USDA-CSREES 2007 National Water Quality Conference

Simulation of BMP Water Quality Impacts in a Northeast Iowa Watershed

The Sny Magill Creek watershed (SMCW) covers 9,126 ha of the Paleozoic Plateau region in Clayton County in northeast Iowa. Nearly 80% of the annual stream flow of the creek is attributable to baseflow, which results in cold water conditions. Land use in the SMCW consists of forest (48.9%), pasture (23.9%), and cropland (25.9%). The primary shifts in land use during the 1990s were an increase in soybean acreage (from land previously planted in corn) and greater participation in the Conservation Reserve Program (CRP). Extensive installation of BMPs occurred in the SMCW during the 1990s, including over 82,000 m of terraces and 722 ha of contouring. Analysis of SMCW water-quality data collected during 1991-2001 shows that BMPs installed during the 1990s resulted in a 7% decrease in total suspended solids (TSS). However, an increase in nitrate concentrations of 15% was found at the SMCW outlet. Simulation of the SMCW conditions will be reported based on an application of the USDA Soil and Water Assessment Tool (SWAT) model within a simulation framework constructed around the use of Common Land Units (CLUs). The CLUs serve as the hydrologic response units (HRUs), which are smaller non-spatial (i.e., percentages of land area) land units within each of the 12 subwatersheds defined in the SWAT simulation. Although the HRUs are non-spatially defined within the SWAT simulation, the use of the CLUs for the HRUs does provides a basis for linking SWAT runoff, erosion, and other estimates back to specific land parcels within the watershed. This provides a means for a more direct assessment of the impacts of various BMPs that have been introduced in the watershed at the CLU level. The simulation approach used for the study will be presented, including the methodology for defining the CLUs as the HRUs in each of the SWAT simulations. The results of assessing baseline conditions will also be presented, including issues pertaining to the temporal variation of BMP installation, which occurred mainly during the 1990s in the SMCW. The impacts of different hypothetical BMP configurations will further be shown, including a scenario depicting the impacts of no BMPs having been installed in the watershed.

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