

2006-2007 Learning Technologies Grants Proposal

(COVER PAGE)

Project Information

The Development of a Web-enable map server to enhance Ecological Training

Project Title

Elizabeth Kramer

Project Director

Institute of Ecology

Requesting Department

\$25,000

Amount Requested Year 1

Amount Requested Year 2

Project Director's Signature

Proposal Endorsement Signatures

Department Head

Dean

Proposal Abstract (100-word maximum)

Spatial analysis skills are critical for ecological studies. There have been two barriers for ecology students to develop these skills and they are a lack of access to ecological data and the complexity of GIS software used to analyze these data. The purpose of this project is to create an interactive web-based map server which will provide ecology students with access to a series of natural resource datasets and simple analysis tools which will enhance their understanding of ecosystems and the distribution of flora and fauna in Georgia, and to provide teaching materials for a number of ecology undergraduate and graduate courses. Once complete, the web-server will be made available for others to access these data and materials, by providing a clearinghouse for projects, laboratory and lecture materials.

Section I. Project Description

Nature of the innovation

The purpose of this project is to create an interactive web-based map server which will provide datasets to students in the ecology program which will enhance their understanding of ecosystems in Georgia and the distribution of biodiversity within the state. In addition to information on natural systems in Georgia, other data such as land cover, impervious surface density, tree canopy density and various census data products will be integrated into the system allowing students to interactively assess human impacts on natural systems. By providing these data in a web-based environment rather than stand alone, students will be able to explore data without having to have extensive training in Geographic Information Systems (GIS).

Ecological processes are inherently spatial; however, GIS software requires users to overcome steep learning curve before they can begin to analyze many datasets that are currently available. This steep learning curve prevent students from being able to perform simple analysis for class projects and discourages the use of spatial analysis in thesis and dissertation projects. New internet based mapping software products allow the user to perform simple analysis on data which don't require an extensive knowledge of GIS. These types of analyses include data overlays, queries, and other measurements. Web-based systems can now be designed to involve more complex analysis and even be used for 3-D data visualization. Students in ECOL 8900 (GIS for Environmental Planning- currently in the CAPP system as ECOL 6310), will learn to create a set of web-based modules that perform these complex analysis as class projects. Other courses will be benefit from these new modules develop by ECOL 8900 students by accessing various GIS modules and datasets for their course labs and lectures. We will integrate the data into a number of ecology courses including ECOL 1000, 3500, 3530, 4010, and 4310. This project will enhance all students' cognitive spatial skill sets.

Need/Rationale

Recent developments in web based maps have become the new "killer app". Sites such as Google Earth, Yahoo maps, and Microsoft's Live Local have proven to be very popular as a tool for finding directions and identifying information such as ATM locations, restaurants, etc. The potential of this technology is just being explored. In fact, these sites now have user communities which actively integrate information via forums and use these sites as outlets to share information within a broad user community. However, these sites focus on the built environment and lack any capability for interpretation and analysis.

Over the past 10 years the Natural Resources Spatial Analysis Laboratory (NARSAL www.narsal.ecology.uga.edu) has developed a number of statewide datasets including a land use trends datasets (land cover for 1974,1985, 1992, 1998, 2001 and 2005), an assessment of Biodiversity, and most recently a time series of maps depicting the changes of impervious surface and forest canopy for the state. These data reflect a \$5 million investment by a number of foundations, government agencies and other private sector organizations. They also represent a unique resource that is not available to any other state. A number of these datasets are made publicly available via the Georgia GIS Clearinghouse. Although the clearinghouse provides public access to these datasets, it does not have an interface for which a non-GIS user may access these datasets. This limits the utility of the datasets for analysis by those with limited access to

either GIS software or skills in manipulating geospatial data. This project will develop a web-based tool that will provide access to students and faculty on campus and eventually throughout the University System to these datasets.

A web enabled map server will provide a unique opportunity to link numerous data layers such as Census data, land cover, impervious surface extent, tree canopy extent and species distributions allowing users to explore relationships between the natural and built environments. Ultimately, these data can enhance our ability to link landscape change to issues of public health, environmental policy, tourism needs, land conservation, recreational opportunities, etc.

Over the past 25 years the state of Georgia has experienced unprecedented growth. We are now the 10th most populous state in the nation. In addition it is expected that the state will double its population again in the next 25 years. This change has implications for every aspect of our lives including the environment, housing, business, social services, government functions, education, agriculture, forestry, etc. This web enabled map server provides an opportunity for students of multiple disciplines to have the ability to explore solutions which can be used to guide Georgia through the next decade.

The web site will include the following functions an internet enabled map server, an area where student projects will be posted and an area for tutorial materials and suggested lab materials for faculty. Data sets developed by the Natural Resources Spatial Analysis Laboratory will provide the initial base maps for the project. Other statewide data layers that are currently distributed through the Georgia GIS Clearinghouse will be incorporated into the map server. As student projects are completed and data sets are developed these data will be added to map server. In addition, we will work with various agencies and governments to add data to the map server over time. Finally, the web site will expand the geographic extent first to the Southeastern US; then nationally and finally we will serve global data sets if available.

Relevance of the project to unit and University Priorities

The project represents an integration of public service and outreach, instruction and research by the Institute of Ecology. The data were develop as part of the public service mission of the Institute of Ecology and will be incorporated into instruction and research. In addition it will introduce students to geospatial technologies, one of the most rapidly developing fields of employment in the country.

