

Potential Exposure of the Nation's Waters to Animal Manure

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The National Water-Quality Assessment Program (NAWQA) has studied the effects of agricultural and urban land use on the quality of the Nation's streams and ground water since 1991. Analysis has emphasized the presence and distribution of nutrients and pesticides derived primarily from anthropogenic nonpoint sources. Regional investigations of major river and aquifer systems, called Study Units, give perspective to emerging water-quality issues, such as the potential movement of nutrients from animal-feeding operations (AFO's) to nearby streams and shallow ground water (less than 80 feet deep). Analysis of data from the first 20 Study Units distributed across the Nation has demonstrated that nitrogen and phosphorus yields to streams and nitrate concentrations in shallow ground water generally increase with increased concentration of land applications of fertilizer and animal manure. The concentrations of nutrients in water also are related to local conditions of soils, geology, and hydrology. Census of Agriculture data on animal populations from the 1980s and 1990s were plotted by county on national maps to compare regional distributions and patterns of change over time. Nitrogen content in manure from different animals also was estimated and compared to the distribution of well-drained soils as an initial estimate of potential AFO effects on shallow ground-water quality.

Although AFO's were not specifically studied as sources of nutrients in water, some inferences about AFO effects in various regions can be made from the available data. In five Study Units in the eastern and the central United States where animal manure was substantially applied to the land, rankings of nutrient concentrations in streams and shallow ground water were excessive compared to the other Study Units. The general trend was high concentrations of nitrate in ground water where manure was applied as fertilizer and where the soils and the aquifer material, such as those comprised of permeable sand and gravel, karst limestone, or fractured rock, were susceptible to relatively rapid recharge. Compared to background conditions, elevated concentrations of nitrogen and phosphorus were detected in some streams near farmland where animal manure was applied. Areas of sloping, low-permeable soils were associated with some of the highest concentrations of nutrients in streams.

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