MALAWI TRIP REPORT

November - December 1998

Sam Drake

Dept. of Forestry   11/27
Lilongwe

Patrick Jambo
Joseph Mlotha

As I entered the computer lab with Patrick Jambo, his attention was immediately diverted to a 'customer' asking to purchase a map of Malawi showing primarily its protected areas, in relation to roads and major cities, with appropriate text labeling for reference. This hardcopy map was to be incorporated into a promotional poster and, while an off-the-shelf product would suffice, some custom design as suggested by the client could help make a stronger point. This seemed a perfect opportunity to employ ArcView's cartographic production capabilities to good effect. At least some of the PLUS data layers were available for ArcView to access, and there were existing views and layouts on the computer being used. The product was wanted within a few hours and in the end, unfortunately, it proved impossible to deliver as a custom production with all the features desired by the client. This was simply due to Patrick's lack of fluency with ArcView. When joined by Joseph Mlotha in a collaborative effort, more rapid progress was made, but still it seemed as though producing the required map would take an inordinate amount of time -- days, not hours. In the end a previously-prepared map, weak but adequate, was retrieved from a drawer and delivered to the client. I couldn't ascertain who produced this map (could have been the UA), how long it took, or how long it might take Patrick and/or Joseph to create another version to replace this map in the drawer.

The GIS issues that Patrick and Joseph felt they most needed help with were:
1. Using Idrisi files (.img or .lan format) in ArcView
2. Using imagery to detect changes in cover and quality of forested areas
3. Feasibility of onscreen digitizing with ArcView
4. Producing effective maps and posters

Joel Luhanga is the system administrator for the office. He manages an intranet comprised of one NT server and 11 workstations; a working connection to the internet and e-mail exists also. The following hardware boxes were evident:
D-Link DE809TP
US Robotics SportsterVoice 33.6 faxmodem (28800 bps)
STC Civet telephone

The office e-mail address is   sadcfstcu@malawi.net   Include "message for Mlotha & Jambo" in the subject line.

Dept. of Surveys   11/30 - 12/1
Blantyre

Geoffrey Mzembe
Thomson Sumani
Susan Nyirenda
Alice Gwedeza
Harry
Musa
John

Geoffrey's stated need for the 2 days I could spend at Surveys was for a semi-formal presentation of vector GIS concepts to his staff. Some members of the staff knew the rudiments of digitizing in a cookbook fashion, some knew principles of analog cartography but little about GIS, and Geoffrey felt that progress toward institutionalizing GIS methods in the Department was being stymied by the lack of a common and comprehensive knowledge base among its employees. While my allotted time could make only the tiniest of inroads, I offered about 12 hours of roundtable discussion/presentation of topics including the vector GIS data model vs. the raster data model; point, line and polygon feature types; database structure of spatial features as coordinate pairs; definition and importance of vector topology (nodes, vertices, directional arcs, closed polygons); concepts of connectivity, contiguity and area definition; ArcInfo's implementation of vector topology in the coverage; association of tabular attribute data with spatial features via the all-important unique feature-id number; cartesian and real-world coordinate systems; map projections; scale and resolution of data capture and display; the intended uses of ArcInfo, ArcView, Cartalinx and Idrisi; data import-export issues; the components of a working GIS or EIS, including hardware, software, data, people, and tasks or questions to be answered; data QA/QC procedures and their significance; use of an EIS for decision support; and others. Although this was far too much to cover in far too little time, the material was well received, and prompted many probing questions and engaging discussion from the group.

A particular problem plaguing the office was the inability to use ESRI's Data Automation Kit, or DAK, for digitizing. This piece of software was prone to crashing within a few minutes of the start of a digitizing session. Reinstallation hadn't helped. The cause of the instability was probably attributable to system conflicts with other installed software, but my knowledge and time were insufficient to address the problem. As a workaround solution, Cartalinx was being used as the office's data creation package, with the intention of converting digitized layers into shapefiles for use with ArcView. This seemed an acceptable semi-permanent solution if the DAK could not be made to work, since

Cartalinx was relatively easy to learn and the data conversion is feasible, but this system is not as seamless as using all ESRI products.

Surveys had begun studying the feasibility of taking the lead in building a digital database of property parcel maps and attributes for the city of Blantyre, under some sort of contractual arrangement with the responsible municipal agency. This would be a very large undertaking requiring years of effort and, though feasible in principle, Geoffrey felt that his group would not be able to accept the task. Unfortunately for all, there was no other group within Malawi which could handle the job either, so the idea will have to wait.

The Department of Surveys is not close to having a functional internet connection or e-mail access. They currently do not have a working telephone line, apparently due to billing arrears. Although the location of the Department's administrative offices is in transition, Geoffrey indicated that the technical offices will remain in their current building, which is supplied with (4?) mechanically sound phone lines that can resume service as soon as the bill is settled. All other necessary hardware and software for internet access would have to be provided.

