Web based data delivery and decision support tool

STATEMENT OF THE PROBLEM
One of the responsibilities for the planning departments of the City of Columbia and Boone County is to distribute geographical data sets such as parcel maps, soil, geology and administrative boundaries to the public and other departments. Presently most of the geographical data sets are distributed through photocopies, CDs or Disks. This method of data distribution is costly and time consuming. One of the requirements identified by the end users in a series of ICREST-local government planners meetings was to develop simple tools for geographical data dissemination and decision support.

In addition, critical to the success of the Synergy local government demonstration project is the ability to provide timely and tailored products to the selected user community through a concept called "info mart". An info mart provides a way to maintain a small set of data that is oriented to the "essential" application needs of a given set of users and eliminates having to "navigate" a large data source. Additionally, the info mart provides guidance about how to use the scientific data provided in the mart. The info mart prototypes are initially a web server and a web browser. It includes both Internet and Intranet applications. Info mart architectures will need to become more robust and scalable as the info mart products prove their operational value. Realizing the importance of user requirements and the info mart approach, we have developed a Web-based data delivery and decision support tool for serving GIS datasets to city and county officials as well as the citizens of Boone County.

TECHNICAL APPROACH TAKEN

1. A Web based data dissemination tool
The Internet is chosen as a development platform for the data delivery mechanism and decision support tool because of platform independency, low cost, ease of use and wide accessibility. Design and development of the Web-based data delivery and decision support tool involves client server technology wherein the client makes a request to the server and the server gives the results back to the client. This task was accomplished by applying software, such as ArcView GIS and Internet Map Server (ArcView IMS or ArcIMS), ArcView Image Analysis (AIA) extension, Java, JavaScript, HTML and Avenue programming (for detail see URL: www.bocomo.missouri.edu). Figure 1 shows the Web-based data delivery interface developed for Boone County. The overall client server transaction processes involve design and development of client front end, customization of the ESRI's Map café Java applet, and adding more analytical functions in Arcview GIS. The client front-end was built using HTML and JavaScript. Java programming was used to customize and to add more functionality to the ESRI Map café Java applet. The Avenue scripting language was used to add more GIS functions in Arcview GIS. The graduate student was assisted in the development of this web based data dissemination tool.

Figure1: Web Site for BOCOMO

2. Decision Support Tool

The decision support tool was developed using the Environmental Sensitivity Model (ESM), which identifies and prioritizes local watersheds based on several environmental criteria. The ESM was developed using the above-mentioned methodology in collaboration with storm water planners of the city of Columbia. The present prototype of the ESM tool was developed using a few watersheds in the county as testing sites (Figure 2) and has eleven environmental criteria.
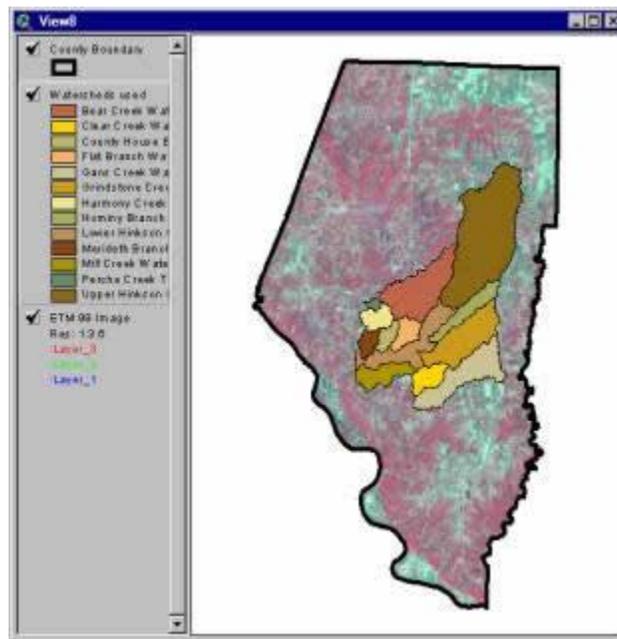

Figure 2: ESM testing site

The criteria include degree of land slope, 100-year flood plain, wetland, delineated karst topography, designated regulatory stream use, presence of wooded stream corridors, and macro-invertebrate distribution. The ESM uses a multi-criteria evaluation approach and allows the user to execute the analysis in the Web by assigning relative

