

## SURFACE RUNOFF IN TURF

Tom L. Watschke, Ph.D.  
Pennsylvania State University  
University Park, Pennsylvania

This interdepartmental research project was initiated early in 1982 via planning and organizational meetings of the principal investigators involved from the departments of agronomy, agricultural engineering, entomology, horticulture and plant pathology.

Development and construction of the physical facilities involved the complete renovation of an abandoned soil erosion research area, fabrication of collection and subsampling equipment, instrumentation and data logger linkage with computer access and establishment of twelve turfed slopes (some seeded, some sodded) to which the application of nutrients and pesticides could be made. By late 1985, the facility was completed and since that time, much of the research conducted has emphasized the hydrological characterization of each sloped plot.

Approximately 80 percent of the nations's water is supplied by underground aquifers. This high dependence requires the maintenance of groundwater supply. However, as our population increases demand and land development continues to decrease groundwater recharge capacity, alternative sources of water are needed.

It has been suggested that because of the high percentage of runoff surfaces which are located in urban and suburban environments that recharge from these areas might make a considerable contribution to our need for a safe and potable water supply. Collection, storage and treatment of stormwater runoff has been attempted on a limited scale in some metropolitan areas. However, recent studies suggest that water quality tends to decline as urbanization increases. Decreased water quality has been primarily associated with the movement of undesirable particles deposited on impervious surfaces (highways, parking lots, rooftops, etc.). A parallel concern has been expressed relative to the quality of water emanating from turfed surfaces that have received nutrient and pesticide applications.

It is possible that some nutrient and pesticide loading of urban/suburban watersheds has already occurred. Environmentalists' apprehensions about the application of 2,4-D have increased pressure for governmental regulation of the use of this important pesticide. Moreover, turf fertilization has been implicated as a contributor to the presence of nitrates in groundwater.

For many urban/suburban situations, stormwater collection systems are inadequate, underdesigned or nonexistent. Little is known about the quality of runoff water moving from landscaped surfaces, particularly from developments where a large percentage of the homeowners utilize nutrients and pesticides. The buffering capacity of the sod is directly related to plant density and thatch, which is improved through proper fertilization and pest management. Therefore, there may be an enhancement of the quality of water emanating from such sites.

#### PRELIMINARY RESULTS

The slopes have been hydrologically characterized. Seeded slopes had 10 to 12 times more runoff than sodded slopes during peak flow (irrigation was applied at a rate of six inches per hour). The lapse time from irrigation initiation to moment of runoff was four to five times shorter for seeded versus sodded plots. More runoff occurred in the fall of the year regardless of method of establishment. The infiltration rate of sodded slopes is approximately three times the rate of seeded slopes. The structure of the soil surface of seeded slopes was adversely effected by the compacting action of raindrops and irrigation during establishment. The surface of the soil on sodded plots was protected immediately on the day of establishment, and soil structure improved each day thereafter.

Irrigation was applied 48 hours after the application of nutrients and pesticides, unless a runoff-producing natural event occurred prior to that time. Analysis of nitrogen, phosphorus and potassium in lysimeter and runoff water has revealed low levels in all samples.

The herbicides 2,4-D, 2,4-DP, dicamba and pendimethalin and the insecticide chlorpyrifos have been applied. Analysis of the compounds in leachate and runoff water is currently underway at the pesticide analysis laboratory at Pennsylvania State University.

This research project is in the very early stages, but preliminary results indicate that high quality turf appears to have a strongly positive impact on the environment. Surface movement of water and any nutrients or pesticides associated with it (regardless of concentration) is very limited when the turf is mature and of high quality.