

Nutrient and Pesticide Runoff from Golf Course Fairways Caused by Simulated and Natural Rainfall

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Objectives:

1. The objective of this portion of the project is to investigate the amount of nutrient runoff that occurs from a bermudagrass golf course fairway under normal maintenance conditions.

Start Date: 2004

Project Duration: four years

Total Funding: \$110,000

Although several studies have measured the amount of nutrient runoff from turf that occurs during simulated storm events, the amount of nutrient runoff that is likely to occur under common maintenance conditions and natural rainfall is not known. The objective of this study was to investigate the amount of nutrient runoff that occurred from a simulated bermudagrass golf course fairway under normal maintenance conditions and natural rainfall.

Collection troughs and automated samplers were positioned at the bottom of six 40 by 80 ft. plots (5% slope) for surface runoff collection. Rates of N fertilizer and P fertilizer common to bermudagrass maintenance practices were applied to two of these plots (6,400 sq. ft.) at the beginning of each month during the growing season on a site specifically constructed and managed to simulate a bermudagrass (*Cynodon dactylon* L.) golf course fairway.

A system of time domain reflectometers were used to monitor antecedent soil moisture and irrigation was used to maintain the site at approximate field capacity throughout the study. Runoff samples were collected and tested for $\text{NO}_3\text{-N}$, $\text{NH}_4\text{-N}$, and dissolved reactive phosphorus (DRP) during natural rainfall events that produced runoff in 2003 through 2007.

An average of seven rainfall events that have sufficient intensity and duration to generate runoff from this particular site occur annually. However, not all of these events happen during the growing season. A total of sixteen rainfall events produced runoff during the growing seasons from 2003 through 2006.

In 2007, fourteen events produced runoff. These events and the addi-

tional rainfall that occurred during 2007 constituted the most rainfall ever recorded in Stillwater, OK. Because 2007 was such an unusual year, constituting a worst-case scenario for Stillwater, it was interesting to compare 2007, with the approximately normal results of 2003-06.

Runoff water samples were collected for 11 of the 16 runoff events that occurred in 2003-06 and 13 of the 14 events that occurred in 2007. These runoff events resulted in losses of 0.3% of the N and 1.2% of the P applied as fertilizer in 2003-06 and 1.0% of the N and 5.5% of the P applied in 2007. Although the amount of fertilizer lost was greater in 2007, the concentrations of N and P in runoff were less and the likelihood of eutrophication was reduced.

In 2003-06 the mean N concentration in runoff was 2.7 parts per million (ppm) and the mean P concentration was 3.6 ppm. In 2007, because runoff volume was substantially greater compared with the nutrients lost, the mean N concentration was 1.3 ppm and the mean P concentration was 3.2 ppm. Of the 16 runoff events recorded during 2003-06, 0.23 inches of rainfall was lost to runoff during an average event.

Of the 14 events recorded in 2007, 0.55 inches of rainfall was lost to runoff during an average event. In 2003-06, once runoff began, 23% of the rainfall that occurred became runoff and in 2007, 48% of the rainfall became runoff.



Stillwater, OK experienced record-setting rainfall in 2007 creating a worst-case scenario for natural rainfall runoff during a single growing season.

Summary Points

- Stillwater, OK experienced record-setting rainfall in 2007 creating a worst-case scenario for natural rainfall runoff during a single growing season.
- An average of four runoff-producing rainfall events per season occurred on the site from 2003 through 2006, but fourteen events occurred in 2007.
- Runoff losses amounted to 0.3% of the N applied and 1.2% of the P applied as fertilizer in 2003-06 and 1.0% of the N and 5.5% of the P applied in 2007.
- Due to the large volume of runoff that occurred in 2007, nutrient concentrations in runoff were lower than in 2003-06 and less likely to encourage eutrophication.