Management practices to reduce runoff

By Justin Moss, PhD, and Greg Bell, PhD

Figure 1. Oklahoma State University runoff research site.

Sports turfgrass areas are fertilized to maintain turf health, promote adequate turf cover, maintain playability, and provide aesthetic appeal. Whenever fertilizers and pesticides are applied, there is always the possibility of off-site contamination through surface runoff. Therefore, turfgrass scientists have examined the various management practices that can help to eliminate the chance of fertilizer and pesticide losses to the environment through surface runoff.

Why worry about runoff?

Grasses are very beneficial for erosion, noise, and dust prevention, cooling effects, and for providing safe playing surfaces. Turf can also help to mitigate runoff and sediment losses from agricultural fields, construction sites, and right-of-ways. Highly managed turfgrass areas can prevent runoff losses due to excellent turf density and cover. However, if fertilizers and pesticides are not applied correctly, there is a chance that some could be lost through rainfall or irrigation runoff. Loss of nutrients and sediments through surface runoff has contributed to the "dead zones" in the Gulf of Mexico and Chesapeake Bay areas. Excessive nutrients such as phosphorus can be swept away from agricultural lands and loaded into water bodies causing an excessive growth of algae which can reduce available oxygen in the water, thus causing these dead zones. However, for the turfgrass manager, proper turf management, fertilization, pesticide applications, and irrigation management can minimize or eliminate the possibility of losses through runoff.

Turfgrass managers have a responsibility to protect the environment and should be aware of management techniques that help to reduce runoff and environmental contamination. Common sense, experience, and attention to recent turfgrass research results help to make a good runoff prevention program. For example, applying fertilizers or pesticides to saturated soil, frozen soil, or non-target surfaces such as concrete or plastic are likely to increase chemical runoff during subsequent rainfall events. Maintaining a nice, dense turf can help to alleviate runoff but a program

A HEALTHY, DENSE TURFGRASS STAND IS AN EFFECTIVE SURFACE RUNOFF DETERRENT, WHICH CAN BE ENHANCED WITH PRACTICAL, COMMON SENSE TURFGRASS MANAGEMENT STRATEGIES THAT SPECIFICALLY SEEK TO ELIMINATE POTENTIAL NUTRIENT AND PESTICIDE LOSSES FROM RUNOFF.

of over-fertilization or unnecessary pesticide applications, not only wastes money, but also encourages chemical losses to the environment.

Yearly soil testing, growing season conditions, and turfgrass manager experience are all part of a turf fertility program. Pesticides should only be applied as a final step in an integrated pest management program. Reading labels, checking weather forecast, monitoring pest activity, and application timing are all important aspects to environmentally sound pest management. Good planning can result in application windows that allow us to apply chemicals when weather conditions are most suitable for chemical activity and runoff losses are least likely to occur.

Post-application weather forecasts are just as important because a major rainstorm following a chemical application is likely to result in chemical losses to runoff. Using slow-release nitrogen and phosphorus sources only provide a small amount of soluble nutrient at any given time thus reducing the potential for nutrient runoff.

Aerification is a common turf management practice that serves to alleviate compaction, promote new growth and increase soil oxygen content. Core aerification helps to increase the surface infiltration rate and slows soil saturation that results in runoff. It could be argued, however, that aerification results in a greater leaching potential by moving chemicals through the soil more quickly. However, the soil is a great filter and can provide some resistance to nutrient or pesticide losses. In addition, "watering-in" fertilizers or pesticides when recommended with a small amount of irrigation or rainfall that does not produce runoff is effective for reducing the amount of product lost to a runoff event that occurs shortly after application.

Mowing is important

One of the most effective management practices for reducing runoff is proper mowing. As long as the mowing height remains in the range of species adaptability, turf tends to increase in density as the mowing height is lowered. A dense turf provides a complex system of shoots and stems that slow runoff and allow more time for surface infiltration. High mowing heights can also deter runoff when properly used.

Turfgrass scientists in Oklahoma have studied the runoff-reducing effects of turf mowing heights for many years (Figure 1). Their findings indicated that a strip of bermudagrass from 4 to 16 feet wide mowed at 1.5 inches down the slope from an area of bermudagrass mowed at 0.5 inches resulted in less runoff and lower chemical losses than bermudagrass that was not bordered by a buffer. The width of the buffer did not seem to make a substantial difference in the amount of runoff that occurred. Although turf density can be expected to increase with lower mowing height and have a negative effect on runoff, the work of Baird et al. in 2000 indicated that when a buffer strategy is employed, the shoot height of the buffer vegetation has a greater effect on runoff than turf density.

Figure 2. Runoff slows and puddles as it flows across turf mowed at 0.5 inches and encounters a buffer mowed at 2.0 inches on a 5% slope.

Our work in 2005 hypothesized that a series of buffer strips mowed at increasingly higher heights from 1.0 to 1.5 to 2.0 inches might further inhibit runoff by presenting multiple low-cut to high-cut obstacles. After 2 years of testing irrigation and natural rainfall runoff, the researchers found that the multiple height buffer strategy was, indeed, more effective than a single height buffer (Figure 2). ■

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