



# AGWA Automated Geospatial Watershed Assessment

## A GIS-Based Hydrologic Modeling Tool

*Key words:* watershed assessment; hydrologic model; runoff; erosion; geographic information systems

### Background

Planning and assessment in land and water resource management are evolving from simple, local-scale problems toward complex, spatially-explicit, regional ones. Such problems have to be addressed with distributed models that can compute runoff and erosion at different spatial and temporal scales. The extensive data requirements and the difficult task of building input parameter files, however, have long represented an obstacle to the timely and cost-effective use of such complex models by resource managers.

The U.S. EPA Office of Research Development and the USDA-ARS Southwest Watershed Research Center have developed a tool to facilitate this process. A geographic information system (GIS) provides the framework within which spatially-distributed data are collected and used to prepare model input files and evaluate model results.

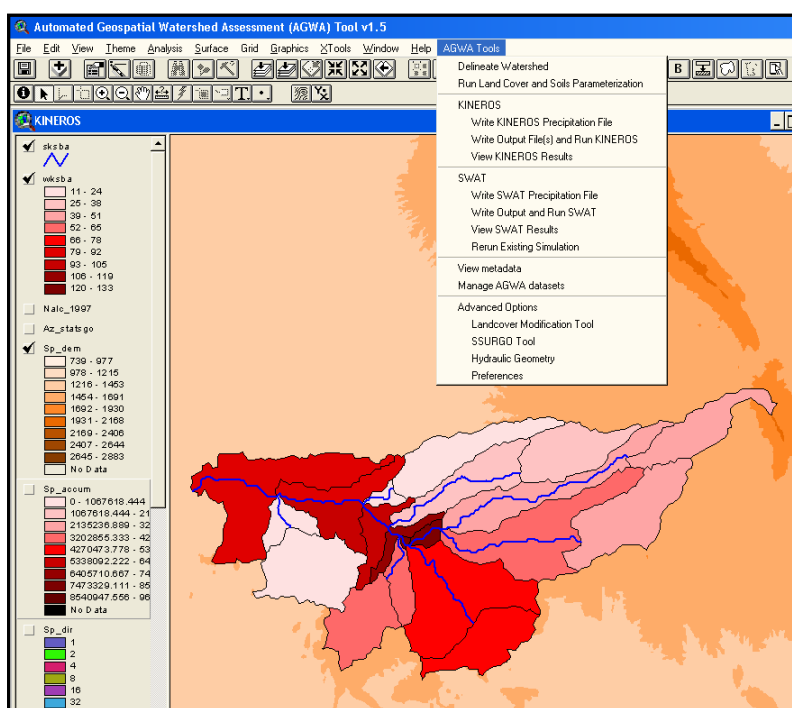
The Automated Geospatial Watershed Assessment (AGWA) tool uses widely available standardized spatial datasets that are readily obtained via the Internet. The data are used to develop input parameter files for two watershed runoff and erosion models: KINEROS and SWAT.

### KINEROS

The Kinematic Runoff and Erosion Model is an event-oriented, physically-based model developed at the USDA-ARS to describe the processes of interception, infiltration, surface runoff and erosion from small watersheds characterized by overland flow. The watershed is represented by a cascade of planes and channels, thereby allowing rainfall, infiltration, runoff, and erosion parameters to vary spatially. KINEROS can be used to determine the effects of various artificial features such as urban developments, small detention reservoirs, or lined channels on flood hydrographs and sediment yield. For more information on KINEROS, please visit [www.tucson.ars.ag.gov/kineros](http://www.tucson.ars.ag.gov/kineros).

### SWAT

The Soil and Water Assessment Tool is a quasi-distributed model developed at the USDA-ARS to predict the impact of land management practices on water, sediment and agricultural chemical yields in large, complex watersheds with varying soils, land use and management conditions over long periods of time (> 1 year). SWAT is a continuous-simulation model, i.e. a long-term yield model, using daily average input values, and is not designed to simulate detailed, single-event flood routing. For more information on SWAT, please visit [www.brc.tamus.edu/swat](http://www.brc.tamus.edu/swat).



