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Application of SWAT and APEX Models Using SWAPP (SWAT/APEX Program) for Dynamic Fertilizer Management Application

In response to the Clean Water Act of the early 1970s, the Agricultural Research Service (ARS) branch of United States Department of Agriculture (USDA) initiated the development of several process-based nonpoint source models. These models are used to assess and evaluate various BMPs (best management practices) at field (using Agricultural Policy/Environmental eXtender, APEX) and watershed (using Soil Water Assessment Tool, SWAT) levels. However, these models are capable of simulating a limited number of scenarios individually. During this study the SWAPP (SWAT/APEX Programs) program is developed to facilitate the simultaneous use of these two models. The SWAT (version 2003) and APEX (version 2110) models are applied using the SWAPP program to the upper North Bosque River (UNBR) watershed located in central Texas. Flow and loadings (sediment and nutrient) from various land uses, such as cropland and pasture, are simulated by APEX and then are routed by SWAT within the SWAPP program. SWAT alone (SWAT-A) and combined SWAT and APEX models within the SWAPP program were calibrated and verified against historical monitoring data collected within the UNBR watershed during a recent study. Herein, the APEX model within the SWAPP program is modified to allow manure application rates to change dynamically within the simulation as a function of soil test P. The modified APEX and SWAT models within SWAPP are tested using data from a subbasin within the UNBR watershed. The results obtained from this study show that the SWAPP program enables one to simulate field level management scenarios, such as multicropping, dynamic manure or fertilizer application, and filter strips using APEX through SWAPP program, since SWAT has limited ability to simulate these practices.

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