Use of a Hydrogeologic Framework to Examine the Effects of Agricultural Fertilizers and Manure Applications on Nutrients in Shallow Ground Water of the Mid-Atlantic Coastal Plain

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The spatial distribution of nutrients in shallow ground water of the Mid-Atlantic Coastal Plain and processes that control this distribution are being evaluated within the context of a surficial hydrogeologic framework and other landscape variables. The newly developed framework provides a more detailed understanding of the surficial hydrogeology in this area than was previously available. In the Mid-Atlantic Coastal Plain, agriculture accounts for 29 percent of the land use. Confined animal feedlot operations (CAFOs), including poultry and swine, are particularly prevalent in the Delmarva Peninsula and in North Carolina, respectively. Agricultural practices involving the application of inorganic fertilizers and animal wastes from CAFOs can have major effects on the water quality in the surficial aquifer system. For instance, application of manure and fertilizers, which adds nutrients to the soil, can lead to increases in the concentration of nutrients in shallow ground water. In previous ground-water studies of the Delmarva Peninsula and the Mid-Atlantic region, nutrient concentrations in ground water were found to be higher beneath agricultural areas than beneath other land uses.

The vulnerability of ground water to nutrient contamination is controlled by a number of factors such as geology, soil type, hydrology, and land use. We are conducting a regional synthesis of existing ground-water data from the Mid-Atlantic Coastal Plain as part of the National Water Quality Assessment (NAWQA) Program. The data will be analyzed in the context of a regional hydrogeologic framework that was developed to define areas of the Coastal Plain where the occurrence and movement of chemicals into the shallow ground water and streams are controlled by a relatively consistent set of natural factors. In our study, we will describe nutrient concentrations and their mobility in the shallow ground water, analyze spatial patterns in regional nutrient data, and compare these spatial patterns to fertilizer and manure application data for particular areas of the framework.

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