Example of a watershed discretized by AGWA  
(Walnut Gulch, San Pedro River Basin, Arizona).

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## AGWA Description and Uses

Using digital data in combination with the automated functionality of AGWA greatly reduces the time required to use these two watershed models. Through a robust and intuitive interface the user selects an outlet from which AGWA delineates and discretizes the watershed using Digital Elevation Model (DEM) information. The watershed elements are then intersected with soil, land-use/cover, and precipitation (uniform or distributed) data layers to derive the requisite model input parameters. The model is then run, and the results are imported back into AGWA for visual display. Model outputs that can be displayed in AGWA are shown in the table to the right. This feature allows managers to identify problem areas for further monitoring and management activities. Additional functionality can generate alternative future land-use/cover scenarios and display differences between simulation outputs (potential change), designed to provide decision support when combined with planning efforts.

AGWA is designed to provide qualitative estimates of runoff and erosion relative to landscape change. It cannot provide reliable quantitative estimates of runoff and erosion without careful calibration. It is also subject to the assumptions and limitations of its component models.

## Features New to AGWA 1.5

AGWA 1.5 includes several new features to aid in watershed assessment. These features include: multiple outlet watershed discretization, parameterization and simulation; KINEROS riparian buffer simulation; SWAT hydrologic response units and water quality simulation; nested watershed discretization; improved contributing source area handling for lateral elements; and additional visual display options. The core functionality of AGWA has also been improved for more robust handling of watershed discretization and parameterization.

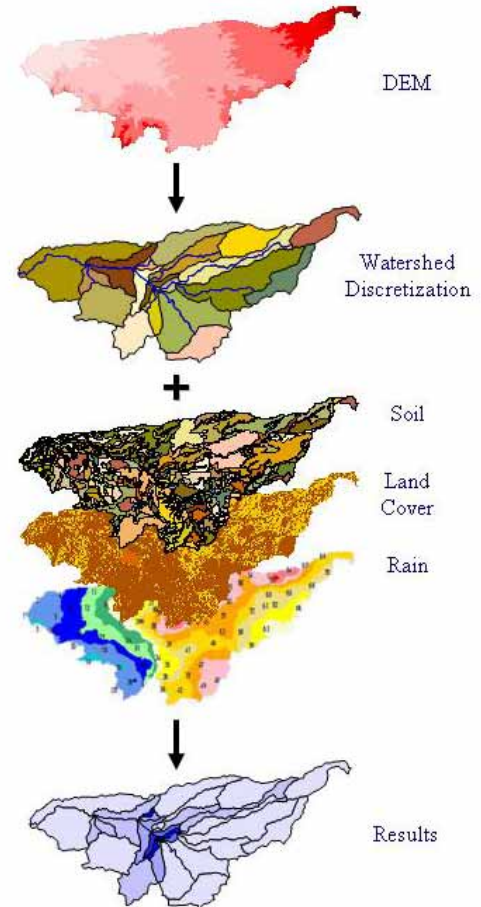
## Software and System Requirements

To use AGWA, you will need version 3.1 or later of ArcView and version 1.1 of the Spatial Analyst extension. AGWA works with the Windows 95, 98, 2000, ME, NT, and XP environments. Please note that we do not provide any technical support for AGWA.

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### Output variables that can be displayed in AGWA

KINEROS	SWAT
Infiltration (mm, m <sup>3</sup> /km)	Precipitation (mm)
Infiltration (in, ac-ft/mi)	ET (mm)
Runoff (mm, m <sup>3</sup> )	Percolation (mm)
Peak flow (m <sup>3</sup> /s, mm/hr)	Surface runoff (mm)
Sediment yield (kg/ha)	Transmission loss (mm)
Channel scour (mm/m <sup>2</sup> )	Water yield (mm)
Sediment discharge (kg/s)	Sediment yield (t/ha)

