United States Department of Agriculture

NRCS Natural Resources Conservation Service

Fact Sheet:
Drainage Water Management (554)

IMPACTS OF DRAINAGE WATER MANAGEMENT

Drainage water management, compared to unmanaged drainage, reduces the amount of water passing through the tile which proportionately decreases the amount of nutrients that flow to drainage ditches and streams.

Raising the water table may also increase the amount of surface runoff, leading to increased soil erosion and transport of sediment-adsorbed and soluble phosphorous. The soil erosion and resulting sediment transport can be controlled with residue management, buffers, grassed waterways, and other conservation practices.

Partially raising the water table after crops are established can conserve soil moisture and may enable a crop to be more productive in years where there is an extended dry period during the growing season.

DRAINAGE WATER MANAGEMENT PLAN

A Drainage Water Management Plan is an important part of the conservation management system for a drained crop field. The Plan documents the producer's drainage water management decisions for the crop field based on his or her resource objectives. It includes:

- maps identifying the locations of the drainage water outlet control structures and impacted area of each structure,
- sizes and elevations for each planned outlet control structure,
- a schedule with target timing (e.g. planting, harvest, manure application) and water levels for each outlet control structure,
- recordkeeping guidance, and
- maintenance, inspection, and repair requirements to ensure continued performance as planned.

WINTER / FALLOW SEASON CONTROL

As soon as harvest is complete, raise the water levels at the outlet control structure so it is close to the ground surface. Depending on the resource objectives for the fallow season and the slope of the ground that the outlet structure is controlling, the recommended elevation should be around 6 inches from the surface.

Soils rarely freeze at the depth of the tile, and are less likely to do so when the water table is raised. Freezing of the outlet control structure itself could be an issue and lowering of water levels cannot occur until the structure thaws. However, there have been no reports of outlet control structures being frozen in the spring at the recommended time for lowering the water table.

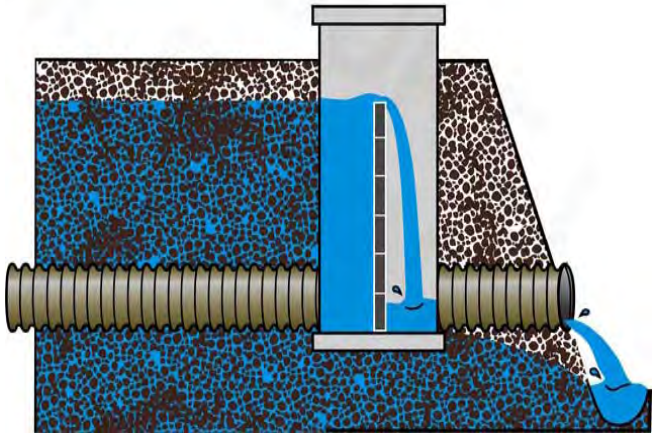

Figure 1: The outlet is raised after harvest to reduce nutrient delivery.

SPRING PLANTING

The water table should be lowered in the spring early enough for the field to be accessible for seedbed preparation, planting, and other field operations.

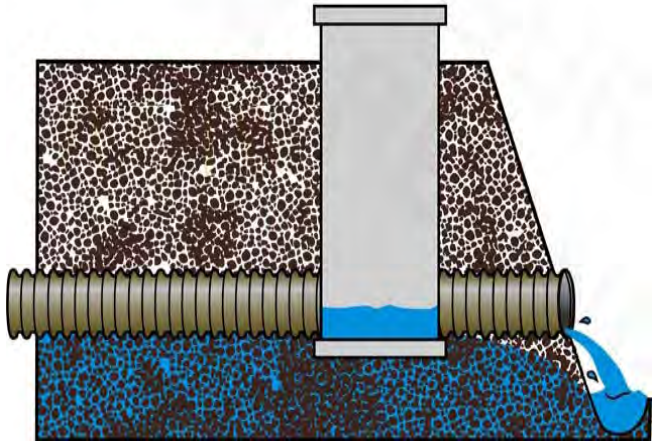

Figure 2: The outlet is lowered a few weeks before planting and harvest to allow the field to drain.

