REGIONAL EFFECTS OF AGRICULTURAL CONSERVATION PRACTICES ON NUTRIENT TRANSPORT

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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 are a statistically significant feature in the Midwestern landscape associated with nitrogen 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.

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