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Natural resource data analysis: Finding comfort with computers

James A. Stevens
Department of Forestry, Michigan State University, East Lansing

Jeremy S. Fried
Department of Forestry, Michigan State University, East Lansing

*Graduate residents develop extensive natural history knowledge and critical naturalist skills. The graduate students that come to TSS arrive with exceptional undergraduate backgrounds in the sciences, yet they have very little practical, field experience and direct knowledge of nature. At TSS, their theoretical knowledge is grounded in real world experience in nature which promotes their effectiveness as communicators and teachers. The curriculum of the PREE program has as a fundamental focus the notion that the essential character of any kind of environmental or natural resource education is helping students find a "sense of place" in their natural and human community.

*Graduate residents learn natural resource conflict management skills, including effective communication, negotiation and mediation. Often graduate students that spend a year at Teton Science School arrive with academic training in resource and environmental policy and management, but have had little real life experience working with and through conflict. Their communication skills are primitive and their understanding of the nature of conflict is underdeveloped. We help to improve these skills by exposing them to regional conflict and asking them to teach these skills to visiting students. In addition, each student participates in three intensive seminars in which they explore their personal and professional communication skills, their ability to work through conflict and their awareness of the essential elements of a professional life.

*Graduate residents use long-term, TSS field research projects as educational opportunities with students that visit TSS. Although many graduate students come with some research experience, the opportunity to teach the research process to students as well as to help them collect and analyze data, deepens their appreciation for and understanding of the nature of science. They become communicators of good science and effective management rather than merely technicians.

Offering direct exposure to these sorts of skills and experiences is difficult in more traditional university settings. The Professional Residency, because of its experiential and real-world setting, presents an interesting and effective complement to more typical natural resource education.

NATURAL RESOURCE DATA ANALYSIS: FINDING COMFORT WITH COMPUTERS

James A. Stevens and Jeremy S. Fried

Assistant Professors, Department of Forestry, 126 Natural Resources,
Michigan State University, East Lansing, MI 48824

ABSTRACT: For the past six years Michigan State University Department of Forestry has offered a course, "Natural Resource Data Analysis," that has evolved as computer technology and the skills that students bring to the class have changed. In addition to the mastery of basic computer skills, there are three principle objectives in the course: identifying a natural resource problem and obtaining relevant data; conducting an objective, quantitative analysis of the data; and presenting the analysis in a way that is clear to a non-technical audience. The course consists of a combined lecture/lab where fundamental concepts oral and written communication, quantitative analysis, and spatial analysis/cartography are introduced and a hands-on lab where students practice specific computer and analytic skills. The ultimate course objective is the presentation of an analysis of a natural resource problem via World Wide Web pages, a written report and an oral, computer-assisted presentation.

When the course was first offered in 1993, the primary course objective was to increase student proficiency in the use of computer applications and to help them become more comfortable with computers. Few students at that time came to the course with a high level of computer competence and confidence. Today's students are more likely to have gained some

computer experience before enrolling in this course, so we have now refocused to concentrate more on analysis and communication objectives.

The course has always involved teaching the core software tools that are essential in almost every professional setting: word processing, spreadsheet and presentation applications. Early on, instruction in the design and use of relational databases was included; this module has since been replaced with an introduction to GIS and geospatial analysis (which includes some elements of data management). Despite a changing mix of software, the course has always had an emphasis on integrating the applications for seamless communication through reports, spreadsheet generated graphics and slide show presentations.

The data gathering stage of the course has changed dramatically since 1993 when instructors supplied students with research oriented data sets (e.g., plot data from a regeneration study or timber price time series, fire history databases). In part due to enthusiastic student response to the GIS module, spatial information now plays a more prominent role in the course. Students are now provided with core sets of Michigan county-level geographic, demographic, socio-economic, and resource-based data. They can then supplement this core with data appropriate to the natural resource term paper topic of their choice. We expect to realize significant advantages such as improved consistency in student projects as a result of building common data sets which can also be used for weekly homework exercises.

Requiring students to search for some of the data they will analyze acquaints them with the variety of data resources now available including library reference materials, CD ROM data bases, and an increasingly rich stockpile of on-line data sources. One challenge is to teach students to think critically about the data that they find and to evaluate its suitability for the analyses they wish to conduct considering such issues as resolution/scale, lineage, accuracy, objectivity, and currency. A few years ago it was a challenge to make students aware of the World Wide Web as a resource; today the challenge is to make them understand that it is not the only resource.

The data analysis objectives for the course have been refined and are now articulated as a set of analytic tools such as descriptive statistics, trend line analysis, histograms, thematic mapping, and spatial query with which students should be proficient by the end of the course. These tools are demonstrated by the instructors and practiced by students using in-class and homework exercises. Students are expected to appropriately use a certain number of these techniques in the course of the analysis they conduct for their term projects.

All class components are integrated in the term project (which builds gradually over the semester in a series of incremental blocks). As students gather project data and develop a project prospectus, they are expected to design and publish a web site that describes the goals of their analysis and documents the sources of the data they will use. By the end of the course, students are expected to be capable of creating appropriate, clear graphics, generating focused text slides, and presenting a lucid oral report with a question and answer session. Students must also write reports that integrate tabular and graphic presentation of analysis results with documentation of analytic methods. Examples of recent student projects include: Great Lakes Water Quality, Urban Sprawl and Land Use Change in Michigan, Fire Effects in Northern Michigan Forests and Michigan Super Fund Sites.

Other uses of technology during the course include a web-based discussion page on which students are encouraged to post questions that come up between class sessions; other students and/or course instructors (who regularly monitor the site) can respond with suggestions or clarifying questions. Groups are paired so that they can offer feedback to another group on their web page information based on certain criteria (e.g., Is it clear? Are the data sources reliable?). Homework grades are regularly posted on-line allowing students to track their progress. Another innovation has been the addition of on-line quizzes available only during lab sessions. The results are automatically emailed to the teaching assistant and serve to reinforce key points as well as tracking attendance.

As the importance of computer and analytic skills has been more widely recognized, this course has been added as a requirement for both Forestry majors and as an option for Resource Development and Fisheries and Wildlife majors. The emphasis of this course has been to train students to take advantage of computer technology to make them more marketable and effective natural resource professionals. One benefit of the course is that it allows instructors of upper division courses to teach at a higher level since basic computer competency can be assumed. Comments from previous students suggest that they have been able to apply these skills both in their later education and on the job.