

## **Watershed Modeling of Mustang Creek, California, Using the Soil and Water Assessment Tool (SWAT)**

**Dina Saleh, Hydrologist U.S. Geological Survey, Sacramento, CA 95819,  
dsaleh@usgs.gov**

**Abstract:** This project is part of a national study on how agricultural chemicals move through the hydrologic system. The study is being conducted by the National Water Quality Assessment program of the U.S. Geological Survey (USGS) in five nationally important agricultural settings across the nation. The objective of the Mustang Creek project is to apply the Soil and Water Assessment Tool (SWAT) model to a small agricultural basin in central California. The model will be used to simulate streamflow in Mustang Creek, a tributary of the Merced River on the east side of the San Joaquin Valley. Mustang Creek has a drainage area of 20.1 square miles; the modeled area is the upper 9.1 square miles. The main land uses in the study area are vineyards and almond orchards. The defined stream channel in the study area is 1.86 river-miles long.

SWAT is a watershed-scale model developed to predict the impact of management practices on water, sediment, and agricultural-chemical yields in basins with soil, land-use, and management conditions that vary over time. SWAT uses the Soil Conservation Service (SCS) curve-number procedure for estimating surface-water runoff. The SCS curve number is a function of the soil permeability, land use, and storage capacity. The main parameter categories used in SWAT are topography, soils data, land-use information, and precipitation and climate data. Since these parameters have varying effects on model output and have varying levels of data quality, it is important to perform sensitivity analyses to determine which parameters have the greatest effect on simulated streamflow. We compared the effect of data quality of these parameters on SWAT output. The comparisons included:

1. Soils data: The soils data are available on two scales. A state-level database designed to be used for planning and management of state, regional, and multi-state areas, and a more detailed county-level database. The county-level database was used to identify the location and extent of the hardpan, which affects soil drainage, in the Mustang Creek Basin.
2. Topography: 30-meter topography obtained from the digital elevation models (DEM) versus 5-meter topography obtained by digitizing USGS topographic maps. Because the Mustang Creek Basin has little relief, a 5-meter DEM is better able to predict the streamflow paths than the 30-meter DEM.
3. Land-use information: The GIRAS (Geographic Information Retrieval and Analyses System) versus the California Department of Water Resources (CDWR) land use database. The GIRAS has a scale of 1:250,000 and was collected and developed by the USGS in the 1970s. The CDWR database was field checked in 2004 and is more representative of the land use in the area.
4. Precipitation data: Daily precipitation obtained from a weather station located in the nearby city of Modesto versus hourly precipitation data obtained from a USGS weather station located in the Mustang Creek Basin.

The evaluation of the sensitivity of SWAT to these parameters will be based on the match between the predicted (simulated) streamflow and the observed streamflow.