Assessing the Effects of Conservation Practices and Fertilizer Application Methods on Nitrogen and Phosphorus Loss from Farm Fields – A Meta-Analysis

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2015 Interpretive Summary

This project aimed to use two tools of meta-analysis--propensity score and multilevel modeling--to quantify P loss reductions arising from soil and water conservation practices. It uses the MANAGE database, which provides field scale information on nutrient loss from agricultural land.

Applied to the 2007 version of the MANAGE database, the two analytical tools each found that conservation practices (one or more of waterways, contour farming, terraces, and buffers) reduced total P loss by approximately 70%. In addition, they found that the conservation practices reduced the incremental increase in total P loss per unit increase in fertilizer application. These results have been published in the Journal of American Water Resources Association (Qian and Harmel, 2015).

An additional paper is nearly ready for submission on the analysis of the October 2014 version of the MANAGE database, which includes 65 peer-reviewed publications (ten more than the 2007 version) covering 1,980 watershed years. One important finding was that many of the factors influencing the reported nutrient losses are confounded; for example, fields with higher rates of applied nutrients were more likely to have conservation practices implemented. Thus, to accurately assess the efficacy of these conservation practices, the two tools described in the preceding paragraph need to be applied. The graduate student, Stephanie Nummer, hopes to complete her MSc thesis by May 2016. This work helps assure accurate interpretation of the large databases being compiled to quantify the efficacy of 4R practices.