

Title: Evaluation of Groundwater Susceptibility Assessment Systems in Dane County, Wisconsin

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Background/ Need: Groundwater susceptibility assessment systems rate areas by their relative potential for groundwater contamination based on hydrogeologic or physical factors that affect groundwater flow and/or contaminant attenuation. Assessment system results are being used in policy analysis and development, in program management, in making landuse decisions, and in providing general education about hydrogeologic resources. Although agencies are using or promoting the results of different types of groundwater susceptibility assessment systems, very little research has been done to test the results of these systems.

System validation can be difficult because there is a general lack of groundwater monitoring data; thus, system susceptibility scores are compared to contaminant concentrations in wells below the water table. However, comparison of system results to contaminant concentrations in groundwater wells (after accounting for landuse practices) will not necessarily validate the results of the system, but this comparison will evaluate a system's ability to assess the susceptibility of drinking water to contamination.

Objectives: The primary objective of this project was to determine whether the groundwater susceptibility assessment systems, DRASTIC, WISM, SCAM3, FarmASyst, and SEEPAGE, could predict atrazine contamination of rural drinking-water wells in Dane County, Wisconsin.

Methods: Assessment system susceptibility scores were calculated using hydrogeologic characteristics over the zones of contribution (ZOCS) of 325 groundwater wells in Dane County, Wisconsin. The geographic information system (GIS) PC ARC/INFO was used to summarize each system's landuse and hydrogeologic parameter information over each ZOC and to calculate system susceptibility scores. We evaluated assessment system results by comparing each system's scores, atrazine concentrations in wells, and total atrazine applications in associated ZOCS. Finally, we examined the ability of systems to assess the susceptibility of drinking water to contamination in regions with specific hydrogeologic characteristics.

Results: After accounting for atrazine application rates in each ZOC, consistent relationships between assessment system scores and atrazine concentrations or detection were not found. Greater amounts of atrazine applied in the ZOC were related to increased detection of atrazine, regardless of system susceptibility results. The systems rate ZOCs in regional discharge areas in Dane County as more susceptible than average,

while atrazine concentration data suggests that these areas are less susceptible to groundwater contamination.

Recommendations/

Implications: None of the susceptibility systems were successful in predicting drinking-water well contamination by atrazine in Dane County. The delineation of regional hydrogeologic flow systems, as an alternative to or in conjunction with assessment systems, may be more useful in assessing the susceptibility of drinking water (and possibly groundwater) to contamination. The identification of potential sources of groundwater contamination with vulnerability analyses, which take into account land use as well as susceptibility estimates, may improve predictions regarding the contamination of drinking-water wells. Finally, accounting for atrazine application amounts to ZOCs may be more useful than using susceptibility scores in predicting atrazine detections.

Related Publications:

Muldoon, M.A., M.F. Bohn, F.W. Madison, and N.H. Richardson, 1994, Hydrogeologic and Land Use Controls on Atrazine Detections in Dane County, Wisconsin, Wisconsin Geological and Natural History Survey Open File Report WOFR-94-02, 64 p.

Key Words: groundwater susceptibility, atrazine, geographic information system (GIS)

Funding: DNR, WGNHS - funds and staff time

Final Report: A final report containing more detailed information on this project is available for loan from Wisconsin's Water Library, University of Wisconsin - Madison, 1975 Willow Drive, Madison, Wisconsin 53706 (608) 262-3069.