

ANSWERS-2000

Model Uses Answers-2000 is a physical model that can be used for the continuous-simulation of agricultural and urban 'Best-Management-Practices' in terms of sediment and nutrient delivery to surface runoff, and the associated leaching of nitrogen through the root zone.

Major Categories Hydrology and Water Use; Water Quality; Geohydrology

Subject Knowledge Level
Advanced

Minor Categories Runoff; Leaching; Sediment Sources; Nutrient Flow

Technical Difficulty Level
Advanced

Model Type Physical Model

Geographic in Nature?
Semi

Abstract

ANSWERS-2000 is a distributed parameter, physically-based, continuous simulation, watershed scale, upland planning model developed for evaluating the effectiveness of agricultural and urban 'Best-Management-Practices' (BMPs) in terms of reducing sediment and nutrient delivery to streams as well as assessing the leaching of nitrogen through the root zone. The model is intended for use by planners on un-gaged watersheds where data for model calibration is not available.

The model divides the area simulated into a uniform grid of square (1 hectare or smaller), within which all properties (surface and subsurface soil properties, vegetation, surface condition, crop management, and climate) are assumed homogeneous. The model uses breakpoint precipitation data and simulates hydrologic processes with a 30-second time step during runoff events and with a daily time step between runoff events. The model simulates interception; surface retention/detention; infiltration; percolation; sediment detachment and transport of mixed particle size classes in rills, interrill areas, and channels; crop growth; plant uptake of nutrients; N and P dynamics in the soil; nitrate leaching; and losses of nitrate, ammonium, total Kjeldahl nitrogen, and P in surface runoff as affected by soil, nutrient, cover and hydrologic conditions.

The model has an ArcView based user interface called QUESTIONS that facilitates data file creation and manipulation.

Future Developments

Unknown

Model Limitations

The sediment detachment sub-model is empirical and out of date.

Predictions of ammonium loss in surface runoff have been poor. This sub-model needs to be updated.

Current procedures for simulating fertilizer placement are cumbersome and need to be automated.

The currently distributed version of the model does not simulate interflow and groundwater contributions to baseflow. The model is therefore inappropriate for use in watersheds where baseflow is significant. The groundwater version of the model recently developed by Bouraoui et al. (1997) may overcome this limitation.

There is no user's manual for the continuous simulation version of the model.

There is very limited user support.

The model does not currently simulate nutrient cycles and fate in receiving waters. This limits the use of the model

to small upland watersheds.

The model does not simulate snow pack and melt and is thus unsuitable for use in areas with significant winter snow accumulation and snowmelt.

Model Features

Utilizes WEPP and EPIC models and a series of other sub-routines to evaluate sediment and nutrient delivery to streams as well as assessing the leaching of nitrogen through the root zone of plants. A user interface aids in the selection of parameters and provides some default values.

Required Data Types

Input parameters include information obtained from soil surveys, topographic and Land Use maps.

ANSWERS can also utilize data exported from ArcView, ArcINFO or like GIS packages.

Hardware Requirements

Standard hardware required to run applications such as ArcView or ArcINFO.

Model Outputs

Raw output is overwhelming, but the user interface condenses, summarizes and provides graphical output, that is relatively easy to understand and use.

Outputs can be displayed spatially or temporally.

Supported Platforms			
DOS	<input type="checkbox"/>	UNIX	<input checked="" type="checkbox"/>
Windows	<input checked="" type="checkbox"/>	Macintosh	<input type="checkbox"/>

Software Requirements

ArcView, ArcINFO or similar GIS packages are recommended as they facilitate the data input process.

Cost, Licensing and Availability

Model is offered free of charge from link provided.

Source

Theo Dillaha - Virginia Tech.

Source (URL)

<http://dillaha.bse.vt.edu/answers/>