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Nutrient Contamination from Non-point Sources: Dissolved Nitrate and Ammonium in Surface and Subsurface Waters at EKU Meadowbrook Farm, Madison County, Kentucky

Reid E. Buskirk
Eastern Kentucky University

Hunter R. Evans
Eastern Kentucky University

Walter S. Borowski
Eastern Kentucky University, w.borowski@eku.edu

Jonathan M. Malzone
Eastern Kentucky University

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Nutrient contamination from non-point sources: Dissolved nitrate and ammonium in surface and subsurface waters at EKU Meadowbrook Farm, Madison County, Kentucky

Reid E. Buskirk, Hunter R. Evans, Walter S. Borowski, Jonathan M. Malzone
Department of Geosciences, Eastern Kentucky University, Richmond KY 40475

Abstract

Agricultural activities often contaminate watersheds with excess nutrients leading to poor water quality and eutrophication. We assayed dissolved nutrient levels in surface and subsurface waters of Eastern Kentucky University's Meadowbrook Farm in order to assess levels of dissolved nutrients leaving its farmland and draining into the Muddy Creek watershed. The Farm raises both crops and livestock so that nutrient sources include fertilizer and manure. We sampled springs, runoff, and subsurface pipe drainage as well as Muddy Creek on six days from May to August 2016 under a variety of weather conditions. Using established, standard colorimetric methods, we measured nitrate (NO_3^-; cadmium reduction method) and ammonium (NH_4^+; sodium hypochlorate method) via spectrophotometry with a precision and accuracy of ~0.1 mg/L.

Nitrate was the dominant dissolved nitrogen species whereas ammonium was often absent in water samples. Nitrate levels were typically <2 mg/L N- NO_3 with the largest values between 7.0 and 14.3 mg/L. Springs and some runoff samples had higher nitrate values. Ammonium generally ranged between 0.0 and 0.5 mg/L N- NH_4 with concentration spikes between 2.0 and 4.3 mg/L, but from no consistent source.

Dissolved nitrogen concentration values responded to rainfall. Generally, nitrate concentrations increased more than ammonium concentrations during wetter periods. Spring samples maintained higher nitrogen concentrations regardless of different rainfall conditions.

Lastly, nitrate contamination was significantly lower than composite national values from streams draining agricultural lands, whereas ammonium was about equal to the median national average. Median nitrate concentration was ~1.8 mg/L N- NO_3 compared to the national value of ~2.8 mg/L, whereas the value for pristine streams is 0.24 mg/L N- NO_3 (Dubrovsky et al., 2010). Median ammonium values from both data sets are ~0.1 mg/L N- NH_4; the national value from pristine streams is ~0.025 mg/L N.

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