USDA-CSREES 2007 National Water Quality Conference

Effectiveness and Optimization of BMPs in Improving Water Quality from an Agriculturally Dominated Watershed

The landscape of the Ozark Highlands of Northwest Arkansas is a complex arrangement of geologic features, soil types, vegetation, and land use. Nonpoint source transport of nutrients, sediment, and pathogens from agricultural activities is a major concern in this area; rolling hills in this region are home to thousands of poultry farms and pastures that produce forage for numerous beef and dairy cattle, resulting in an abundance of animal manure. The predominant use of manure in the area has been as a fertilizer for perennial forage crops. There is growing concern that excess land applications of the manure can lead to surface and ground water pollution due to increased runoff losses of sediment, nutrients, and pathogens. This study seeks to quantify the effects of best management practice (BMP) implementation, timing, and spatial distribution on sediment and nutrient loss reduction and watershed ecological integrity with a focus on Lincoln Lake watershed, a primarily agricultural watershed in NW Arkansas. In its initial stages, this study synthesizes historical field-, farm- and watershed-level watershed and water quality data to determine relationships between BMPs and their influence on watershed-scale water quality. Further, this study performs comprehensive modeling analyses, using the Soil and Water Assessment Tool - SWAT, to determine how land use and management changes over a 10-year period have affected sediment and nutrient loadings from the various subwatersheds in the watershed. We first present our assessment of BMP impacts on watershed water quality, as determined from the analyses of historical data. We then present SWAT model simulations of flow, sediment and nutrients from selected response units and at the watershed outlet over the evaluation period. Finally, we discuss our results as related to other components of this study as well as to their implications on watershed management in the Lincoln Lake watershed.

Author: M. W. Gitau
University Affliation: University of Arkansas
Co-Author(s): I. Chaubey and M.A. Nelson