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 USDA-ARS Southwest Watershed Research Center and the U.S. EPA Office of Research and Development, has developed a GIS 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 can be obtained via the internet. The data are used to develop input parameter files for two watershed runoff and erosion models: KINEROS and SWAT.

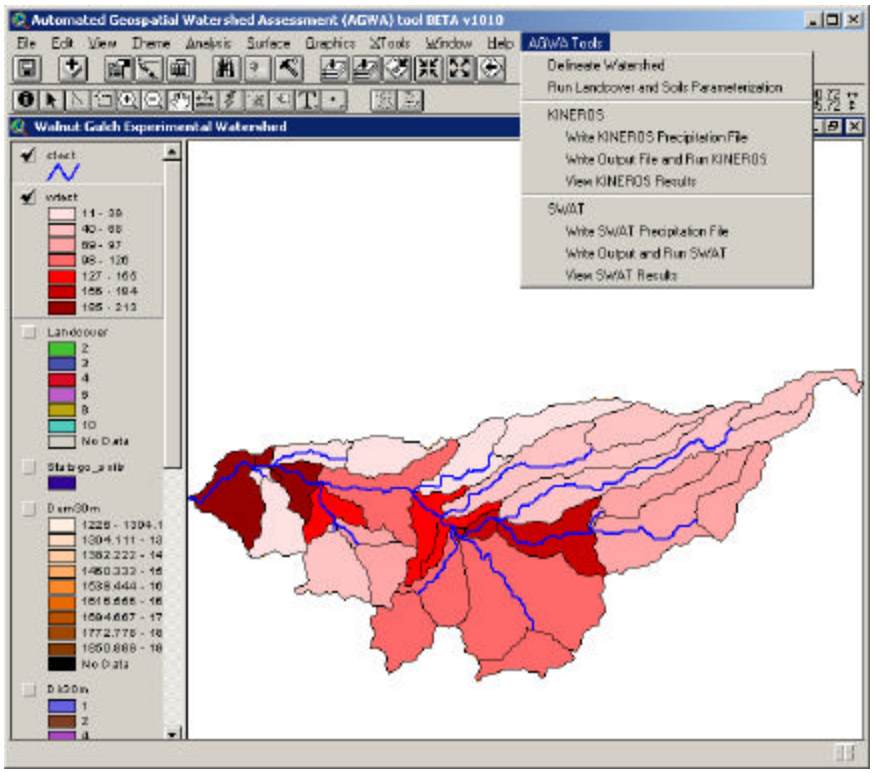

Figure 1. Example of a watershed discretized by AGWA (Walnut Gulch, San Pedro River Basin, Arizona).

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 (= 100 km^2) watersheds. The watershed is represented by a cascade of planes and channels, thereby allowing rainfall, infiltration, runoff, and erosion parameters to vary spatially. KINEROS may 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.

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 (> 100 km^2) complex watersheds with varying soils, land use and management conditions over long periods of time (> 1 year). SWAT is a continuous-time 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.

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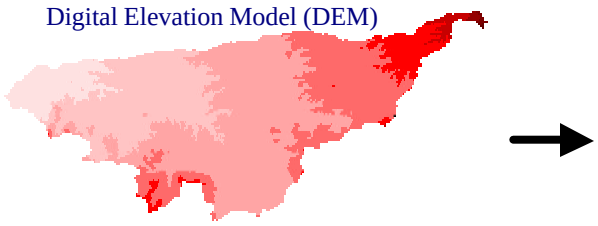

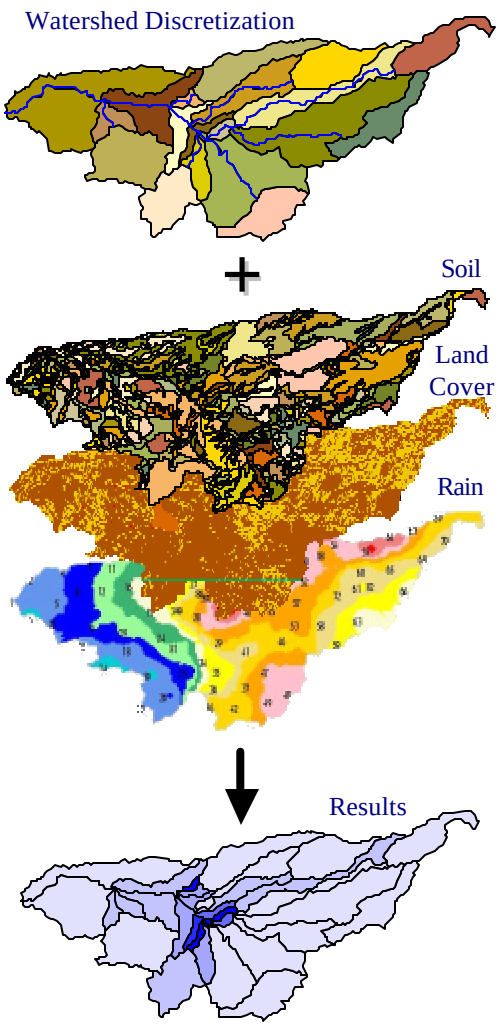

AGWA Description and Uses

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 the Digital Elevation Model (DEM) information. The watershed elements are then intersected with soil, land 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 results that can be displayed in AGWA are shown in the table to the right. This option allows managers to identify problem areas where management activities can be focused, or to anticipate sensitive areas in association 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.

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 AGWA is considered *Beta* software and does not have any technical support.

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Output variables that can be displayed in AGWA

KINEROS	SWAT
Infiltration (mm)	Precipitation (mm)
Runoff (mm)	ET (mm)
Runoff (m^3)	Percolation (mm)
Sediment yield (kg/ha)	Surface runoff (mm)
Peak flow (m^3/s)	Transmission loss (mm)
Peak flow (mm/hr)	Water yield (mm)
Sediment discharge (kg/s)	Sediment yield (t/ha)

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