USA Nutrient managment forecasting via the "Fertilizer Forecaster": linking surface runnof, nutrient application and ecohydrology.

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USA and state nutrient management planning offers strategic guidance that strives to educate farmers and those involved in nutrient management to make wise management decisions. A goal of such programs is to manage hotspots of water quality degradation that threaten human and ecosystem health, water and food security. The guidance provided by nutrient management plans does not provide the day-to-day support necessary to make operational decisions, particularly when and where to apply nutrients over the short term. These short-term decisions on when and where to apply nutrients often make the difference between whether the nutrients impact water quality or are efficiently utilized by crops. Infiltrating rainfall events occurring shortly after broadcast nutrient applications are beneficial, given they will wash soluble nutrients into the soil where they are used by crops. Rainfall events that generate runoff shortly after nutrients are broadcast may wash off applied nutrients, and produce substantial nutrient losses from that site. We are developing a model and data based support tool for nutrient management, the Fertilizer Forecaster, which identifies the relative probability of runoff or infiltrating events in Pennsylvania (PA) landscapes in order to improve water quality. This tool will support field specific decisions by farmers and land managers on when and where to apply fertilizers and manures over 24, 48 and 72 hour periods. Our objectives are to: (1) monitor agricultural hillslopes in watersheds representing four of the five Physiographic Provinces of the Chesapeake Bay basin; (2) validate a high resolution mapping model that identifies soils prone to runoff; (3) develop an empirically based approach to relate state-of-the-art weather forecast variables to site-specific rainfall infiltration or runoff occurrence; (4) test the empirical forecasting model against alternative approaches to forecasting runoff occurrence; and (5) recruit farmers from the four watersheds to use web-based forecast maps in daily manure and fertilizer application decisions. Data from on-farm trials is being used to assess farmer fertilizer, manure, and tillage management decisions before and after use of the Fertilizer Forecaster. This data will help us understand not only the effectiveness of the tool, but also characteristics of farmers with the greatest potential to benefit from such a tool. Feedback from on-farm trials will be used to refine a final tool for field deployment. We hope that the Fertilizer Forecaster will serve as the basis for state (USA-PA), regional (Chesapeake Bay), and national changes in nutrient management planning. This Fertilizer Forecaster is an innovative management practice that is designed to enhance the services of aquatic ecosystems by improving water quality and enhance the services of terrestrial ecosystems by increasing the efficiency of nutrient use by targeted crops.