

Nitrogen and Phosphorus Fate in a 10-year-old Kentucky Bluegrass Turf

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Objectives:

1. Determine if reducing the amount of fertilizer nitrogen applied to a continually fertilized turfgrass stand will reduce the amount of nitrate-nitrogen leaching from the soil profile without compromising turfgrass quality.
2. Determine the fate of phosphorus in a turfgrass stand that soil tests indicate has adequate phosphorus levels.

Start Date: 2003

Project Duration: five years

Total Funding: \$68,886

Extensive research on nitrate-nitrogen ($\text{NO}_3\text{-N}$) leaching in turfgrass systems indicates that, in most cases, leaching poses little risk to the environment. Most of the research, however, was conducted on research sites that were either recently disturbed or established, and the potential exists for $\text{NO}_3\text{-N}$ concentrations in leachate to increase on mature turf sites.

In 2002, the MSU Long-Term N Fate research project, funded by the USGA, was completed. The fate of nitrogen (N) was examined for a 10-year old Kentucky bluegrass (*Poa pratensis* L.) turfstand using intact monolith lysimeters and microplots. From October 2000 through 2002, lysimeters and microplots were treated annually with urea at a low N rate 98 kg N ha⁻¹ (24.5 kg N ha⁻¹ per application) and a high N rate of 245 kg N ha⁻¹ (49 kg N ha⁻¹ per application). From 2000-2002, $\text{NO}_3\text{-N}$ concentrations in



Separating soil from microplots for ¹⁵N analysis

leachate for the low N rate were typically below 5 mg L⁻¹ and for the high N rate greater than 20 mg L⁻¹.

The current N and P fate research is a continuing project that is using the same lysimeters and plot area, but the amount of nitrogen applied for the high N rate treatment has been reduced. For the current research, the amount of nitrogen applied is 98 and 196 kg N ha⁻¹ split over four applications. Phosphorus from triple superphosphate (20% P) is applied at two rates, 49 and 98 kg P ha⁻¹ split over two applications. The phosphorus application dates coincide with nitrogen application dates in the spring and autumn.

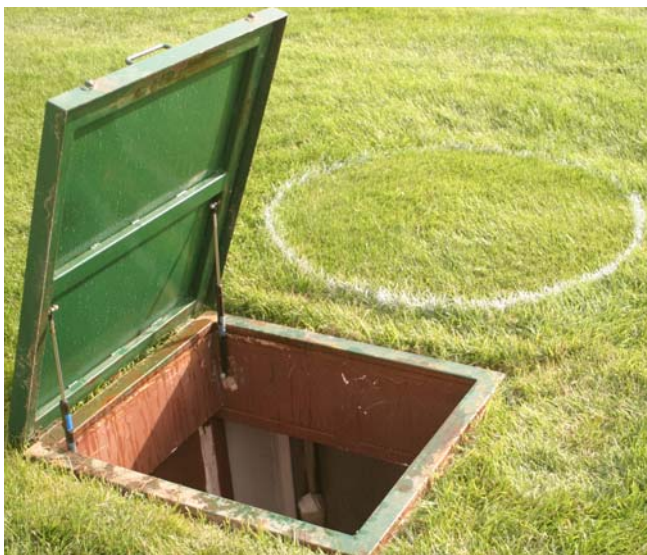
In 2003, the concentration of $\text{NO}_3\text{-N}$ leaching from the high N rate treatment did not decline from the previous years. The average

$\text{NO}_3\text{-N}$ concentration leached from the low and high N rate treatments was 6.3 and 31.6 mg L⁻¹. In 2004, the concentration of $\text{NO}_3\text{-N}$ leaching from the high N rate treatment declined drastically from previous years. The average concentration of $\text{NO}_3\text{-N}$ in leachate for the high N rate was 6.2 mg L⁻¹. This is a decrease in $\text{NO}_3\text{-N}$ concentration of 25.4 mg L⁻¹ from 2003.

For the low N rate, average concentration of $\text{NO}_3\text{-N}$ in leachate for the low N rate was 1.0 mg L⁻¹. The concentration of phosphorus detected in leachate remains very low regardless of phosphorus treatment. The highest concentration of phosphorus detected in leachate in 2004 was 0.2 mg L⁻¹.

Summary Points

- During the second year after reducing the high N rate treatment from 245 to 196 kg N/ha there was a substantial reduction in $\text{NO}_3\text{-N}$ concentrations in leachate.
- Results continue to indicate that there is little if any phosphorus leaching from the lysimeters.



Lysimeter where leachate samples are collected for long-term N and P fate research.