2008 USDA-CSREES National Water Conference
Sparks, NV

Effects of management practices on nutrients and sediment in runoff determined with SWAT for Wahoo Creek Watershed of southeastern Nebraska

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Abstract Text:

Nutrients and sediment loss from watersheds contributes to water quality pollution. A study was conducted to determine the impact of agricultural practices on nutrients and suspended sediment loss from Wahoo Creek watershed. Runoff and loading of sediment and nutrients were assessed using SWAT simulation. The Wahoo Creek watershed area is approximately 93,000 ha. Land use is 34% corn, 32% soybean, and 24% pasture. The rest of area consists of alfalfa, trees, other crops, and low urban density. Aksarben and Judson are the dominant soil series. Eight years (1996-2003) of weather data, Ssurgo soil data, and land use data were used for model simulation. SWAT divided the watershed into 28 sub-basins to investigate the most susceptible areas in the watershed based on the flow at the watershed outlet, P, nitrogen, and sediments concentration. The result of the analysis indicated that hydrologic response unit within sub-basins affected stream flow and nutrients outputs. The upland areas, in corn and soybean production, and with diverse soil series including Sharpsburg, Aksarben, Morril, Steinauer, and Judson were the most susceptible subbasins to nutrients and sediment loss. Current conservation practices, including terraces and dams, are estimated to decrease stream flow, nutrients and sediment loss at the watershed outlet by 60 % compare with if no conservation practices were in place. Physical parameters such as soil curve number (CN), soil K factor, and soil root depth (SOIL Z) were the most sensitive parameters during the model sensitivity analysis. Model was over predicted stream flow, sediment load and nutrient concentration with daily data simulation compared with monthly and yearly simulation.

Impact Statement:

Watershed modeling can be useful for planning and assessing implementation of BMPs for water quality protection. Identification of key source areas is important in managing sediment and nutrient loss.

The impact of watershed characteristics on surface water quality depends on sevral factors, such as geology, soil P content, soil erodibility watershed size and shape, topography, and land use. Therefore, SWAT was used to identify the most susceptible areas that contribute nutrients and sediment to surface water, and evaluate the impact of different agricultural practices such as dams, terraces, residue and grass filter strip within watershed subbasins.