Surface and Subsurface Water Quality Data Collection and Model Development for a Watershed Scale Turfgrass System

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Objectives:

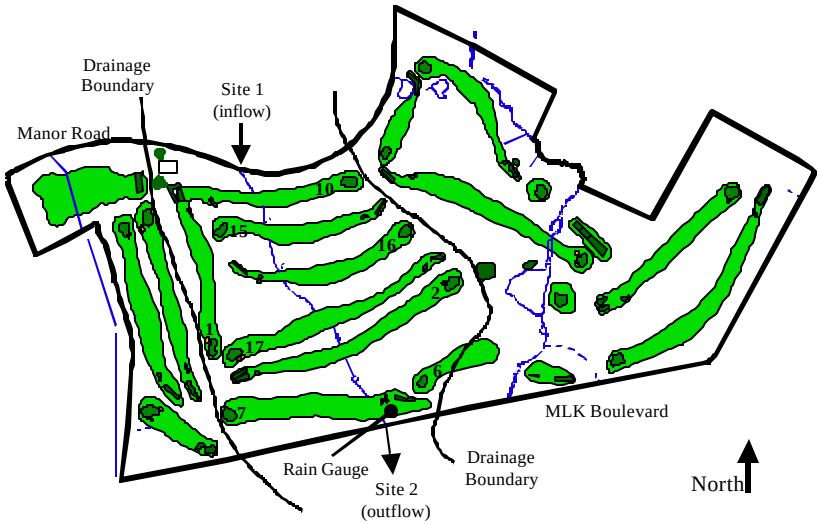
1. Collect, evaluate, and quantify surface and lateral water quality (i.e., nitrate N, ammonium N, phosphorus) from a golf course using a watershed approach.
2. Evaluate the water quality impact of transitioning from potable to reclaimed water for golf course irrigation.
3. Develop a computer model designed specifically for turfgrass systems based on an existing watershed scale water quality model.

Start Date: 2000
Project Duration: 3 years
Total Funding: $74,800

A watershed-scale water quality monitoring and analysis program was initiated in the spring of 1998 to quantify the amount and quality of water exiting a golf course in central Texas. A section of Morris Williams Municipal Golf Course in Austin, TX, managed by the City of Austin Parks and Recreation Department (PARD), was selected as the study site for the project. The selected section of the course is ideal for studying surface water as the section has only one inlet and one outlet for runoff thus the boundary conditions are easily monitored.

The topography is such that the contributing area (71.7 acres) contains 10 greens (1.8 acres), 7 fairways (20.3 acres) and 7 tees (0.7 acres). The managed areas (greens, fairways, and tees) represent 32% of the total area and are managed at a moderate level, typical of most municipal courses in the U.S. The contributing area also contains approximately 16.1 acres of reduced-management rough, with the remainder comprised of unmanaged trees and shrubs.

Researchers with the USDA-ARS are conducting on-site monitoring of water quality from a creek running through a municipal golf course in Austin, Texas.



Layout of study area at Morris Williams Golf Course in Austin, TX.

Baseflow water samples are collected on a near weekly basis while storm flow samples are collected during high flow. Lateral flow samples from a green/fairway drain and a fairway drain are collected on a daily basis while weekly samples are collected from a spring that flows into the stream. Based on the collected data, the system contributed statistically significant increases in median nitrate plus nitrite concentrations (+0.15 mg L^{-1}) and phosphate concentrations (+0.02 mg L^{-1}), and decreases in ammonium concentrations (-0.01 mg L^{-1}) from stormwater.

The golf course contributes a significant increase in median concentration of nitrate (+0.61 mg L^{-1}), reduced ammonium concentrations (-0.07 mg L^{-1}), and no significant effect on phosphate concentrations to base flow. Lateral flow from the green/fairway drain indicates average concentration of nitrate plus nitrite at 1.53 mg L^{-1}, ammonium at 0.06 mg L^{-1}, and phosphate at 0.13 mg L^{-1},while analysis from the fairway drain indicate average concentrations of nitrate plus nitrite at 0.53 mg L^{-1}, ammonium at 0.04 mg L^{-1}, and phosphate at 0.09 mg L^{-1}. Data from the spring indicates average concentrations of nitrate plus nitrite at 2.42 mg L^{-1}, ammonium at 0.02 mg L^{-1}, and phosphate at 0.10 mg L^{-1} entering the surface stream.

Use of reclaimed water is scheduled to begin in March/April, 2002. Both storm flow and base flow sampling strategies will continue.

Summary Points

- Significant contributions of nitrite plus nitrate have been measured in storm flow, base flow, lateral flow, and return flow.
- Concentrations of ammonium nitrogen are reduced through the course while phosphorus is generally not affected.
- Advances in simulation technology are continuing as well as the validation of the model based on the first three years of collected data.
- Evaluation of transition to using reclaimed water for irrigation should begin within the next year.