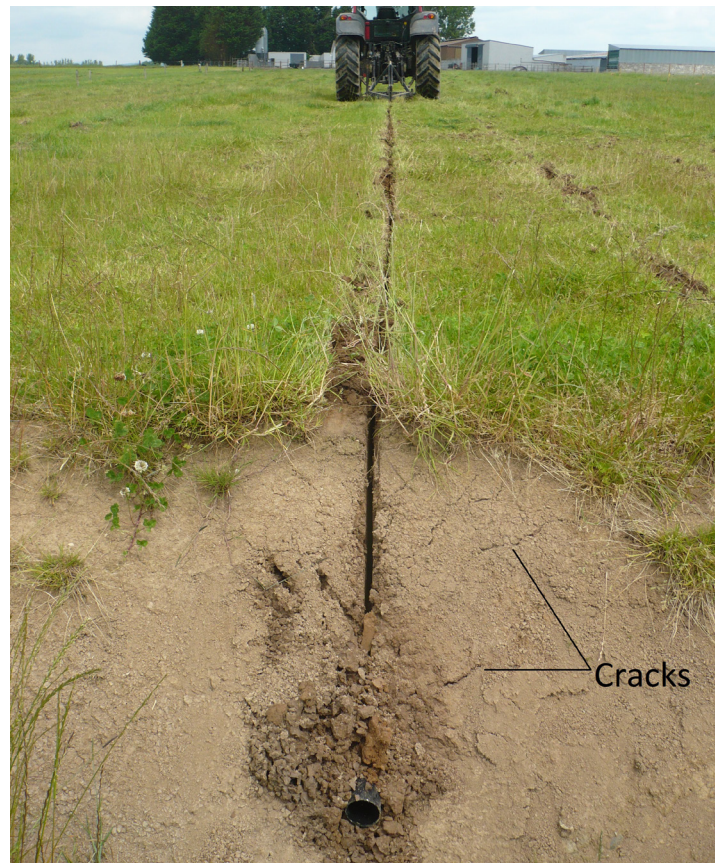


Figure 6- A rigid pipe at the outlet of a mole channel. Notice the soil cracks visible above the outlet (photo credit: Patrick Tuohy).

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