

Calibration of Computer Model Scenarios for Pesticide and Nutrient Runoff and Leaching in Turfgrass Environments

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Objectives:

1. Conduct field investigations for pesticide offsite movement such that the data can be used to calibrate regulatory computer model scenarios for turf.
2. To calibrate PRZM/EXAMS scenarios for turf such that the scenarios can be used in tier-2 exposure assessments for turf pesticides.
3. To modify the code of PRZM as necessary based upon the collected data to best represent the turf environment.

Start Date: 2000

Project Duration: 3 years

Total Funding: \$75,000

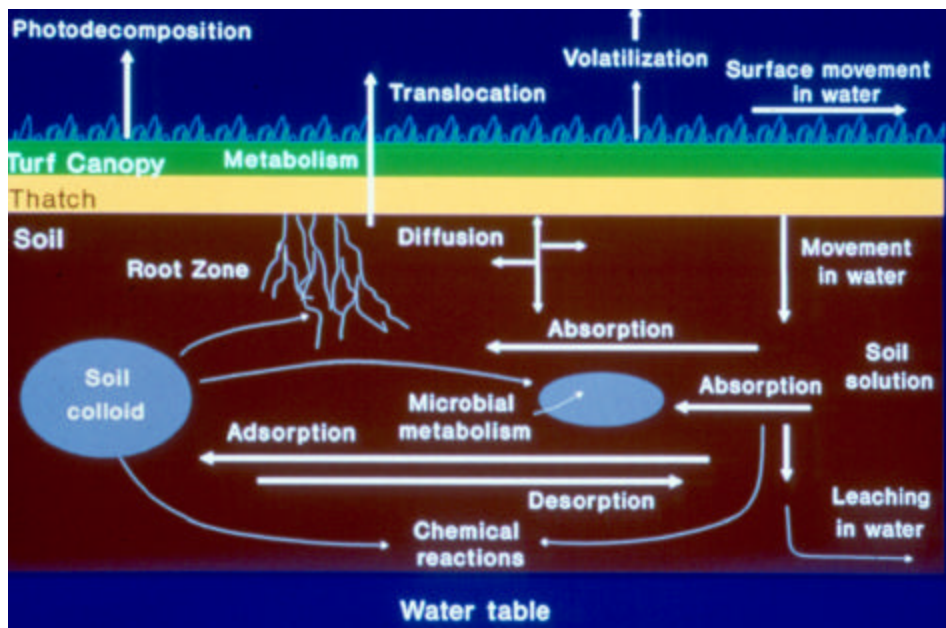
Pesticides and nutrients are often detected in urban/suburban watersheds at higher concentrations and higher frequencies than in corresponding agronomic settings according to the National Water Quality Assessment Program conducted by the U.S. Geological Survey.

This year's research focused on collecting current and historical data on specific pesticide degradation products in golf course leachate from lysimeters constructed into golf course greens. The research also is characterizing the fate of one of the degradation products in laboratory investigations.

Chlorothalonil and chlorpyrifos are commonly used to control disease and insect pests on golf course greens in the southeastern U.S. While they are relatively immobile in the soil profile, their respective soil degradation products, 4-hydroxy-2,5,6-trichloroisophthalonitrile and 3,5,6-trichloropyridin-2-ol are more polar and may be present in green leachate.

To investigate this possibility, six stainless steel lysimeters were built into two practice greens at a country club in a northern Atlanta, Georgia suburb. Over a period of one year, after rainfall events, lysimeter leachate samples were collected in glass bottles, filtered, and analyzed.

Chlorpyrifos was not detected in any sample and chlorothalonil was detected only in one sample at a concentration of 0.12 mg/L. However, metabolites of both chlorpyrifos and chlorothalonil were



Pesticide fate models need to take into account the several ways pesticides are adsorbed and broken down in turfgrass thatch and soil.

detected more often. Hydroxychlorothalonil was detected in 87% of the samples showing a medium concentration of 0.55 mg/L and a maximum concentration of 2.21 mg/L. Trichloropyridinol was detected in 63% of the samples showing a medium concentration of 0.15 mg/L and a maximum concentration of 1.77 mg/L.

Data generated by the pesticide registrant for chlorpyrifos has shown that trichloropyridinol is rapidly degraded by water and sunlight. Irradiation with simulated sunlight degraded hydroxychlorothalonil in deionized water, phosphate buffer, and pond water with half-lives of approximately 30 minutes. Simulated degradation of hydroxy-chlorothalonil in a pond setting using the US EPA's EXAMS MSPond scenario suggested that this laboratory generated 30 minute half-life would equate to approximately a 2.6 day half-life in a 2-meter deep pond. These

data suggest that in surface water it should be rapidly degraded by sunlight to small aliphatic acids upon transport into aquatic systems.

Summary Points

- Chlorpyrifos was not detected in any sample and chlorothalonil was detected in one sample.
- The degradation products, trichloropyridinol and hydroxychlorothalonil, were detected in 63% and 87% of the samples, respectively. The highest concentrations were typically associated with periods of greater rainfall.
- Although the degradation product of chlorothalonil, hydroxychlorothalonil, formed in significant quantities in soil, it should be rapidly and extensively degraded by sunlight in aquatic systems. Photodegradation was predicted to be responsible for 81% of the degradation.