Land Resources and Conservation Dept.   12/3 - 12/4
Lilongwe

Vincent Mkandawire
Joel G.T. Munthali

LRCD shows great potential for incorporating GIS into its work, although to be effective it must overcome deficiencies in hardware maintenance, software/system organization and staff training. During my visit the large CalComp digitizing tablet was undergoing replacement of its controller card in an attempt to get it working again after being moved across town to the new Department offices. Physical shock from being carelessly moved in the back of a pickup truck was probably responsible for the tablet's malfunctioning, though improper software reinstallation could not be ruled out. Replacement of the controller card with a new one brought from the US was undertaken as a likely cure, in the absence of a specific diagnosis. No one present in the office, including myself, was fully knowledgeable about performing such a repair, but necessity prompted Vincent to go ahead with it. The tablet was sucessfully repaired within a few days, after consultations with Doug Rautenkrantz at the UA regarding dip switch settings and other matters (no instructions were sent with the new card), and in spite of a lack of precautions against static electricity damage to the new card during installation. In my view, this affair was poorly handled and its successful outcome was a matter of good luck as much as anything. In the first place, damage to the tablet during the short move could easily have been prevented by more careful handling. Rough treatment of sensitive equipment occurs through ignorance rather than willful disregard, and this represents a gap in the training of our counterparts. More explicit emphasis should be placed on teaching proper techniques

of handling electronic equipment. Secondly, diagnosis and repair of an expensive item like a digitizing tablet should perhaps be entrusted to a qualified technician rather than left to untrained staff by default. It might be argued that such staff will "learn by doing" actual repairs, but this is specious if no instruction manual or mentor is provided. Moreover, the likelihood of expensive mistakes is very great, so the cost of hiring a repair technician is certainly justified. Kent Burger has indicated that technicians are available for hire in Lilongwe.

In addition to some help with hardware problems, it is apparent that LRCD would benefit from the services of a general systems administrator, perhaps on a periodic, consultative basis. The office is substantially debilitated by the unregulated and disorganized installation of numerous software programs on each of its computers. The clutter on hard drives and in config.sys and autoexec.bat files is so severe that some programs and peripherals (including CD drives) are not functioning properly. Somehow the tendency of staff members to install various unnecessary pieces of software on the machines needs to be controlled, and the necessary resident software needs to be organized so that the machines will boot in a reasonable amount of time and function effectively. It seems that, at present, no one in the office has the ability to bring order out of the chaos, assuming the political will exists to do so; an outside systems administrator is needed.

Staff training in ArcInfo, ArcView and/or other GIS packages is the greatest long-term need at LRCD if it is to become a quasi-independent GIS shop. During my visit I was really able to work only with Mr. Munthali, and so can speak only of his abilities, but it is likely that these are representative of the level of GIS advancement in the Department as a whole. Mr. Munthali is a willing and interested student of GIS, and knows the rudiments of tablet digitizing with ArcInfo and data display and query with ArcView. However, the extent and quality of his knowledge are so much overshadowed by the amount left to learn that it would be misleading to call him a GIS analyst as yet. Concepts of requisite spatial feature topology, unique feature identification numbers, structure and attachment of an attribute database, resolution of data capture, sources and magnitude of error, and many others are not well seated yet. Moreover, Mr. Munthali was only vaguely aware of the existence of the Malawi PLUS digital dataset, and was unfamiliar with how to use its thematic layers for a current project he was working on rather than redigitize, say, the Malawi national boundary at 1:1,000,000 scale. This situation exists as part of a matrix of institutional or enterprise problems that are fairly easy to see but difficult to solve because of their inextricable interrelatedness. In my view, the fundamental problem in getting LRCD, or any other institution, to implement a GIS as a working tool to perform routine agency tasks or to aid in decisionmaking is to simultaneously convince upper-level directors that they need spatial data products to make informed decisions, *and* to equip a cadre of technical staff to deliver such products in a reliably professional way. Both the demand from above and the supply from below must be present and mutually reinforcing if the implementation effort is to take off. This goal is within sight, but not yet achieved, in Malawi. Getting back to Mr. Munthali, he faces the problem of not being able to dedicate enough of his time to working with ArcInfo to learn it well, and doesn't have enough particular projects requiring deliverable data products for him to quickly develop the skills

necessary to produce these. The LRCD directors, for their part, are unused to asking for GIS data to use in decisionmaking, and indeed cannot yet rely on getting good quality digital data when they do recognize the need for it, so they are most likely to go on using manual methods and neglect the development of an incipient GIS. In a vicious circle or catch-22, then, the lower agency staff again do not get the opportunity to develop their GIS skills, and the whole effort languishes.

More training for employees like Mr. Munthali is necessary, but not sufficient, for the solution of this problem. It is a good first step, if a sustained investment of resources can be assured for a sufficient time without the expectation of an immediate payoff, and if sufficiently interesting real-world project work can be organized for the training of a group of GIS analysts. At some point a sensitization of upper management is needed to spark demand for spatial data products that integrate naturally with the core functions of the agency and offer some benefit over existing data or methods. If these two things are achieved, the stage is set for the interplay of supply and demand to carry the GIS to fruition and establish it as a robust and integral part of the agency.

