

THE PROBABILITY OF CONTAMINATION OF GROUND WATER BY NITRATE IN NEW JERSEY

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ABSTRACT

Hydrogeologic, well-construction, land-use, and water-quality data were used to determine the probability of contamination of ground water by nitrate in New Jersey. Univariate and multivariate statistical tests were used to determine the best predictors of nitrate contamination at threshold concentrations of 1-, 3-, 5-, and 10-milligrams per liter as nitrogen (mg/L NO_3^- as N). A logistic-regression model was used in conjunction with a geographic information system (GIS) to map the probability of nitrate contamination of shallow ground water based on nitrate analyses from 1,126 wells with open intervals less than 33 meters below land surface and a minimum-separation distance of 1,000 meters. The percentages of urban and agricultural land use within a 500-meter-radius-buffer zone of the well were significant (p -value less than 0.05) predictors of ground-water contamination by nitrate at the 1- and 3-mg/L NO_3^- as N threshold levels. GIS maps show that the probability of contamination of ground water by nitrate at a concentration equal to or greater than the Federal and State drinking-water standard of 10-mg/L NO_3^- as N was largest in agricultural areas in southwestern New Jersey. Ground water beneath this highly susceptible area eventually discharges either to streams that then discharge to the Delaware River estuary or directly to the estuary. The quantity of nitrate in ground-water discharged to streams was determined previously, however, the amount of nitrate discharged from ground-water directly to the estuary is not known.

KEYWORDS

Ground water, contamination, nitrate, probability, water quality, drinking water, land use, agriculture, urban, New Jersey, Delaware River estuary