Forecasting the fate of fertilizer in the Chesapeake Bay watershed

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Reducing the runoff from plant nutrients that can eventually wash into the Chesapeake Bay could someday be as easy as checking the weather forecast, thanks in part to work by U.S. Department of Agriculture (USDA) scientists.

One way farmers manage manure from their livestock is by applying it to crop fields, which increases soil levels of nitrogen and phosphorus. But when it rains, the nitrogen and phosphorus in freshly applied manure is much more likely to run off and pollute nearby water sources, which can end up degrading water quality throughout the watershed.

Hydrologist Tony Buda and soil scientist Peter Kleinman with USDA's Agricultural Research Service (ARS) are contributing to the development of a Web-based "fertilizer forecast." The scientists want to create a tool that produces 24-hour and 5-day runoff forecasts that are as user-friendly as weather forecasts.

The scientists are based at the ARS Pasture Systems and Watershed Management Research Unit in University Park, Pa. ARS is USDA's primary intramural scientific research agency.

The researchers are using National Weather Service (NWS) predictions of precipitation, soil moisture, and other data to design a simple hydrologic model that indicates the probability of field runoff occurrence. As part of this work, they are analyzing how runoff measurements in different Pennsylvania regions correlate with different

NWS data sets for the same areas.

For instance, the scientists have found that soil moisture forecasts are a strong indicator of nutrient runoff potential in fields underlain by fragipans, which are dense subsurface soil layers that can block water movement through soil. But at sites with other soil characteristics, runoff potential is much more strongly associated with other variables, such as forecasts of rainfall amounts.

The team hopes that when their "forecast" is ready, it will give farmers a user-friendly tool that can be used to optimize fertilizer runoff management and enhance water quality.

More information: Read more about this work and other research in University Park to protect the Chesapeake Bay in the August 2010 issue of *Agricultural Research* magazine, available online at: www.ars.usda.gov/is/AR/archive/aug10/bay0810.htm

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