

Subsurface Drainage

Subsurface drainage or tile drainage removes excess water within the soil. Tile drains are usually 10 cm (4 in.) diameter flexible plastic pipe. The pipe has many small slits which allow water entry. Installed in the field, the pipe is on a small grade which allows water to flow off of the field. To work properly, the pipe must be installed across the slope of the field to intercept the water flowing through the soil. In this manner, tile drainage works like an eaves trough on the roof of a house.

Tile drainage is usually installed at a depth of 1 m (3.3 ft.) so that it will not be crushed during field operations. Most tile drainage in the province is installed in the dense subsoil. The dense subsoil above the tile is fractured during installation and will always remain porous to allow water to flow down to the drain.

Most tile drains are installed 12 m (40 ft.) apart. Water in the soil between the drains flows down to and along the subsoil to the fractured area above the tile drain (*Figure 1*). The more slope on the field the better the flow between drains.

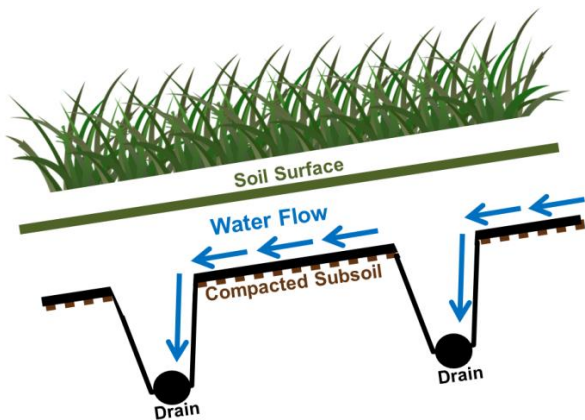


Figure 1. Water flow to drains located in the compacted subsoil on a sloped field.

Outlets

Tile drainage systems usually require a ditch to outlet the water flowing in the pipe. Markers should be installed beside all outlets to enable checking the outlets annually to ensure soil

erosion and any accumulated sediment does not cover the tile outlets. Tile outlets usually run for two days after a significant rainfall in the spring and fall.

In Nova Scotia, more than 70% of agricultural soils have compacted subsoil within 80 cm (30 in.) of the soil surface. This constricting layer limits the soil's internal drainage.

How do you know if you have a drainage problem?

- Water ponding on the soil surface
- Weeds such as water grass or black bulrush
- Soil erosion
- Silt deposits
- Soil color – white colored soil is usually water logged
- Shallow rooting of plants

Types of Subsurface Drainage Systems

The topography, slope, and drainage condition of the field determine the type of system that should be installed.

1. **Random** – A random system (*Figure 2a*) is used to drain isolated wet spots caused by springs or ponding. This approach works well for wet spots but does not necessarily benefit the rest of the field and is often only a temporary solution before systematic drainage will need to be installed.

2. **Systematic** - A systematic system plans drainage lines to control excess subsurface water all over the field. A herringbone system (*Figure 2b*) is used to drain fields in which a narrow depression is near the center of the field. The main line is installed in the depression with angled laterals connecting on both sides. The gridiron system (*Figure 2c*) is used to drain fields with uniform slopes in one direction. The main collector line is installed along one side of the field and lateral lines are connected perpendicular to it.

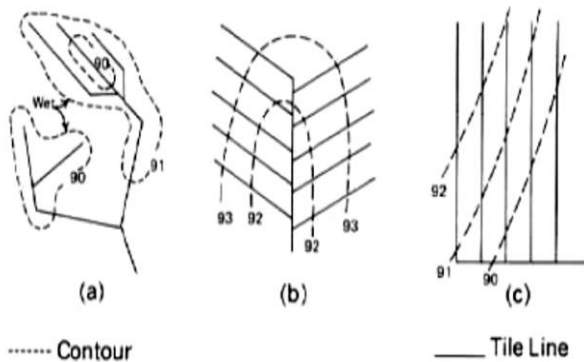


Figure 2. Subsurface Drainage Systems (a) random, (b) systematic herringbone, and (c) systematic gridiron.

Other Drainage Issues

Maintenance

Tile drains can get plugged by tree roots or deep rooted crops (like alfalfa). When the roots break off, they can jam in one section of the pipe and cause a blockage. This problem can be identified by water bubbling out of the soil in this area of the field. Some of these plugs can be removed with a plumbers snake but it may be necessary to dig up the tile line. Tile drainage plans can help with maintenance as they will identify where outlets and tile lines are located.

Tile drainage plans from 1940 to 1995 are available at the Environmental Farm Plan office (902-893-2293). Check the website to see if your plans are listed:

<https://www.nsfa-fane.ca/efp/old-tile-drainage-maps/>

Filters

Filters for subsurface drains are permeable materials (factory pre-wrapped synthetic envelope) placed around the drains to prevent fine grained materials in the surrounding soil from being carried into the drain by groundwater. A filtered pipe should be used in uniform soils where most of the particle size is from 0.01- 0.25 mm (fine sands-silty soils). Only a couple soil types in Nova Scotia require filter material.

Surface inlets

Surface inlets (*Figure 3*) may be used to collect and drain excess surface water when other surface drainage methods are not practical. A surface inlet is a structure used to divert surface water into a tile line. Trash racks or screened inlets should be used to prevent debris from entering the inlet structure.



Figure 3. Surface water inlets.

For more information contact the EFP Team or visit the factsheet section of our website at <https://www.nsfa-fane.ca/efp/resources/factsheets/> to access:

Land Forming on Dykelands

Farm Drainage in the Atlantic Provinces



(902) 893-2293

www.nsfa-fane.ca/efp/