

American Water Resources Association
2010 SUMMER SPECIALTY CONFERENCE
GIS & Water Resources VI
March 29 – 31, 2010
Orlando, FL

Wednesday, March 31

1:30 PM – 3:00 PM

SESSION 35: Hydrologic and Hydraulic Modeling III

Using Ecological Sites to Parameterize a Hydrologic Simulation Model in Geospatial Rangeland Watershed Assessment Tool. - Anthony Perlinski, University of Wyoming, Laramie, WY (co-authors: Ginger B. Paige, Jeff J. Stone, Scott N. Miller, Jagath Vithanage)

Rangeland watersheds contain an inherently high level of heterogeneity. Current spatially explicit rangeland watershed decisions support tools fail to accurately model the hydrology of rangelands. Ecological sites are defined as areas of similar physical characteristics that differ from other areas in their ability to produce a particular vegetative community. Rangelands of the same ecological site in similar condition should have a characteristic hydrologic response. For that reason, we hypothesize that using ecological sites as model elements will improve the ability of rangeland watershed assessment tools to predict runoff and erosion from rangelands. The majority of federal and state land managing agencies have accepted the ecological site as the appropriate minimum scale for making management decisions on rangelands. For this reason it is useful to incorporate ecological sites into rangeland watershed decision support tools thereby increasing the effectiveness of these tools for management. The Automated Geospatial Watershed Assessment tool (AGWA) is used to compare different methods of parameterizing the Kinematic Runoff and Erosion model (KINEROS2). AGWA is a GIS based tool used to parameterize, run, and visualize watershed models. KINEROS2 is an event-oriented physically based model within AGWA that simulates the processes of interception, infiltration, surface runoff, and erosion. This study is conducted using data from a sub-watershed within the USDA ARS Walnut Gulch Experimental Watershed. The sub-watershed is comprised of two ecological sites and long-term rainfall, runoff and meteorological dataset. Rainfall simulator experiments have been conducted on both ecological sites within the sub-watershed to determine model input parameters at the plot scale. Five different runoff-producing events from 2000-2004 were selected for this study. The results compare the following methods used to parameterize KINEROS 2: the default AGWA using readily available GIS layers, ecological site based parameterization, rainfall simulator plot scale parameterization, and actual runoff from the watershed.

'WHAT' (GIS) Tool Explores the Future Environments of the Lake Okeechobee Watershed Project - Barry Wharton, HDR, Tampa, FL (co-authors: Anwar Khan, Stephanie Morse)

The Lake Okeechobee Watershed Project, a component of the ongoing Comprehensive Everglades Restoration Plan (CERP), seeks to improve stage management in Lake Okeechobee and reduce phosphorus loadings to the lake, while minimizing adverse impacts to natural habitats in the lake and its watershed. The project's large size (~1.35 million acres) and aggressive planning schedule demanded a suite of tools to rapidly forecast and assess likely environmental effects of proposed project alternatives. HDR developed a GIS-based application - the Wildlife Habitat Assessment Tool (WHAT) - to generate quantitative estimates of changes in ecological conditions likely to occur between existing (2004) and future (2050) without project conditions in the study area. WHAT was designed to forecast habitat quality and abundance (expressed as habitat units, or HUs) in ten wildlife habitat categories, including wetlands, uplands, grasslands, and open/deep waters. The tool is based on existing and future land use/land cover (LULC) mapping, underlain by a series of assumptions about habitat quality and quantity changes through time based on the surrounding LULC types. Each habitat category was initially assigned an ecological value score (EVS) based on LULC type, scientific literature, local knowledge, and best professional judgment. The WHAT then calculated HUs by multiplying the acreage of each specific habitat category by its EVS. The mapping of future LULC was based on projected future urban growth areas, existing and proposed conservation lands, and residual ("other") lands based on current long-range planning forecasts prepared by local, county, and state planning agencies. WHAT output was used in the formulation and evaluation of alternative plans. Hydrologic and ecologic benefits and cost effectiveness of three alternative plans were compared to each other and to the no action alternative and a tentatively selected plan (TSP) was identified. The WHAT tool was created using the ArcGIS ModelBuilder, which greatly reduced the run time of the

application - from many hours to several minutes - allowing for many different project alternatives to be evaluated within a short time resulting in a tremendous savings in time and effort.

Geo-RAS for Unsteady Models: Friend or Foe? - Marlene Tomaszewicz, Michael Baker Jr Inc, Alexandria, VA

GIS tools such as Geo-RAS have helped ease development of hydraulic models and develop floodplain maps of the results. Commonly used tools include cross section development, bank placement, and stream reach lengths, tools that are used to develop steady state hydraulic models. However, what about the tools for unsteady models? Unsteady models can incorporate geometric features such as ineffective storage areas, lateral weirs, and pumps. How can Geo-RAS assist with these features? Additionally, how can Geo-RAS assist with floodplain mapping results from unsteady models? This presentation will include an unsteady model for a flood mitigation study in Southwest Louisiana. Pros and cons for use of Geo-RAS for this project will be discussed. An open forum is encouraged to discuss improvement of these processes.

Customized GIS Tools to Aid in Hydrologic Modeling - Mark Schwartz, BCI Engineers & Scientists, Inc., Lakeland, FL (co-author: Jie Gao)

Several engineering firms are working with the Southwest Florida Water Management District (SWFWMD) on projects to revise the FEMA floodplain maps. Each of these consultant companies has developed custom GIS tools to supplement "off the shelf" GIS functionality with the goal of increasing productivity and accuracy on these projects. This presentation discusses the suite of tools developed by BCI Engineers and Scientists to assist and automate typical hydrologic modeling tasks such as curve number calculations, time of concentration calculations, development of cross sections, floodplain delineation, model QA/QC, and others.