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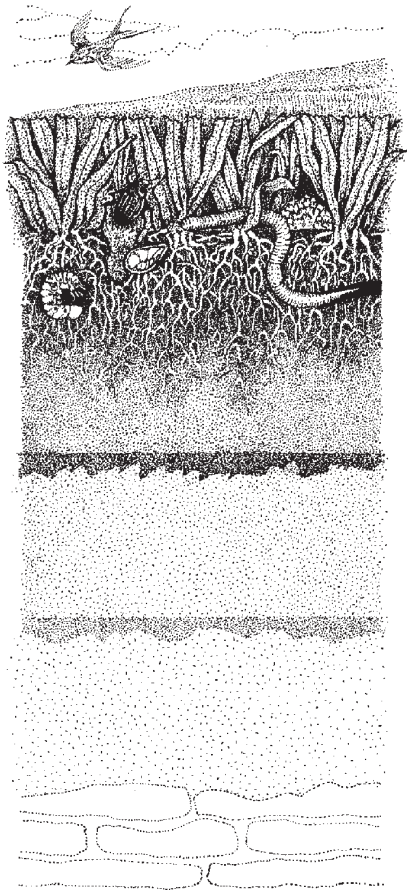

The Role of Turfgrass Management in Water Quality

Much concern has been raised over the impact of turfgrass management practices on the environment. Of special concern is the impact of turfgrass practices on the quality of both surface and groundwater. If we look at the importance of clean water to everyone, then the concerns are truly important. Almost all of our drinking water in the United States comes from surface or groundwater supplies that are tapped by individuals or municipalities. ■

On the average about half of our drinking water comes from surface water sources (streams, ponds, lakes). The other half comes from wells that tap into groundwater. In rural areas groundwater accounts for about 95% of the drinking water supply. When a water supply is contaminated, the options available to correct the problem are often extremely expensive. Thus, it is imperative that turfgrass management programs be developed that do not contaminate water supplies.

The turf maintenance chemicals that threaten groundwater are fertilizer elements like nitrogen (N) and phosphorus (P), and pesticides. The potential health risks associated with N involves nitrates - the form of N that leaches into groundwater. Nitrate has been shown to cause the disease known as blue baby syndrome or methemoglobinemia in infants less than 3 months old. Nitrate and P are also linked with algal population explosions in surface waters that can limit recreational uses, and indirectly affect the health of many other aquatic organisms. The extent of health problems associated with pesticides in water is of great concern and not fully understood.

The knowledge surrounding the fate of fertilizers and pesticides applied to turfgrass is growing. At Cornell University, we have been focusing on the fate of nitrogen fertilizers applied to turfgrass for the past five years. More recently, we have also studied the leaching potential of several pesticides.

Nitrate Leaching

Results from early studies on Long Island showed that a heavy application of a highly water soluble N source, like urea, in the late fall can result in a substantial amount of nitrate leaching by early spring. If slow release N sources were used, however, there was very little nitrate leaching. Current fertilizer recommendations were modified from these results. Turf areas grown on sandy soils should no longer receive

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Turfgrass Management

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late fall fertilization with highly water soluble N source. We recommend you use slow release sources instead.

The question then that needed answering was how would a more typical N fertilizer program influence the magnitude of nitrate leaching. In the fall of 1987, a study was initiated to evaluate the degree of nitrate leaching from ten different N sources applied to a typical home lawn. The study was conducted at the Long Island Horticultural Research Laboratory at Riverhead. The fertilizers were applied at a yearly rate of 4 lbs N/1,000 sq. ft. as either four applications of 1 lb/1,000 sq.ft. or two applications of 2 lbs/1,000 sq.ft. applications. Treatments were made in September, 1987 and May, August, September, and October, 1988. The amount of fertilizer nitrate leaching past the root zone was determined. The results of N source effects on the nitrate leaching are shown in Table 1. The extent of fertilizer nitrate leaching past the root zone was very small and not greatly influenced by the N source, even from the highly water soluble sources. These results suggest that well fertilized lawns do not pose a big threat to groundwater quality when fertilized at the traditional times of the year.

Pesticide Leaching

The leaching of pesticides into groundwater is not well understood, especially when they are applied to turfgrass. Several factors of the turfgrass ecosystem should result in little or no pesticide leaching into groundwater. These include the following:

- Thatch layer that can easily tie up or allow for rapid degradation of a pesticide.
- Heavy turfgrass canopy that can intercept much of a sprayed pesticide. In this case there is greater chance the plant may take up the pesticide, that the pesticide may be degraded by sunlight (photodegradation), or be lost back to the atmosphere (volatilization).

When turfgrass is limed, the surface layer of soil and/or thatch is at pH of 8.3. Some pesticides are highly insoluble at pH's higher than 7 and are therefore unlikely to leach.

The initial study on pesticide leaching was conducted last October in the ARESTS Facility (Automated Rainfall Exclusion System for Turfgrass Studies). This facility is very unique, and is designed to monitor very closely the fate of fertilizers or pesticides applied to turf. Pesticides (2,4-D, dicamba, carbaryl and chlorothalonil) were applied to the plots in the ARESTS Facility on 3 soil types (sand, sandy loam and a silt loam). Irrigation provided leaching conditions either three times weekly or once a week for a three week period. The leachate samples are now being analyzed. The results of this study will be used to evaluate the effectiveness of pesticide leaching models to predict the leaching of pesticides from turf.

Future Plans

The environmental pressures being placed on the turfgrass industry are mounting. Answers to some of the concerns raised will likely be given by research like this. Areas for future research include the influence of the amendment zeolite in sand on pesticide/nitrate leaching from putting greens. The effects of cultivation and irrigation on nutrient and pesticide leaching will also be looked at under the different soil types.

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Table 1. Amount of total Nitrogen leached (NO_3 + NH_4) from the rootzone of Kentucky bluegrass, May 1988 to May 1989.

Nitrogen Source	Number of Applications 4	2
	% of Applied Nitrogen	
Sulfur-coated urea (No sealant)	3	1
Sulfur-coated urea (Sealant)	2	0
Urea	1	0
$Ca(NO_3)_2$	1	1
Resin-coated urea (100 day)	2	0
Resin-coated urea (200 day)	2	0
Ureaformaldehyde	4	0
Methylene urea	2	0
IBDU	3	0
Milorganite	3	0
Mean	2	0

Values adjusted for background levels.