Controlled Drainage = Water Level Control

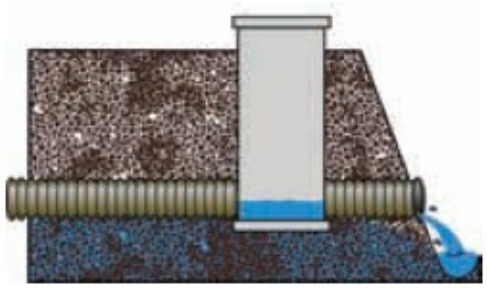

Figure 1. Baffles are removed to lower the water table a few weeks before planting and harvest to allow the field to drain.

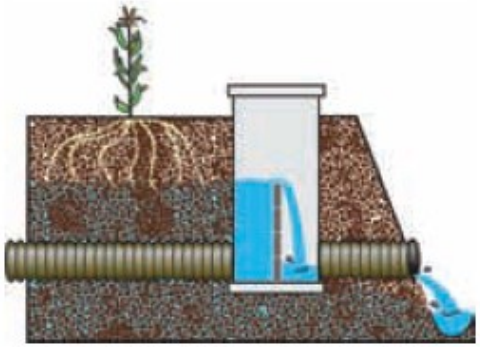

Figure 2. Baffles are added to hold back water after planting to potentially store water for crops.

Potential Problems with Tile Drainage

While we don't have all of the answers to these problems, you may encounter issues with:

- Soils with high sodicity may result in impaired drainage.
- Roots from trees growing within 100' of the tile may plug tile perforations.
- Roots from some crops may plug tile perforations.
- Sand and sediment intrusion in the tile.

Societal Requirements

- County Natural Resources Conservation Service (NRCS) office for wetland maps, soils information, and a certified wetland determination.
- Local water resource board for a permit if you are tiling 80 acres or more.
  Note: If your project is of "statewide" significance, you will need approval from the ND State Water Commission.
- Visit with neighboring landowners.
- North Dakota Regulatory Office of the Corps of Engineers to determine if you need a Section 404 or Section 10 permit. Call (701) 255-0015.
- Wetland management district of the U.S. Fish and Wildlife Service to determine if you have a wetland easement.

For more information, contact:

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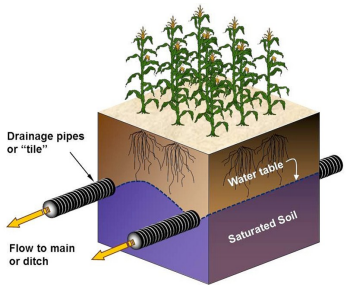
NDSU EXTENSION SERVICE

Subsurface Tile Drainage

What is Subsurface Drainage?

Subsurface drainage is buried perforated pipelines intercepting water below the ground surface and directing it to an outlet.

Subsurface drainage often is referred to as "tile" drainage because until the 1970s, clay or concrete tiles were used to construct the subsurface pipeline.



Drainage Design

- Develop a topographical map of the field:
  - 6-inch to 1-foot contours are best for level fields.
  - 1- to 2-foot contours acceptable for fields with more slope.
- Examine USDA NRCS county soil survey maps; take soil samples in areas indicative of major soil series at the depth of the tile (3 to 4 feet). If sand is present, have a soil sieve analysis done to determine the tile slot size or sock requirement.
- Select the location for one or more outlets.
- Design the field layout (this is the most difficult part!).
- Lay out the design in the field with colored flags or GPS instruments.
- Install in this order: outlet (gravity or pump station), then mains, submains, and finally laterals.
- Include a setback distance and/or inclusion of solid tile to protect wetlands.

Tile Installation is High-tech

Modern tile plows use global positioning systems (GPS) for guidance. They also use GPS or lasers for plow depth control.

Commercial Tile Plow

Farmer owned plow

Drainage Benefits

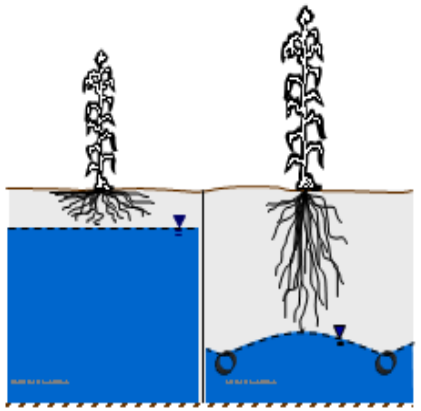
- Proper soil drainage improves agricultural production by
  - Allowing for more timely planting, harvesting and tillage operations.
  - Minimizing crop stress from excess water and high water tables.
  - Promoting conditions for good seedbed establishment and germination.
- Typical Midwestern yield increases from subsurface drainage improvements are about 10 percent.
- Well-drained soils have less year-to-year yield variability.
- Proper drainage minimizes soil compaction and buildup of soluble salts.
- Proper drainage enhances the ability to incorporate other conservation practices, such as conservation tillage.

Hydrologic Impacts

- Subsurface drainage promotes greater infiltration, which generally reduces surface runoff and peak flows, when compared with surface drainage.
- Subsurface drainage typically increases the base flow (low flows) and may slightly increase total water yield (surface runoff plus drain flow).

Water Quality Impacts

- The water quality impacts of drainage are related to the soil mineral content, ground water quality, and fertilizer practices.
- Subsurface drainage reduces phosphorus associated with surface runoff but often increases losses of salts and nitrate-nitrogen.
- Nitrate is a human health concern in drinking water.
- Phosphorus and nitrogen are nutrient enrichments of surface water bodies that can lead to algal blooms and fish kills from hypoxic (low oxygen) or "dead" zones.
- High levels of trace metals may cause impairments to aquatic species.



Subsurface drainage controls the water table in the field.