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Impacts of Historical Changes in Land Use and Dairy Herds on Water Quality in the Catskills Mountains

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ABSTRACT

Surface water eutrophication has been linked to nonpoint sources of agricultural nutrients. Based

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on 1938 and 1968 aerial photos and 1993 Landsat imagery of a 31.7 km² watershed, corn (*Zea mays* L.)/hay rotation, pasture, forest, and impervious/water land uses were digitized in a raster GIS. Monthly runoff volumes resulting from each year's land use were predicted using a variable source area hydrologic model. Historical data on dairy animal populations and the spatial distribution of current soil test phosphorus (STP) levels were used to derive manure loading intensities. Event-mean SP concentration in runoff as a function of manure application intensity and soil test P was derived from field data and published sources. The maximum predicted event-mean SP concentration in runoff was 15.8 mg L⁻¹. Watershed average potential SP loading to perennial streams remained essentially constant at 0.14 kg ha⁻¹ yr⁻¹ over the period 1938 to 1993. Herd size and total manure load dropped significantly over the period 1938 to 1993; however, the P content in manure and confinement of animals increased, counteracting the hypothesized trend that SP loading would drop. The analyses indicate that, for 1993, <6% of the agricultural land accounted for 50% of the agricultural SP load, suggesting that with improved manure handling practices over a relatively small area, it may be feasible to reduce SP loads to streams.

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