Controlling Nutrient Runoff From Golf Course Fairways Using Vegetative Filter Strips

Gregory E. Bell
Oklahoma State University

Objectives:

1. Investigate the influence of multiple vegetative filter strips for reduction of nutrient runoff.
2. Determine if irrigation and natural rainfall differ in propensity for nutrient runoff.
3. Study the impact of antecedent soil moisture and application timing prior to rainfall on nutrient runoff potential.
4. Investigate the potential use of the PRZM3 model for determing nitrogen fate under golf course conditions.

Start Date: 2000
Project Duration: 3 years
Total Funding: $75,000

Progress on the project is a season behind. It took several weeks to procure the moisture sensing equipment and several months to procure the runoff collection equipment. Site construction was completed in May, 2001. Equipment calibration and testing was completed by the end of July, 2001. Research began in August, 2001. Four simulated rainfall events and three natural rainfall events were recorded.

A TDR 100 moisture sensing system was purchased from Campbell Scientific (funds provided by Oklahoma Agricultural Experiment Station) to monitor soil moisture content at the site. CS-615 water content reflectometers are placed six inches below the soil surface at three locations, high, mid, and low in each research plot to monitor soil moisture. A computer in the turfgrass research center polls the data logger continuously through a modem connected by underground cable to the research site.

Runoff research conducted at Oklahoma State University continues to evaluate the effectiveness of grass buffer zones around ponds and creeks.

The irrigation system at the site is activated either automatically or manually to maintain moisture content at field capacity continuously. During June of 2001, a lightening storm destroyed three of the moisture probes that were located in plot six. The probes were returned to Campbell Scientific for repair. New units were returned on July 27, 2001, and were immediately installed on the site.

Dr. Greg Bell (right) and his colleagues at Oklahoma State University continue to investigate the value of using vegetative filters strips to reduce runoff from turf sites.

Automatic runoff collection units were purchased from ISCO (funds provided by the Oklahoma Turfgrass Research Foundation) to collect runoff during periods of natural rainfall or rainfall simulation. Model 6700 samplers pump water from calibrated flumes constructed by the Oklahoma State University Biosystems and Agricultural Engineering Department. One of the ISCO model 6700 samplers malfunctioned. When runoff occurs the samplers are automatically activated by the sensors and collect up to 20 individual samples in 5-minute intervals.

The experiment was repeated four times beginning in August of 2001. Irrigation was applied at a rate of 2 inches per hour for 1.5 hours. Time to initiation of runoff was recorded for each plot. Water samples were collected for one hour after the initiation of runoff at five-minute intervals. A total of twelve water samples were collected from each plot. Flow rates were also recorded for each event. Natural rainfall events were recorded on September 5, September 7, and September 18. All water samples were sent to the OSU Soil, Water, and Forage Analytical Laboratory. Complete and final analysis of results will not be determined until all data has been received from the OSU lab.

Summary Points

- Preliminary results indicate that total runoff volume from multiple vegetative filter strips (VFS) of increasing mowing height is significantly less than total runoff volume from the single VFS mowed at a single height.
- Nutrient concentrations in water samples collected from the multiple VFS of increasing height were not significantly different from nutrient concentrations collected from the single VFS mowed at the single height
- Multiple VFS at progressively increasing heights reduced nutrient runoff by delaying runoff initiation compared with a single VFS mowed at a single height.
- During the first hour of simulated rainfall events, multiple VFS reduced total runoff by 46% compared with single VFS.