TILE DRAINAGE PRINCIPLES

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ABSTRACT

In order to be agriculturally productive tile drain systems are often installed in areas with low permeability soils or high water tables, to lower the water table depth. Some benefits of tile drainage include providing an aerobic root zone for crop growth, improved field trafficability and creating conditions where soils can warm more quickly in the spring. Tile systems also pose environmental risks such as the increased potential for loss of soluble nutrients (nitrate and phosphorus) along with pesticides and pathogens. In addition, soil macro-pores such as shrinkage cracks and earth worm holes can deliver low solids content injected manure directly into tile lines. Keeping injected manure solids content greater than 5%, tilling prior to injection to break up macro-pores or avoiding tiled areas can reduce the risk of manure loss through tiles. Tile systems are gravity-flow systems and in order to function properly must have a free-flowing outlet. In cases where field elevation and grades don't allow for a gravity flow, a pump lift station will be required, which will increase installation and maintenance cost. A relationship exists between depth and spacing of tile laterals. For uniform permeability soils deeper drains can have wider spacing (within reason). Tile system design performance is specified by the drainage coefficient (Dc), which is equal to the depth in inches of water removed from a field in 24 hours. Typical Dc values range from 0.5 to 1.0 inch per day. A higher Dc equals a higher system flow rate, larger pipes and higher cost. Field- and crop-specific conditions will dictate the appropriate design Dc to use.

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