Assessment of Commercially Marketed Filter Materials for Tile Drainage Outlets on Golf Courses

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Objectives:

1. The overall objective of this research project is to assess the feasibility and effectiveness of commercially marketed filters designed to strip nutrients (NO_3-N, total nitrogen, PO_4-P, and total phosphorus) and pesticides (potentially chlorothalonil, metalaxyl, trinexapac-ethyl, azoxystrobin, and imidacloprid) from drainage waters exiting a golf course green.

Start Date: 2005
Project Duration: two years
Total Funding: $26,200

Tile drainage and other subsurface drainage features are considered essential by turfgrass managers to maintain water tables at depths necessary for healthy plant growth. Maintaining sufficient water and air in soil void space stimulates essential microbial activity, avoids rutting and soil compaction by maintenance equipment, and allows site use soon after heavy rains.

Subsurface drainage reduces surface runoff by increasing the subsurface movement of excess water and facilitating infiltration. Nutrient and pesticide transport through subsurface drainage systems may become a component of surface runoff if the drainage water discharges directly into surface water or onto the surface offsite or downslope. Subsurface drains conveying water directly into a stream or pond will bypass natural and managed filtering processes including upland and riparian buffer zones.

The project has three distinct components. The first is a laboratory study of each material. Sorption isotherms will be generated for each material and pesticide. The second component is a controlled laboratory experiment designed to evaluate the filter's effectiveness while operating at or near the design flow rate. The third component is a before-and-after field assessment of the filters. In addition to the primary objectives, the field study will provide unique hydrology data from a managed green.

Samples are collected on a 1000-gallon flow interval. Hydrology (discharge and rainfall) is collected on a 10-minute interval.

The field site is located at Ridgewood Country Club in Waco, TX. The site is a chipping green constructed in a split design. Each half of the green is 4,000 ft^2 and has a distinct drainage network and unique construction. The green was originally designed to test alternative materials for the intermediate gravel layer of green construction. The green was constructed by first establishing the desired subgrade and excavating for the drainage network. Second, an impermeable plastic layer was added followed by the subsurface tile lines. Next was the addition of the material designed to replace the gravel layer followed by a geotextile fabric and twelve inches of sand. The green was sodded with creeping bentgrass (*Agrostis stolonifera* L.).

In late 2005, the field site was instrumented with the two distinct commercial filters (one on each half of the green) and Isco automated water samplers. The samplers were positioned to collect simultaneous samples at the inflow and outflow of the filter, thus providing before-and-after assessments. Samples are collected on a 1000-gallon flow interval. Hydrology (discharge and rainfall) is collected on a 10-minute interval. Water quality data was collected for a two-month period and shared with the industry representatives. After reviewing the data, each of the filter industries expressed a desire to alter their designs. We are currently awaiting the delivery of one of those filters before continuing the assessment.

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One of the bonuses of this project is the ability to gain some insight on the subsurface hydrology of greens. We have continued to measure the hydrology of the greens while waiting delivery of the filters. Since installation, thirteen measurable precipitation events have occurred. The precipitation amounts range from 0.4 inches to 1.6 inches. The current data indicates a well defined relationship with precipitation and peak flow for each half of the green. Data also suggests that approximately ½ inch of water is required to initiate flushing a green.

Summary Points

- Field and laboratory instrumentation is in place to assess the different filter materials.
- Preliminary data has been shared with the filter industry and adjustments are forthcoming
- Hydrology data has been collected for approximately one year.
- Preliminary hydrology findings suggest that the amount of water required to initiate flushing a green is approximately ½ inch.