# STOCHASTIC SIMULATION OF ATRAZINE LEACHING TO GROUNDWATER FOR TWO TOPOGRAPHIC REGIONS OF NEBRASKA

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## ABSTRACT

Atrazine runoff and leaching were simulated for cropland conditions in the Mid-western U.S. based on the pesticide component of the model AGNPS (Agricultural Non-Point Source). This computer program stochastically simulates an atrazine concentration occurring at the outlet of a watershed and at three possible water table depths below the watershed. The objective of this project was to determine the risk of excessive atrazine levels at the outlet and three water table depths for different farm management practices, climatic parameters, and topographic regions of Nebraska.

Three pesticide fate and transport processes were modeled with the program. Degradation was simulated using first-order kinetics. Absorption/desorption was modeled assuming a linear soil/water partitioning coefficient. Advection was based in part on the USDA-NRCS curve number method.

Fate and transport processes for atrazine were modeled using inputs that included degradation half-life, soil-water partitioning coefficient, and storm event rainfall depth. These inputs were all assumed to follow either normal (soil/water partitioning coefficient and rainfall depth) or log-normal (degradation half-life) distributions and, therefore, were made random with a first order Markov Chain. The 50.8 mm rainfall event was simulated 100 times with a Monte Carlo simulation. After each, the pesticide runoff and three subsurface pesticide concentrations were compared to the atrazine maximum contaminant level (MCL) of 3 micrograms/liter. The concentrations that exceeded the MCL were converted to a risk percentage. This risk was computed for 90 combinations of application rate, possible water table depths, topographic regions and time between application and rainfall event. Results show that the risk correctly increases as the application rate increases, the depth to water decreases, and the degradation time between application and rainfall decreases. Risk was also less for the Nebraska plains topographic regions with their fine textured soils than in the valley regions with their highly permeable, coarse-textured soils.

**Key words:** atrazine, leaching, Monte Carlo simulation, plains, valleys