There have been few research studies on nitrogen (N) fate in turfgrass that have lasted beyond a couple years. Nitrate-nitrogen (NO$_3$-N) leaching in a mature Kentucky bluegrass (Poa pratensis L.) turfgrass has now been examined continuously from 1998 through 2005 at the Long-Term Nitrogen Fate Research Area at Michigan State University. The fate of nitrogen was examined for 15-year old Kentucky bluegrass turf using monolith lysimeters. From 1998 through 2002 two nitrogen rates were analyzed: 245 kg N ha$^{-1}$ (49 kg N ha$^{-1}$ application$^{-1}$) and 98 kg N ha$^{-1}$ (24.5 kg N ha$^{-1}$ application$^{-1}$). In 2003 the high N rate was reduced to 196 kg N ha$^{-1}$ (49 kg N ha$^{-1}$ application$^{-1}$). Since 1998, NO$_3$-N concentrations in leachate for the low N rate have typically been below 5 mg L$^{-1}$. From 2000-2003, for the high N rate, NO$_3$-N concentrations in leachate were often greater than 20 mg L$^{-1}$. In 2004, NO$_3$-N concentrations in leachate declined dramatically from previous levels to less than 10 mg L$^{-1}$. In 2005, the concentrations of NO$_3$-N in leachate for the low and high N rates were similar to values from 2004. 

Historically, many of the studies on fertilizer fate in turfgrass have been conducted on relatively young turf. Most of these studies found very low levels of nitrate-nitrogen leaching from the turf. However, it is important to determine if this response holds true for mature turf as well. The Long-Term Nitrogen Fate Research project at Michigan State University is investigating the amount of NO$_3$-N leaching from a mature turf stand. The turf stand being studied has been under continual management and fertilization for 22 years. Research using the same lysimeters as the current research was conducted by Millner et al. (1996) from 1991-1993. Millner et al. (1996) studied the fate of $^{15}$N labeled urea for spring and fall application schedules applied to Kentucky bluegrass. NO$_3$-N concentrations in leachate were generally below 1 mg L$^{-1}$ throughout the 3-year study. 

In a review of the fate of nitrogenous fertilizers to turf, Petrovic (1990) states that soil organic matter will increase on a turf area for several years due to root and thatch inputs in an undisturbed soil. The soil organic matter can hold some of the applied nitrogen until a new equilibrium for soil organic matter is established. Data from Porter et al. (1980) suggests that nitrogen accumulation in turf is rapid in the first ten years and changes little after 25-years. Using the data from Porter et al. (1980), Petrovic (1990) concluded that older turf sites should be fertilized less to reduce NO$_3$-N leaching to groundwater.

The soil type is a Marlette fine sandy loam (62% sand, 22 % silt, and 16% clay) with a pH of 7.3. The soil type is a Marlette fine sandy loam (62% sand, 22 % silt, and 16% clay) with a pH of 7.3. The soil type is a Marlette fine sandy loam (62% sand, 22 % silt, and 16% clay) with a pH of 7.3.

**Objective**

- To examine the fate of nitrogen applied to a mature Kentucky bluegrass turf.

**Materials and Methods**

- Four monolith lysimeters were constructed between 1989 and 1991 at the Hancock Turfgrass Research Center.
- In September 1990 the area was sodded with a polystand of Kentucky bluegrass (cv. ‘Adelphi’, ‘Nassau’, ‘Nugget’).
- Prior to the construction of the lysimeters the area had been in turfgrass for six years.
- The lysimeters are 1.14 m in diameter and 1.2 m deep. The bottom of the lysimeter has a 3% slope to facilitate leachate drainage to a tube on one side.
- The soil type is a Marlette fine sandy loam (62% sand, 22% silt, and 16% clay) with a pH of 7.3.
- The lysimeters and surrounding plot area have received continual fertilizer applications and cultural practices to maintain high quality turfgrass since lysimeter construction.
- Irrigation is used to return 80% potential evapotranspiration on a regular basis.
- The turf is mowed at 7.6 cm and clippings are returned.
- Nitrogen Treatments
  - Nitrogen source: urea
  - High nitrogen rate
    - 1998-2002: 245 kg N ha$^{-1}$ yr$^{-1}$ split among 5 applications
    - 2003-2005: 196 kg N ha$^{-1}$ yr$^{-1}$ split among 4 applications
  - Low nitrogen rate
    - 1998-2005: 98 kg N ha$^{-1}$ yr$^{-1}$ split among 4 applications

**Results and Discussion**

**2000-2002**

- Low N Rate: NO$_3$-N less than 5 mg L$^{-1}$ on 28 of 39 sampling dates.
- High N Rate: NO$_3$-N greater than 20 mg L$^{-1}$ on 20 of 39 sampling dates.
**2003**

- In the first year of reducing the high N rate from 245 to 196 kg N ha$^{-1}$, the flow weighted mean NO$_3$-N concentration actually increased from 2002 (Table 1).
- The flow weighted mean NO$_3$-N concentration for the low N rate was similar to previous years.

**2004-2005**

- For the high N rate, the flow weighted mean NO$_3$-N concentration decreased dramatically from 2003 (Table 1).

**Conclusions**

- Porter et al. (1980) theory - organic N accumulates under turf as the turf ages.
- Most accumulation of organic nitrogen occurs during the first 10 years after establishment.
- Our data from the high N rate treatment supports the theory that mature turf sites should be fertilized at a reduced rate to minimize potential for nitrate leaching.

**Literature Cited**