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Mediation of eutrophication of surface and subsurface water from non-point sources:

Nutrient monitoring at Meadowbrook Farm (Madison County, Kentucky)

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Abstract

Non-point sources from various human activities such as farming have replaced industrial point sources as contributors of many contaminants in surface and subsurface waters of the United States. Eastern Kentucky University's Meadowbrook Farm (720 acres, ~2.9 km²; Madison County, Kentucky) is a teaching facility dedicated to improving farming techniques and discovering best practices for farm operations that include minimizing environmental impacts. Agricultural activities on the Farm contribute nutrients to the Muddy Creek (Kentucky River) watershed that promote eutrophication and degrade water quality. Farm management already uses protocols to mediate drainage of dissolved nitrogen off the Farm, but also wants to limit phosphorus contributions by developing a phosphorus sequestration program. To correctly assess the success of sequestration, phosphorus export from the farm must be quantified before sequestration efforts begin and then after implementation.

For the next several years before phosphorus sequestration begins, we will quantify nutrient export of a representative portion of the farm acreage by measuring stream discharge and nutrients (orthophosphate, PO₄³⁻; total phosphorus; nitrate, NO₃⁻; and ammonium, NH₄⁺) over a constructed weir. Once sequestration begins we will continue to monitor nutrient export and compare before-and-after results to test the efficacy of phosphorus sequestration efforts. Our team initiated work to characterize nutrient drainage from the Farm in summer 2016.

Geology and farming combine to control runoff and the nutrient content of Meadowbrook Farm waters. Two main overland drainages are developed on the Farm and a series of 10 springs drain into Muddy Creek on the Farm's southern and eastern borders. Springs emanate from the Boyle Dolomite (Silurian) and often connect to surface drainage, which can then run for as little as 10 m or up to 100's of meters before entering Muddy Creek. Crop area of the Farm is underlain by a network of tile drains, some of which discharge directly into Muddy Creek whereas others discharge into channels that feed overland drainage. Our team sampled waters from all 3 major sources and from Muddy Creek to assess dissolved nutrient levels with results given as a series of student poster presentations presented at this conference.

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