MANAGING WATER LEVELS FOR CROPS

After planting, the water level at the outlet control structure can be raised to conserve soil moisture for use by the crop during extended dry periods. If growing season management is anticipated, an outlet depth of two or more feet below the field surface is suggested. The goal is to provide enough drainage for good aeration and root development while also capturing some of the water that would otherwise drain out under conventional, continuously open drainage systems.

Once the crop is established, evapotranspiration will often be sufficient to remove excess water from the root zone. It may be necessary to lower the water level at the outlet control structure during extended wet periods. Careful attention to drainage water management for water conservation may increase yields, particularly in dry years.

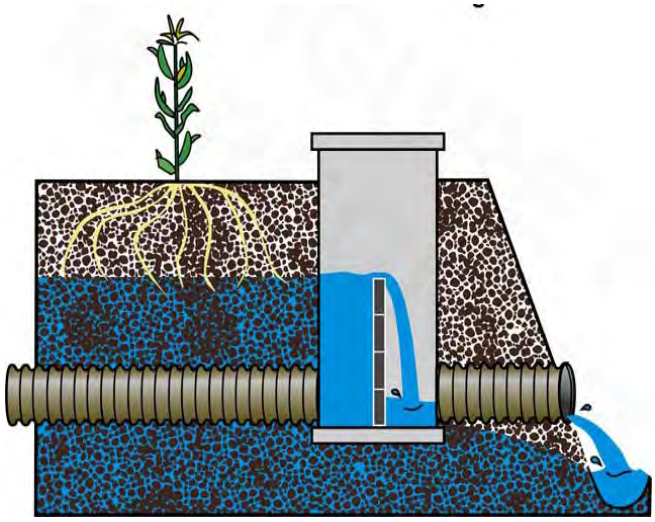

Figure 3: The outlet is raised after planting to potentially store water for crops.

MANURE APPLICATION

Manure cannot be applied when the water level is near the soil surface because of trafficability and soil compaction problems. However, raising the water level at the outlet control structure on dry soils can reduce the risk of liquid manure leaking directly into drainage tile through macropores caused by roots, earthworms, and cracks or through accidental over-applications.

In most years, there is a comfortable time window in the fall for manure application between when the outlets are raised and sufficient rainfall occurs to raise the water table. Because of an increased potential for surface runoff after the water table has been raised for drainage water management, manure should be injected or incorporated into the soil.

Manure application in the spring may not be compatible with drainage water management as it may require lowering the water table earlier in the spring, therefore negating some of the nutrient reduction benefit of drainage water management.

OPERATION AND MAINTENANCE

The level of management required depends on whether the structures will be used to raise the water level at the outlet control structure during the fallow season, the growing season, or both. During the fallow season, the only management required is to raise the water level at the outlet control structure after harvest and field operations in the fall and lower it approximately two weeks before the planned start of field operations in the spring. During the growing season, management may involve temporarily lowering the outlet level to increase the drainage intensity during periods of heavy rain, or sustained wet periods.

The operation of the outlet control structures will follow that described in the drainage water management plan for the crop field. The owner/operator will also perform maintenance of the system to include, but not limited to, the following:

1. Routine monitoring of water levels at outlet control structures to ensure no leaking, clogging, or breakage has occurred.
2. Monitoring of runoff and erosion during winter and adjustment of water levels to reduce surface ponding and runoff where erosion occurs.
3. Monitoring of water levels at the outlet control structures before and after rainfall events during the growing season (if managing water levels during the growing season) and adjusting levels to prevent crop damage.
4. Prompt repair of any damage to structures.

References:

WQ44 - Questions and Answers about Drainage Water Management for the Midwest, Purdue Extension. December 2007

Indiana Job Sheet (554): Drainage Water Management, NRCS-Indiana. October 2008