



**Title:** Use of the SWAT Model for Modeling Manure Nutrient Imports in Turfgrass Sod to a Suburban Watershed

**Name:** Chad Richards

**Email:** chad-richards@tamu.edu

**Organization:** Texas A&M University

**State:** TX      **Region:** Southern

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**Theme:** Watershed Management

**Situation:** Texas has developed a TMDL for P in segments of the Upper North Bosque River that includes a mandate for a 50% reduction of soluble reactive P loading. One suggested BMP is the export of P through turfgrass sod produced with composted dairy manure from the impaired watershed to another receiving watershed. The transplanted sod could eliminate P fertilizer applications on receiving watersheds. Research is required to verify the fate of manure P before and after sod harvest as well as potential impacts this may have on the watershed scale.

**Objectives:** The objectives are to: 1) quantify the export of P and N through turfgrass sod fertilized with composted dairy manure; 2) use experimental data to calibrate the GIS-based Soil Water Assessment Tool (SWAT); 3) develop a GIS database that will quantify land areas suitable for sod production on the impaired watershed; and 4) evaluate existing nutrient transport algorithms and impacts of manure P export in sod through GIS-SWAT simulations for the impaired watershed and a possible receiving watershed, the Mary's Creek watershed.

**Methods:** The GIS-based SWAT 2000 model was used to produce a prediction of the nutrient and sediment loading in Mary's Creek. A 10-meter resolution digital elevation model (DEM) as well as land use data were collected from the Texas Institute for Applied Environmental Research (TIAER). The soil survey geographic database (SSURGO) was used as the soil input to SWAT and weather data was downloaded from the National Climatic Data Center (NCDC). USGS stream gage data along with nutrient data collected from experimental plots on the Texas A&M Research Farm were used in the SWAT model calibration.

**Partnerships:** Partnerships were established among research, extension and teaching faculty and representatives of the turf industry and animal agriculture. The turf industry collaborated in producing sod on the paired sod fields. Extension specialists supplied GIS data and modeling support.

**Research:** Research, extension, and teaching faculty have integrated the planning and evaluation of research and development of recommendations for composted manure use on sod in an extension curriculum that conveys recommendations within limits of environmental constraints. Associated faculty also offer a course emphasizing the use of the SWAT model as a watershed management tool.

**Resources:** Resources were leveraged through related proposals or funding from USDA SARE, the Texas Advanced Technology Program, Texas Cattle Feeders Association, USGS National Water Resources Institute, and the United States Golf Association Greens Section.

**Results:** Nearly 50% of the total P applied in composted dairy manure was exported in a single sod harvest in a paired field comparison. The proportion of land area suitable for sod production was found through GIS analysis to be 1.8%, which is sufficient to export all of the manure P excreted annually by dairy cows within the selected county. The SWAT model is currently being utilized to verify on a watershed scale the export of manure P to an urban watershed. Validation of the SWAT model at Mary's Creek could lead to activation of this BMP and the restoration of the Bosque River.



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