SPORTS TURF MANAGER

... for better, safer Sports Turf

JUNE 1998

GTI HILITES

Problems with Over-Irrigation

During the 1995 and 1996 seasons, Mr. Steve Thurtell, a graduate student studying with Dr. Claudia Wagner-Riddle in the Department of Land Resource Science conducted a study to determine the influence of water and fertilizer management on the quality of water draining from a turf grass site. In particular they were interested in the discharge of nitrate nitrogen in the water leaving the root zone.

Ministry of the Environment guidelines suggest that water leaving the root zone should not contain more than 10 ppm of nitrogen in the form of the nitrate ion. Unfortunately, all forms of nitrogen applied to the soil will eventually be converted to nitrate, which is completely soluble in water. Hence, water percolating through the root zone will carry the nitrate with it, if the nitrate is not absorbed by the turf root system. The objective of good turf management is to minimize the concentration of nitrate ions in the soil solution while at the same time maintaining optimum turf growth.

The research site at the GTI was a reconstructed site and is comparable to what might be found on a golf fairway or a football field constructed with original soil. In this case, the root zone was 30 cm of loam topsoil overlying a sand to gravel subgrade. The turf was primarily Kentucky bluegrass.

Fertilizer was applied as ammonium nitrate to provide zero nitrogen, 1.8 kg N/100 m^2 and 3.6 kg N/100 m^2 per year. Only two-thirds of the rate was applied in 1995 due to the late start of the experiment and the yearly rate was split into three equal applications.

Irrigation was applied at a rate to provide normal rainfall, normal rainfall plus 100% of the potential evapotranspiration (PET), and 150% of PET as irrigation. PET was calculated according to a modified-Penman, computerized model which calculated PET from hourly average air temperature, relative humidity, wind speed, incoming short wave radiation, and hourly total rainfall. Irrigation was applied each time 50% of the estimated available water was consumed. From the data it was possible to compute the amount of water which had been lost through drainage.

Soil solution samplers were installed in each plot to allow the removal, on a two to three day frequency, of small samples of soil water which were analyzed for nitrate-nitrogen content.

Table 1 summarizes the total amount of nitrate nitrogen leached during the study period as it relates to the amount of nitrogen applied and the amount of water which was applied as rainfall and irrigation. Where the water inputs were low and the rate of nitrogen application did not exceed the OMAFRA recommendations for average turf production, the amount of nitrate leached to the ground water was minimal. Both nitrogen at rates in excess of those recommended and irrigation beyond that required to satisfy the evaporative demand, resulted in high loss of nitrate to the ground water.

The environmental concern for nitrate leaching to the groundwater results from the fact there is no know mechanism for the breakdown of nitrate in groundwater once the water has passed below the zone of microbial conversion of nitrate to nitrogen gases. As a result, the concentration of nitrate will continue to increase in the groundwater, unless there is a high volume of water flowing to the groundwater to provide the necessary dilution to below

continued on page 2

In This Issue