

Modeling Nitrogen and Phosphorus Runoff and Leaching from Golf Courses Using PRZM3/EXAMS2

Larry M. Shuman
University of Georgia

Objectives:

1. To quantify the amounts of N and P that runoff fairways and leach from greens under various management practices with the specific intent to use the data to calibrate predictive models.
2. To determine the amounts of N and P that runoff golf course fairways at an actual course site with the data being used to validate models calibrated in objective 1.
3. To determine amounts of N and P loss as measured in a stream and ponds within and adjacent to golf course fairways and to determine the remediating effects of ponds on the quality of these surface waters.

Start Date: 2001

Project Duration: 2 years

Total Funding: \$60,000

This is the second year of a three-year project to gather water quality data from a golf course to be used with previous small-plot and greenhouse data to calibrate and validate leaching and runoff models. A secondary objective is to modify existing models or design new predictive models to take into account the unique properties, characteristics, and processes that occur in turfgrass as opposed to the agricultural cropping scenarios for which most are currently designed. Results from a previous USGA-funded project indicated that under certain management and environmental conditions, both phosphorus and nitrate-N have the potential to enter surface waters from applications of fertilizers to fairways and greens.

An ISCO sampler was installed to collect runoff from fairway number 8 at the Golf Club of Georgia, which is in a suburb of Atlanta. Sampling was initiated for storm events and analyses carried out for phosphate, nitrate-nitrogen and ammonium-

nitrogen. Five storm events were sampled between April and August, 2002 and sampling is continuing. For each event, up to 24 samples are taken for up to 15 minutes.

Samples from Camp Creek are being taken upstream of the Golf Club of Georgia course and after it has passed through a significant part of the course. This monitoring has been ongoing from March, 2001 to date. Samples are taken monthly and analyzed for nitrate-N, ammonium-N and phosphorus as for the runoff samples along with turbidity.

Phosphorus average concentrations in the 2002 runoff water taken at fairway number 8 at the Golf Club of Georgia were all between 1 and 2 mg/L with the exception of the first one on April 15, where the samples averaged 8.2 mg/L P. It is fairly certain that this phosphorus came from a application of ammonium phosphate. The ammonium-N concentration for that date averaged 93 mg/L, which is very high in comparison to the other dates. For the second date on June 10th the ammonium-N concentration average was 7 mg/L, and the average concentrations for the other dates were near 1 mg/L. Thus, both the ammo-

nium and phosphate were high for the April 15 sampling.

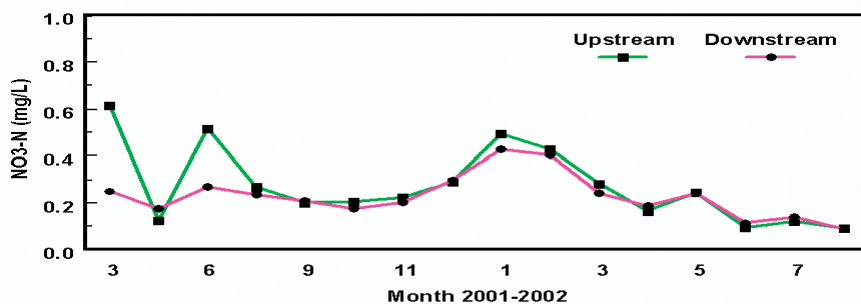
The concentrations of phosphorus, nitrate-N, and ammonium-N in the Camp Creek samples have essentially shown no important differences between the upstream and downstream sites during the two years of monitoring. Initially the upstream values were somewhat higher than downstream. Thus, the golf course was not adding nitrate-N to the stream. Similar results have been found for the other nutrients and turbidity. We are continuing to monitor this stream.

In October, 2002, we expect a Post Doctoral Associate to arrive. She will be using small plot and greenhouse data from our prior USGA project to calibrate the RZWQM leaching and transport model. We will then use this information to predict the amounts of runoff expected from the golf course being monitored here. The objective is to be able to predict potential runoff and leaching from scenarios different than those in this project.

Summary Points

- A second year of sampling runoff from a golf course fairway showed that ammonium-N and phosphorus became elevated due to spring fertilizer applications.
- Samples from a creek running into a golf course did not have differences in nitrogen or phosphorus concentrations upstream as it entered the course versus downstream inside the course.
- Modeling will be carried out during the third year of the project to be able to generalize fertilizer nutrient leaching and runoff results to different scenarios from where the original samples were taken.

Camp Creek - Golf Club of Georgia
Nitrate-N



Nitrate-N concentrations for 2001 and 2002 in Camp Creek at the Golf Club of Georgia upstream outside the course and downstream inside the course.