VISUALIZING COMPLEX WATERSHED INTERACTIONS

Current laws and regulations require state and federal organizations to address environmental assessment and management issues at the watershed scale. New federal initiatives, such as those defined under the Clean Water Action Plan, indicate that integrated watershed studies, including restoration assessments, will become even more prevalent over the next five years. EAD is applying its experience and expertise to develop and use models, data, and other tools to help scientific teams, decision makers, and the public visualize complex watershed interactions.

PROBLEM/OPPORTUNITY

Addressing environmental issues at the watershed scale has proven difficult. The complex spatial relationships among interacting parameters and variables are difficult to understand, which hinders agencies and stakeholders as they develop restoration strategies. Important watershed initiatives can get stalled in early stages of problem definition and strategy development. Many bottlenecks result from the inability of decision makers, the public, and the members of scientific teams to visualize the complex spatial phenomena. New tools are needed that can provide realistic 3-D visualizations tied to dynamic models and watershed data. The tools should be able to show the current state of the watershed and underlying interactions and be useful for developing restoration strategies that show desired future conditions based on alternative restoration strategies.

APPROACH

EAD is starting a project that will integrate watershed models, data, and visualization tools to give organizations a method of communicating complex watershed interactions to interested parties. Addressing watershed issues often involves difficult negotiations among stakeholders who define alternative strategies in nonquantitative terms. When alternative strategies can be visualized, negotiations can focus on core issues, and assessments are more likely to address these issues in a quantitative manner. Tools that integrate models, spatial data, and visualization techniques would provide interdisciplinary teams with a common focal point for problem development, definition, and approach.

EAD will use distributed parameter watershed models that are currently complete and have been accepted by the stakeholder community. Each watershed model will be coupled with a geographic information system (GIS) to create a model/GIS data system. Powerful 3-D rendering software that has recently become available allows specific model variables and parameters within a GIS to be photorealistically positioned in a 3-D landscape (the watershed). EAD will link this software to the model/GIS system to provide a quantitative, but visual, interface for model initialization, scenario development, and model output. Each parameter or variable will have a corresponding set of visual markers. Both historical (i.e., presettlement) and alternative future watershed landscapes will be visually portrayed. In addition, EAD has compiled a number of landscape indices that will be used to quantify landscape conditions.

A key component of the initial effort will be developing partnerships with federal and state watershed managers and scientists who can help

provide watershed data or develop specific issues. Partners who can help EAD locate a study watershed are also needed. The watershed cannot be larger than about 20,000 hectares, and, if possible, GIS database coverages (including detailed topography, land cover classifications, and soil classifications) for the area should be available.

Results

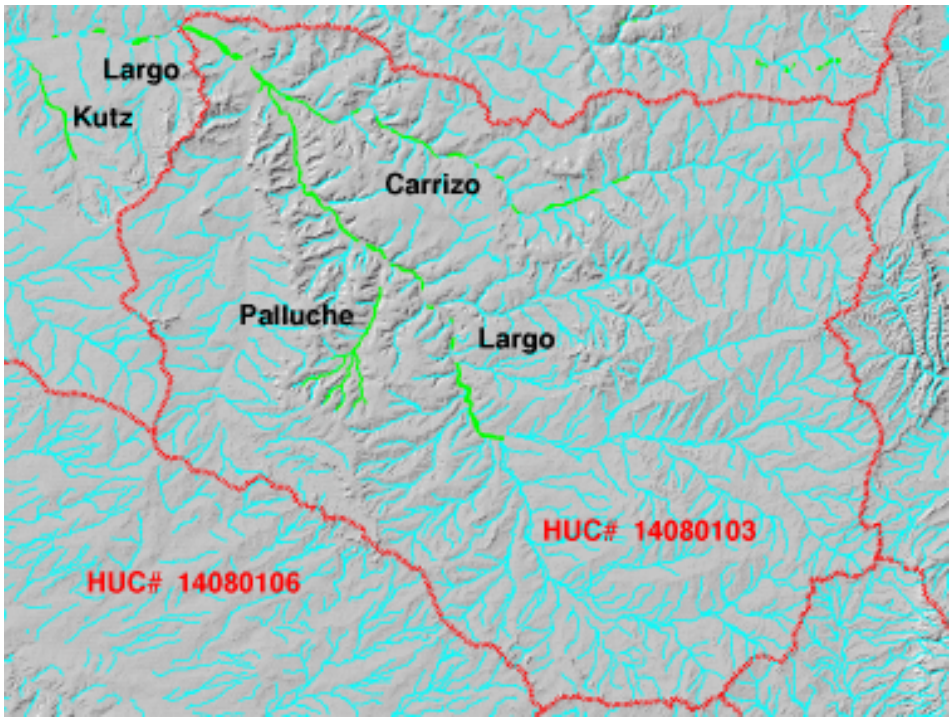
This project was started in December 1999. A partnership was established with Region 5 of the U.S. Environmental Protection Agency; the State of Wisconsin Department of Natural Resources, Watershed Restoration Division; and the Fox River 2000 organization. The Silver Creek Watershed will be used for prototype testing. Silver Creek is the primary drainage for Green Lake, the deepest inland lake and highest-priority watershed protection project in Wisconsin. Currently, EAD staff are processing the digital elevation files, developing model parameters, and using Landsat data to set the initial conditions for World Construction Set, the landscape visualization software that will be used for this project.

Future

By implementing this project in partnership with Wisconsin and the EPA, EAD will become a recognized participant in the expanding area of watershed restoration programs carried out at the state level. Feedback obtained from partners will give EAD an opportunity to develop an operational tool that can be used in other watershed projects.

Communication of Results

EAD staff will present study results at two national conferences. In addition, results will be featured on the State of Wisconsin Department of Natural Resources web site.



Visual representation of riparian habitat areas in northern New Mexico, with shaded relief and U.S. Geologic Survey hydrologic unit watershed boundaries

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