

CHESAPEAKE BAY REGION

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Abstract: Soil net nitrogen mineralization and nitrification rates were studied on nine relatively undisturbed, forested watersheds in an effort to explain the large variations in nitrate export in streamflow within the Chesapeake Bay region. The primary hypothesis tested was that nitrate export from the watersheds was positively associated with rates of net soil nitrogen mineralization and net nitrification in the upper 10-cm of mineral soil. Rates of soil net nitrogen mineralization and net nitrification were measured over a 5-week summer incubation period (June-July) using nine buried bags in each of the three major soil types on each watershed. High, medium, and low nitrate export watersheds, respectively, exhibited the high, medium, and low mean net nitrogen mineralization and net nitrification rates at $\alpha = 0.05$. C/N ratios and soil moisture content together explained 44% of the variation in soil nitrogen mineralization rates and 41% of the variation in soil nitrification rates. The percent of total nitrogen in the upper 10-cm of mineral soil explained 46% variation in watershed nitrate export, while the percentage of mineralization due to nitrification explained 42% of the variation in watershed nitrate export. Estimated rates of wet and dry atmospheric deposition of nitrogen were not significantly correlated with watershed nitrate export. The percentage of N in the upper mineral soil and soil net mineralization and nitrification rates show promise as indicators of nitrate export from forested watersheds within the Chesapeake Bay region.

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