In observing the disappointing results of periodic short-term GIS training, it seems clear that more consistent, long-term involvement is needed to really build a strong cadre of GIS analysts within an agency. My recommendation would be to post a competent GIS analyst/instructor (or more than one) in Malawi full time for at least one year. The main function of this person would be to work a fixed schedule of visits to one or more agencies, say at least one full day per week with the same people, to provide the necessary support for those learning ArcInfo or other software, using it to accomplish specific project tasks. I see this kind of support as a necessary adjunct to periodic formal training sessions in a classroom setting, which certainly could be continued to good effect. These sessions do have merit, but are simply not enough to impart a good knowledge of GIS. ESRI acknowledges that most people require at least one year of nearly full time, mentored work with ArcInfo to become competent operators, and considerably more time to approach the ability of a "super-user." How, then, can we expect our Malawian counterparts to "pick it up" from a just few weeks of training spread over several years?

About the status of an internet connection at LRCD, I didn't discuss this closely during my visit so there may be more present than meets the eye, but I did not see evidence of any necessary hardware or software. The new Department office building is supplied with working telephone lines.

ArcView Training-of-Trainers   12/7 - 12/8
Bunda College of Agriculture

Mesheck Kapila
Sam Chilombe
Steven Taulo
Joseph Jonazi

Again because of the limited time available, our objective for these two days was to prepare the four trainers named above to deliver parts of the upcoming Introduction to ArcView presentation to a class of beginning trainees, and to assist in answering questions about the five hands-on exercises planned for the class. The first day was spent on a general ArcView refresher; familiarization with the exercises and the data layers needed for those; deciding on a teaching strategy and division of labor; and transfer of pertinent teaching materials (overhead transparencies) to the trainers. Day two was spent by the trainers independently preparing their lessons for the upcoming three days of training. They put in considerable effort creating custom overheads and flipcharts, and redrafting some of the exercises in more detail. Joseph was responsible for the basic ArcView introductory material, including the structure and intent of the software, the user interface, views and themes, the five document types, the Help system, and basic display and query functionality. Sam Chilombe taught the concept of theme-on-theme selection as a fundamental 'desktop GIS' operation. Steven Taulo presented material dealing with tables in ArcView. Mesheck presented a very good session on cartographic modeling which went well beyond the confines of ESRI's Introduction to ArcView textbook.

Introduction to ArcView Training 12/9 - 12/11
Bunda College of Agriculture

With 23 trainees: Thomson G.T. Sumani, Susan Luwe Nyirenda, Lucy Kondwani, Joel Godwin T. Munthali, Charles B.L. Jumbe, Nicholas Shawa, Luke Malembo, Alice Janet Gwedeza, Jimmy John Mkumbira, Flyson Matthews N. Bonda, Lawrence Zalinga-Matias, Adams Shentone Chavula, Priska E. Munthali, Fabian K. Kalua, Amos Madhlopa, Richard Watts, Ladislas R.S. Mpando, Geoffrey C. Mamba, Amadeus Edmon R. Nyondo, Richmond Chatose Chinula, Stella Gama, John Mathews Mlava, Francis Xavier Mkanda

Despite promises from Charles Matiya and the training manager Osten Chulu of active assistance in setting up the teaching lab, this work was done by myself and Kent Burger immediately prior to the training. Eleven computers were configured with adequate hard drive space, necessary sample data layers for the exercises, and a working version of ArcView, without Spatial Analyst. Major problems to be overcome were the lack of a CD drive on any of the computers, and the availability of only one hardware key to run the international version of ArcView. Of the fifteen PCs actually present in the lab, four could not be successfully loaded with data and/or ArcView program files from an external CD drive due to an unknown operating system conflict which could not be resolved in the available time, so these machines were not used for the training.

An acute, though not unexpected, disappointment occurred on the first morning of the course when Joseph Jonazi failed to appear to present his agreed segment on ArcView Basics. Truth be told, this absence was directly attributable to a visible pattern of overconsumption of alcohol. I went ahead and delivered the introductory material myself,

and from this point the rest of the training proceeded very well. Steven and Sam both did a fine job with their sections, in spite of some nervousness from being only newly familiar with the material. It seemed to me as if the vernacular phrasing they used more easily communicated concepts to the students than the American English dialect I and other American trainers habitually used. It may well be that even new or inexpert local trainers are equally effective at teaching fundamentals as are expatriate "experts." Having handled the lectures well, there were a few (of many) audience questions posed to Steven and Sam that they preferred to have me answer, indicating some lack of ease with the material, but this could be expected. Mesheck did a superlative job teaching cartographic modeling, involving the audience in creating a relevant local example on-the-fly to generate interest, then following up with a more elaborate and formal modeling example, fully explained. He was able to answer all audience questions in a very competent way. As with the other trainers and perhaps more so, I felt his style and delivery were more effective and easily comprehensible to the audience than my own.

In the three days of training allotted, I and my three colleagues were able to cover most of the first 8 chapters in ESRI's Introduction to ArcView manual (except Geocoding Addresses, ch.7), with the addition of a segment on GIS data models and spatial feature topology at the beginning and Mesheck's cartographic modeling at the end. I concluded the last session with some remarks on how GIS generally fits in with the mission of a resource management agency, to make clear the "three A's" of information utility -- Archive, Analysis and Action.