Methodology for Predicting Agrochemical Leaching on a Watershed Basis

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Most pesticide contamination of ground water in Southern Ontario is below Canadian drinking water guidelines, but there are growing public concerns over potential health hazards related to long-term exposure to low levels of pesticides (Agriculture Canada, 1990). Pesticide residues, especially atrazine, have been detected in surface, ground and tile drainage waters of many agricultural watersheds in the Great Lakes basin, particularly where there is some combination of high pesticide usage, intensive agriculture, high precipitation, coarse and other highly permeable soils, high water tables, and sloping topography (Millette & Torreiter, 1992).

Pesticide contamination of ground water has traditionally been considered to be due primarily to spills, and to improper storage, disposal and application practices. There is increasing evidence, however, that normal agricultural practices can also result in low-level, non-point source contamination of ground water via the downward migration of pesticides through the soil profile (Agriculture Canada, 1990). Consequently, there is a need to determine how important and widespread this type of contamination might be, what the controlling soil, land use and weather factors are, and what agricultural practices are required to maintain this type of pollution at acceptable levels. Essential steps in obtaining this information include identification of the primary mechanisms controlling pesticide movement through the soil profile, and development of the capability to characterize and predict the pesticide movement in space and time with acceptable accuracy. To achieve these steps, a methodology was developed which incorporates a solute transport simulation model, pedotransfer functions, geostatistics and a geographic information system (GIS).