Public Abstract
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Title: Groundwater Vulnerability to Agrochemicals: A GIS-Based DRASTIC Model Analysis of Carroll, Chariton, and Saline Counties, Missouri, USA

This investigation presents an analysis of groundwater vulnerability in three mid-Missouri counties that represent an agricultural production region that is physiographically and hydrogeologically complex. Anthropogenic activities create a potentially vulnerable environment as groundwater is exposed to contamination from agricultural practices that threaten the sustainability of high-quality groundwater as a natural resource.

The goals of this study are to (1) provide a spatial analysis of the elements and conditions under which groundwater of the study area may become contaminated, and (2) develop a model and decision support process for identifying particular portions of these counties that are vulnerable to agricultural chemical applications. Geospatial analysis is based on hydrogeological elements that are collectively incorporated into the DRASTIC model, a groundwater pollution potential evaluation system. The seven elements that are combined in the model are Depth to Water (D), Net Recharge (R), Aquifer Media (A), Soil Media (S), Topography (T), Impact of the Vadose Zone (I), and Hydraulic Conductivity (C). A Geographical Information System (GIS) provides the geoprocessing capability to collect, analyze, display, and disseminate this data.

The culmination of combining the hydrogeological setting elements is a range of numerical values termed the DRASTIC Index. Derived by combining the seven DRASTIC element index values, a range of values are developed that have been classified to represent groundwater vulnerability. Statistical data grouping is implemented in order to differentiate three categorical index ranges (High, Moderate, Low). Resulting distribution of data in this model indicates that high vulnerability exists at over 32 percent of the study area, primarily in the most intensively farmed Missouri River floodplain. Moderately vulnerable areas comprise nearly 39 percent of the area, and the least vulnerable areas make up the remaining 29 percent of the total area.

A GIS-based groundwater vulnerability map generated by this process provides a decision support mechanism for landowners, agricultural producers, and state and local agencies engaged in investigating the relationship between hydrogeologic-anthropogenic system elements and protective ecosystem planning and management efforts.