Thursday, May 1

Session M5: Quantifying Agricultural Nonpoint Sources and Controls

3:30 – 5:00 pm | Room 233

A Regional Assessment of the Effects of Conservation Practices on In-Stream Water Quality

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Abstract
The Conservation Effects Assessment Program (CEAP), initiated by USDA Natural Resources Conservation Service (NRCS), has the goal of quantifying the environmental benefits of agricultural conservation practices. As part of this effort, detailed farmer surveys were compiled to document the adoption of conservation practices. Survey data showed that up to 38 percent of cropland in the Upper Mississippi River basin is managed to reduce sediment, nutrient and pesticide loads from agricultural activities. The broader effects of these practices on downstream water quality are challenging to quantify. The USDA-NRCS recently reported results of a study that combined farmer surveys with process-based models to deduce the effect of conservation practices on sediment and chemical loads in farm runoff and downstream waters. As a follow-up collaboration, USGS and USDA scientists conducted a semi-empirical assessment of the same suite of practices using the USGS SPARROW (SPAtially Referenced Regression On Watershed attributes) modeling framework. SPARROW is a hybrid statistical and mechanistic stream water quality model of annual conditions that has been used extensively in studies of nutrient sources and delivery. In this assessment, the USDA simulations of the effects of conservation practices on loads in farm runoff were used as an explanatory variable (*i.e.*, change in farm loads per unit area) in a component of an existing a SPARROW model of the Upper Midwest. The model was then re-calibrated and tested to determine whether the USDA estimate of conservation adoption intensity explained a statistically significant proportion of the spatial variability in stream nutrient loads in the Upper Mississippi River basin. The results showed that the suite of conservation practices that NRCS has catalogued as complete nutrient and sediment management are a statistically significant feature in the Midwestern landscape associated with phosphorous runoff and delivery to downstream waters. Estimates of the magnitude of this effect using SPARROW indicated that conservation practices have played a significant role in reducing nutrient pollution from agricultural activities to downstream receiving water bodies.

Monitoring Methods Used to Improve Agricultural Best Management Practices Evaluations at the Edge-of-Field Scale

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Abstract
The Great Lakes Restoration Initiative (GLRI) is an interagency effort that seeks to accelerate ecosystem restoration in the Great Lakes by confronting threats to the region, such as nonpoint source pollution. Three Priority Watersheds having a high density of agricultural land use and clearly identified ecosystem impairments have been targeted: Fox River/Green Bay in Wisconsin, Saginaw River in Michigan, and Maumee River in Ohio. As part of GLRI, the U.S. Department of Agriculture Natural Resources Conservation Service, U.S. Environmental Protection Agency, and the U.S. Geological Survey (USGS) have partnered to conduct environmental research on privately owned farms applying agricultural conservation practices. Monitoring methods are modeled after previous USGS studies in which locations were targeted within study watersheds that were directly affected by conservation efforts. This

method allows for a rapid assessment of water-quality changes due to conservation efforts and focuses on the major pathways for nonpoint source pollution to enter the stream.

The principal objective of this study is to develop an understanding of the effect of differing agriculture practices on the quantity and quality of runoff water from monitored farms, including edges of fields and subsurface drains, and the effect of this water on receiving streams and agricultural drains. To meet this objective, study tasks include: quantifying annual and event-by-event runoff volumes and losses of sediment, nutrients, and chloride; collecting meteorological data to help establish cause-and-effect relations between agricultural practices and water quantity and quality; and ensuring that the data are accurate and made available in USGS reports and databases.

This presentation will review the study design utilized and describe the unique settings in which edge-of-field and subsurface tile monitoring exist. In addition, the challenging conditions that exist for year-round monitoring in the Upper Midwest will be identified and approaches to overcome them will be suggested.

Neonicotinoid Insecticide Occurrence in Iowa Streams during the 2013 Growing Season

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Abstract
Neonicotinoid insecticides are of environmental concern, especially because of potential adverse effects to pollinators, but little is known about their overall occurrence in surface water. Neonicotinoids are commonly used in both agricultural and urban settings. Most current research has focused on their fate near the point of application (“edge of field”). These compounds are water soluble (log Kow <1) and have aqueous half-lives on the order of months, so they have the potential for offsite transport. Iowa was chosen as the study location because of the high agricultural use of neonicotinoids for both seed treatment (corn and soybeans) and in aerial applications. Water samples were collected monthly from nine sites during the growing season from pre-plant to harvest (March to October, 2013) with additional storm-runoff samples collected when possible. All samples were analyzed for six neonicotinoids (acetamiprid, clothianidin, dinotefuran, imidacloprid, thiacloprid and thiamethoxam). Clothianidin (detected in 90% of the samples), thiamethoxam (67%), and imidacloprid (33%) were the most frequently detected compounds in the samples collected to date (March-August). During the 2013 planting season (May-June), clothianidin and thiamethoxam were both detected in nearly all samples (>97%) while imidacloprid was detected in 61% of samples. Detections and concentrations of all neonicotinoids decreased later in the growing season (July-October) most likely because of a combination of time since planting and applications, and also lack of rainfall. Additional samples were collected at a wastewater-impacted stream (above, at the outfall, and below a wastewater treatment plant) in central Iowa during winter low-flow conditions (streamflow approximately 99% effluent) and spring flow conditions (11% effluent). Results document generally conservative transport of clothianidin and imidacloprid over an 8 km reach. Concentrations during such winter conditions indicate that these compounds can persist long after initial application and are also present in wastewater effluent. Clothianidin concentrations were lower in the wastewater effluent than the corresponding upstream samples (predominantly agriculture), while imidacloprid concentrations were higher in the wastewater effluent than the corresponding upstream samples indicating a potential urban signature for imidacloprid.

The National Water Quality Initiative’s Monitoring Framework

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Abstract
In 2012, the United States Department of Agriculture (USDA) launched a National Water Quality Initiative (NWQI). The Natural Resources Conservation Service (NRCS) is collaborating with the Environmental Protection Agency (EPA) and state water quality agencies to reduce nonpoint sources of nutrients, sediment, and pathogens related

to agriculture in small priority watersheds in each state. These priority watersheds are selected by NRCS State Conservationists in consultation with state water quality agencies and NRCS State Technical Committees. NWQI provides a means to accelerate voluntary, private lands conservation investments to improve water quality and to focus water quality monitoring and assessment funds where they are most needed. USDA is designating approximately five percent of EQIP financial assistance to targeted agricultural conservation practice implementation in 165 HUC 12 NWQI watersheds. NRCS has dedicated funding for Edge-of-Field monitoring of conservation systems in approximately six NWQI watersheds. EPA is working with the state water quality agencies to track progress through instream water quality monitoring, that also helps support NRCS' future modeling efforts. State agencies are using Clean Water Act 319 or other funds to conduct water quality monitoring in at least one priority watershed per state. The goal of NWQI instream monitoring in selected watersheds is to assess whether water quality conditions for nutrients, sediments, and/or pathogens (from livestock) have changed in NWQI watersheds and if so, whether it can be associated with agricultural conservation practices in the watershed. This initiative enhances partnerships at the local, state, and federal level to address nonpoint sources of pollution in priority watersheds across the US.