

SWAT Model Application to Assess Nitrogen loadings from the Kaskaskia River Basin in Illinois

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Abstract: The Future Midwest Landscape (FML) project is part of the U.S. Environmental Protection Agency's new Ecosystem Services Research Program, undertaken to examine the variety of ways in which landscapes that include crop lands, conservation areas, wetlands, lakes and streams affect human well-being. The goal of the FML project is to quantify current and future ecosystem services across the region and to examine changes expected to occur as a result of the growing demand for biofuels. Increased anthropogenic inputs of nitrogen from fertilizer application and fossil fuel combustion can lead to eutrophication, hypoxia and contamination of drinking water. Eco-hydrologic models can be employed to simulate how future conditions may affect nitrogen turnover and transport. In this study, Soil and Water Assessment Tool (SWAT) model was used to assess the impacts of land use change and management practices have on nitrogen loadings to streams within the Kaskaskia River Basin (071402) in Illinois, a 6-digit HUC watershed of the Upper Mississippi River Basin. A base land use map for 2001 was developed by incorporating different sources, and maps for 2005, 2010, 2015 and 2020 were generated by using crop yield estimates. Several scenarios of management practices, such as tillage and fertilizer application, were created to simulate their influences on crop production and nitrogen loadings in the watershed. The results showed that nitrogen loadings increased due to larger crop areas and greater fertilizer application. This study also provided several suites of management practices for reducing nitrogen loadings from the Kaskaskia River Basin.

Keywords: Future Midwest Landscape study, SWAT model, watershed modeling, conservation practices, ecosystem services, nitrogen.