Because the project encourages and supports the free flow of information and ideas, there is hope that it can lead to the development of new technologies and increase the use of existing technologies. Geographical Information Systems is one of the fastest growing areas of technological adoption. The user community has grown to include such diverse occupations as utility management, marketing research, business logistics, and real estate development. Government entities are using the technology for emergency management, public health management, cancer research, environmental protection, natural resource management, wildlife disease research, transportation planning, and tourism. In addition, the key industries in the state, such as forestry and agriculture are beginning to use these technologies to improve their practices. The use of the technology is endless. This project will play an integral role in training the next generation of GIS users and developers. The University of Georgia has been always a

key player in the development of these technologies; this project will allow the University to maintain that role.

Specific courses benefiting from the project and number of students served

Course	Title	Students	Semester
ECOL 8990	GIS for Environmental Planning	20	Spring
ECOL 4010/6010	Ecosystem Ecology	30	Spring
ECOL(FORS) 4310/6310	Limnology	30	Fall
Ecology 3530	Conservation Ecology	20	Fall
ECOL 1000	Ecological Basis of Environmental Issues	600	All
ECOL 3500	Ecology	360	All

Section II. Budget

Itemized budget

Item	Quantity	Total Cost	Requested from LTG	Provided By other Sources
Personnel				
Data Manager/Web Manager	6 months	20,000		20,000
Project Manager Dr. Liz Kramer	2 Months	12,000		12,000
System support Jeremy Sanderlin	1 month	3500		3500
Equipment				
Dual Processor web server	1	5400	5400	
data storage	1	15,000	15,000	
Tape backup	1	4600	4600	
Supplies				
software		32,000		32,000
Total Costs		92,500	25,000	67,500

Budget Justification

Personnel costs for the data manager/web manager will be covered by external funding. NARSAL was recently funded by the US Forest Service to develop a web based mapping system

for the Southeastern US, the database and web development is covered as part of the forest service grant. Project management includes 2 months of salary for Dr. Liz Kramer, to oversee the web site development and to work with other faculty to develop course materials. Dr. Kramer's salary is funded by the Institute of Ecology. In addition, the Institute of Ecology will provide system administration support over the course of the project and beyond.

Equipment costs are for a server to run multiple web-based applications and to store over 2 terabytes of data. The system includes a blade sever with a fiber channel switch to the storage array. The system architecture is being established for expandability over time. In addition to data storage a tape backup system is being requested. We currently have priced a Dell PowerEdge 1850 Server and an AX150 Fiber Channel Array for data storage.

In addition we have secured a donation from Leica Geosystems for their new internet mapping software called Virtual Explorer. The retail value of this software and all of its modules is \$32,000. In addition to the software the company is providing direct access to their development team to assist us in the development of new applications for this software.

Timeline for development of the project

Project timeline

Date	Objective	Person(s) Responsible
11/06 – 1/07	<ul style="list-style-type: none"> • Purchase equipment • Hire data manager/web manager • Setup computer and software • Develop database 	Liz Kramer Data manager/web manager
1/07 - 4/07	<ul style="list-style-type: none"> • Design Web pages • Integrate database with web pages 	Data manager/web manager
5/07 – 6/07	<ul style="list-style-type: none"> • Rollout of web site • Test and debug web site 	Jeremy Sanderlin Data manager/web manager
7/07 - 8/07	<ul style="list-style-type: none"> • Develop training materials for interested faculty • Identify additional funding opportunities 	Liz Kramer
8/07 - 11/07	<ul style="list-style-type: none"> • Work with ecology faculty to access website and create course materials 	Liz Kramer
1/08 - 6/08	<ul style="list-style-type: none"> • Integrate website into ECOL8900 • Evaluate effectiveness of program • Adjust website to improve usefulness 	Liz Kramer

	<ul style="list-style-type: none"> • Design additional training for user community 	
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Section III. Learning Outcomes

Learning outcomes and how resources will be used to achieve these outcomes.

Learning outcomes include a better understand of how GIS technology can be used in natural resource and environmental planning and management. Students will gain insight into the variety and breadth of data available for decision making. Students will have a greater appreciation for how data are developed and the types of uses and misuses that occur with GIS data. And finally, students will get a better understanding of how prevalent the technology in society.

Students will enhance their skills with geospatial technologies, learn some of the basic concepts in map making and increase their competency with innovative computer technologies.

A section of the site will provide a clearinghouse for new lab materials developed for a number of courses at the Institute of Ecology. The site will be setup to encourage faculty from around campus and other institutions to share their lab exercises and lecture materials on the clearinghouse.

Methods for evaluating the project and learning outcomes

Students enrolled in GIS for environmental planning will immediately be able to integrate the data directly into their course projects. The course currently uses a case study approach to learning and this project will be directly incorporated into future lectures and labs. Students from other courses will be able to post their project results on the website. The site usage will be monitored so that we can easily track the extent of the user community beyond the original course. We will be able to track feedback from the greater user community through the webpage interface. I will use an interactive area on the web page as a way of tracking the success of the project.

Potential applications in other academic areas

The focus of the current project is to enhance the use of GIS data for natural resources and environmental management and planning. The use of the technology is continuously growing and this system can be useful to departments in all of the colleges and schools around campus. Other potential users include Forest and Natural Resources, Marine Sciences, Agriculture and Environmental Sciences, and Landscape Architecture. We are already discussing collaborations with faculty at the Warnell School of Forest and Natural Resources.

Section IV. Support Plan

Staffing and resources to be used to continue the initiative following LTG funding

The Natural Resources Spatial Analysis Laboratory (NARSAL) is committed to providing the necessary resources for maintaining the database for the project. All future data products produced by the lab will be incorporated into the database. In addition, the Institute of Ecology will provide system administration support for the hardware. I believe that a project like this had great potential for outside funding opportunities from a variety of foundations and other sources. I also believe that this project will provide an opportunity to work with faculty and researchers around campus to expand the capabilities over time.