CSREES National Water Quality Program

Title: An Internet-based Spatial Decision Support System for Rangeland Watershed Management

Name: D. Phillip Guertin **Email:** phil@srnr.arizona.edu

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Abstract:

Situation: The impact of livestock grazing on water quality, especially erosion and sedimentation, is an important concern in the southwestern United States. In response to Federal and State regulations, Best Management Practices (BMPs) for rangeland management are being developed and implemented in many western states, although the efficacy and economic impact of many practices have not been examined. To assess the potential effectiveness of BMPs, a Spatial Decision Support System (SDSS) has been designed to integrate water quality, livestock management and economic concerns.

Objectives: The development of an operational GIS-based, integrated watershed-planning tool deployed via the Internet that provides land managers with the information necessary to evaluate the effects of livestock grazing impacts on water quality. The tool will be capable of evaluating available BMPs that can be implemented to mitigate detrimental impacts and assessing economic ramifications of management decisions. The Internet-based SDSS provides core functionality required for rangeland watershed management planning and decision-making.

Methods: Users have the capability to dynamically delineate watersheds by clicking on a map to locate a watershed outlet and perform simulations using hydrologic models with parameter sets derived from soils and land cover GIS data layers. The application provides a “thicker” client to delineate rangeland management systems. Hydrologic and economic simulations are performed on user delineated management systems and results are presented in a spatial, graphical, and tabular format.

Partnerships: The project has been a collaborated effort between researchers and extension agents at the University of Arizona and researchers with USDA Agricultural Research Service’s Southwest Watershed Research Center located in Tucson, AZ.

Research: This project is an extension of a project between ARS, UofA and the EPA’s National Exposure Research Laboratory that created the Automatic Geospatial Watershed Assessment (AGWA) tool designed to evaluate landscape change. This project added to AGWA functionality for evaluating rangeland BMP’s and converted AGWA to an Internet-based application. The tool has been used for instruction in several University courses. Working with extension agents, capabilities are being added into the application to utilize rangeland monitoring data and NRCS ecological site guides.

Resources: This project has resulted in several new efforts with the Arizona Department of Environmental Quality, EPA, ARS and the U of A TRIF program that are expanding the application’s capabilities.

Results: The Internet-based SDSS for rangeland watershed management is currently being validated. As with other applications deployed via the web, the Internet based SDSS provides advantages over traditional desktop applications. First, the application is centrally located, simplifying distribution and maintenance. In addition, the Internet based approach increases the user base by reducing costs of access to users. The current version of the Internet-based SDSS was targeted for rangeland watershed management. In future versions the Internet-based SDSS the functionality will be expanded to address Intergraded Watershed Management and Planning for semiarid watersheds. Additional information can be found at http://www.tucson.ars.ag.gov/sdss