weights to each criterion. Figure 3 shows the ESM criteria and weight interface and Figure 4 demonstrates the Model output.
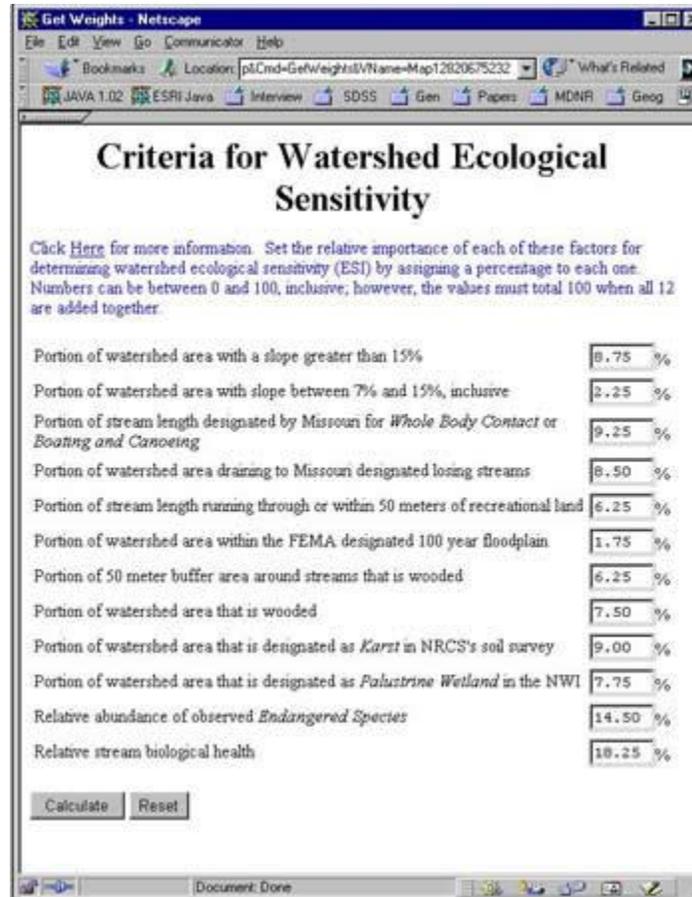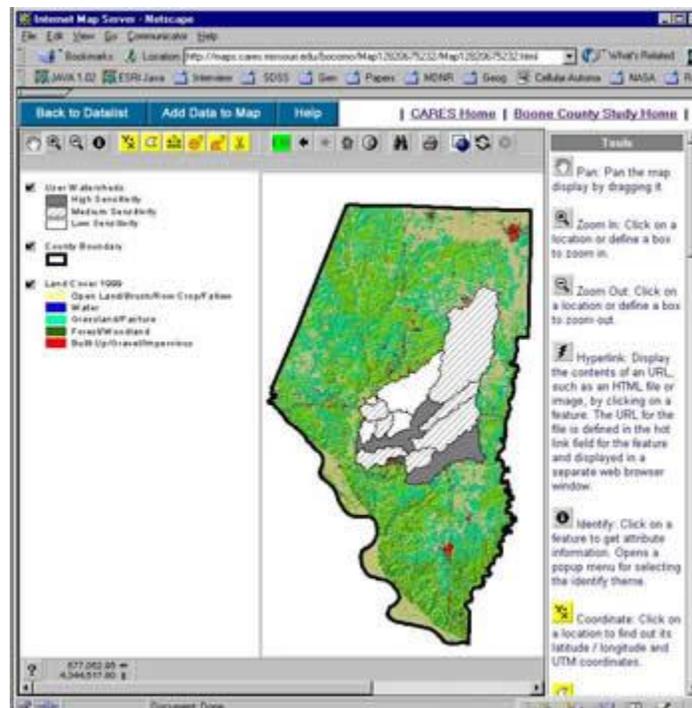

Figure3: ESM criteria interface

Figure4: ESM output

The Web-based data delivery and decision support tools were demonstrated and were well received by city and county officials. These tools will aid in the data dissemination and development of consensus regarding specific local areas deserving increased protection and the public policies to be pursued in minimizing the environmental impact of future development.

Additional information on these University of Missouri ICREST activities can be found at: http://www.geog.missouri.edu/synergy

THE WEB BASED DATA DELIVERY AND DECISION SUPPORT TOOL EVALUATION

The web-based data delivery mechanism was demonstrated to the end users and received several feedbacks. The positive feedbacks include, the interface is easy to use, simple method of data access, required no additional geo-based software, several interactive tools such as zoom in, zoom out, query, download and print, and also saves money and time for city and county officials. The negative feedback includes slow, require high bandwidth (the amount of data transmitted or received per unit time) to view satellite images, no facility to view the local data sets and need for additional interactive tools. The end users suggested we enhance the data dissemination interface with additional tools such as the digitization tool, image-clipping tool, customized printing tool and also an intranet facility (the end users do not want to share certain data sets, which are works in progress, with the public). In future work these tools will be added and improvement will be made to the data dissemination interface.

The present prototype of the ESM tool was developed using only a few watersheds in the county as testing sites and has limited environmental criteria. County and city officials desire this tool for the entire county and want to include more criteria in the ESM model. The future work will enhance the ESM tool by adding more environmental criteria and also an assessment will be done for the entire county.

ANTICIPATED IMPLEMENTATION PROBLEMS IN URBAN GOVERNMENT

The methods used to develop a Web-based data dissemination and decision support tool from this project will be implemented because they provides i) a simple, cost effective mechanism for the data delivery, ii) education of the public and others about urban growth through the Web and ii) education of planners and mangers to use the simple web-based decision support tool to identify and prioritize the local watersheds based on several environmental criteria

ADDITIONAL WORK

·1)The Web interface enhancement with additional tools such as the digitization tool, image-clipping tool, customized printing tool;

·2) Facility to add and view the local data sets;

·3) Different compression algorithms (for example MrSID) will be tested to improve the speed in serving the images;

·4) Development of an intranet for Boone County;

·5) Improving the ESM tool by adding more environmental criteria and incorporating an assessment for the entire county.

PROJECT PARTICIPANTS

Dr. Ramanathan Sugumaran, Dr. Chris Fulcher, Mr. Daniel Zerr, Mr. Jim Meyer and Eric Compas (graduate student) of Center for Agricultural, Resource and Environmental Systems (CARES), 130 Mumford Hall, University of Missouri, Columbia, 65203. Email: sugumaranr@missouri.edu. The end users are: Thad Yonke, Bill Florea and Ross Short of County Planning and Zoning Department, John Fleck and Susan Vale of City Planning Division.