Understanding Pesticide and Nutrient Loss with Runoff From Fairway Turf and Evaluating the Ability Of Management Practices to Mitigate Their Loss

Principle Investigators
Dr. Brian Horgan (U of MN) and Pamela Rice (USDA/ARS)
University of Minnesota

This research project is part of a multi-state cooperative initiative to improve the current understanding of pesticide and nutrient runoff from turf. Two objectives of the study are 1) to quantify pesticide and nutrient transport with runoff from fairway turf as affected by regional variability, turf species variability, and test plot size, and 2) to evaluate the ability of turf management practices to mitigate pesticide and nutrient loss with rainfall and snowmelt runoff.

Effect of Regional Variability, Turf Species Variability, and Plot Size

A standardized protocol was used for the construction and maintenance of fairway turf plots in the North-Central, Mid-Atlantic, and Southeastern regions of the United States. Pesticide applications, rainfall simulation, runoff collection, and chemical analysis are similar for all locations (Minnesota, Maryland, and Mississippi), while plots size (small, medium, large) and turf species (bentgrass, Bermuda grass, tall fescue, Meyer Zoysia) vary according to location. Plots representing each treatment are replicated and hydrologically isolated from each other. Forty-eight hours prior to pesticide application the rainfall simulator will be used to pre-wet each plot to saturation to ensure uniform water distribution. Beginning this summer (2004), replicate samples of surface runoff water and turf/soil cores will be collected and analyzed to determine levels of nutrients and pesticides removed from the site of application with runoff water, leaching to the underlying soil, or remaining on the grass and thatch. We have selected medium size plots (20' x 80') planted with creeping bentgrass for the Minnesota location. Creeping bentgrass was also planted at the Maryland site while a number of different turf species are represented with the Mississippi plots. Data collected from this study will help fill the information gaps between former studies and what is required by the US EPA to more accurately assess the non-point source pollution potential of pesticides and nutrients from turf runoff. Improved knowledge of pesticide transport will allow risk assessments to be made with quantitative data rather than conservative assumptions, which should reduce overestimation of risk and provide more accurate real-life estimates, resulting in more scientifically-based criteria for the registration and use of turf protection products

Ability of Management Practices to Mitigate Pesticide and Nutrient Loss

The off-site transport of pesticides and nutrients is both an agronomic and environmental concern resulting from reduced control of target pests in the area of application and contamination of non-target surrounding ecosystems. The primary objective of our research project, in Minnesota, is to evaluate the ability of management practices to mitigate pesticide and nutrient loss with rainfall and snowmelt runoff. Several management practices including tine aeration, vertical mowing, and sand topdressing can be utilized to control thatch accumulation. Hollow-tine aeration removes a small percentage of the thatch and introduces microbes responsible for organic matter degradation into the thatch layer. Vertical mowing has been successfully used as a substitute for core cultivation for thatch control but does not have the same impact on reducing compaction. Regular sand topdressing of fairways is becoming more popular and has been shown to improve courses with heavy soils and poor drainage. Ultimately, this practice enhances playing conditions however it is not common on golf course fairways because of the resources required. Despite the widespread use of these turf management practices, their impact on runoff and potential to mitigate pesticide loss with runoff has not been studied. Our goal is to identify the management practice that maximizes pesticide and nutrient retention at the site of application, thereby improving desired results of pest control and turf maintenance while minimizing environmental contamination and adverse impacts associated with the off-site tranpsort of these compounds. Assessment of management practices to reduce runoff volume and pesticide and nutrient loss with rainfall runoff will begin this summer (2004) followed by fall application of snow-mold fungicides and late-fall fertilizers, and the assessment of their transport with runoff during the following spring thaw. Results of this research will provide quantitative-information to golf course superintendents that will allow for informed decisions on best management practices that are both environmentally-responsible and provide quality turf.