LTER Long Term Ecological Research

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LTER DataBits

Information Management Newsletter of The Long Term Ecological Research Network

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DataBits: An electronic newsletter for Information Managers ----- Fall 2003 Issue (http://intranet.lternet.edu/archives/documents/Newsletters/DataBits/03fall/)

Featured in this issue:

Theresa Valentine and Don Henshaw discuss their approach to the marriage of tabular and spatial data at the Andrews LTER. Barrie Collins gives his take on ArcIMS, ESRI, and his management philosophy. We are exposed to adding internet spatial visualization to environmental projects when Peter McCartney discusses three internet map applications produced by The Center for Environmental Studies, Arizona State University. Also in this issue a move towards maximizing the spatial aspect of the LTER Network is taken with a new Network-wide survey.

DataBits continues as a semi-annual electronic publication of the Long Term Ecological Research Network. It is designed to provide a timely, online resource for research information managers and to incorporate rotating co-editorship. Availability is through web browsing as well as hardcopy output. LTER mail list IMplus will receive DataBits publication notification. Others may subscribe by sending email to majordomo@lternet.edu with two lines "subscribe databits" and "end" as the message body. To communicate suggestions, articles, and/or interest in co-editing, send email to databits-ed@lternet.edu.

----- Co-editors: Todd Ackerman (NWT), Chi Yang (MCM)

Feature Articles

Integrating Spatial and Tabular Data

- Theresa Valentine & Don Henshaw, Andrews LTER, USDA Forest Service, PNW Corvallis Forest Science Laboratory

Introduction:
The development of a new data model for storing and accessing spatial data within relational database management system (RDBMS) software has caused information managers to review/update how spatial and tabular data are stored within their information systems. This white paper looks at how the H. J. Andrews Experimental Forest LTER Site is approaching the integration of spatial and tabular data and areas to consider when working toward achieving an integrated information management system.

History:
Traditionally, spatial data has been managed within a geographic information system (GIS), often duplicating attribute data stored within tabular databases. GIS technology has not been efficient at providing connections to external tabular data.

The H. J. Andrews LTER Site has moved toward dynamic access to data through implementation of a web interface to the Forest Science Data Bank (FSDB). FSDB is an information management system that supports the collection, quality control, archival and long-term accessibility of collected data and associated metadata (Henshaw and Spycher 1999). The information system features a structured metadata database to facilitate web publishing of data and metadata, data production through the use of generic and database-specific tools, and mechanisms for searching and integrating diverse types of information (Henshaw et al. 2002). Simultaneously, a separate spatial information management system is in place that provides Environmental Systems Research Institute, Inc (ESRI) coverages and shapefiles to users. The spatial data have historically been documented with an in-house metadata format, and more recently have been captured in ESRI ArcCatalog.

The Vision:
The vision is an integrated information management system that contains spatial and tabular data and metadata. Users of the system would easily find data through queries based on location and keywords that meet their criteria, and Internet searches would commonly return both maps and lists of data. It is transparent

to the user where and how the data is stored.

Points to Consider:
Four primary areas come into play when attempting this type of integration; defining organizational roles, database design, integrating with existing database schemes, and technical issues. This section highlights the AND LTER approach and serves as one example to solving integration of spatial and tabular data.

1. Defining Organizational Roles

With the advent of GIS technology that incorporate an RDBMS, GIS specialists are finding that they need to learn and understand traditional database management principles while at the same time, database experts find themselves needing to understand GIS principles. Issues arise when trying to identify new roles, where duties overlap, what data to manage where, and how the two disciplines will now interact. This can be an exciting time for both sides, but also stressful as people are trying to learn new rules and concepts. A good database design can help alleviate stress especially if all the specialists are involved in the database design process. The keys to success are developing a good working relationship between the two groups and remaining flexible as roles may change over time.

2. Database Design.
It is very important to develop a database design before you begin the integration process.

"From a user perspective, an application design is a decision process. In the older technology of coverages and map libraries, design options included tile structure, coverage type, and content of feature attribute tables. The geodatabase structure also supports construction of alternative data models with the framework defined by the core software. Design is a process to decide between data structure options. The results of the design decisions for an application are communicated through data model diagrams specific to the problem." (ESRI Draft Forestry Data Model Reference Document, 2000)

It is really great to see ESRI putting an emphasis on database design when implementing the geodatabase. Initially, existing ARC/INFO clients were told to convert their data over to the new data model, as is. This did not make sense to many who could see no valid reason to convert unless there was some additional functionality available within the new data structure. The geodatabase provides tools for structuring spatial information in a more normalized fashion. ESRI is in the process of developing data models for specific industries and applications. According to the ESRI Website, "The goal for each ArcGIS data model is to provide practical templates for implementing GIS projects for specific industries and applications. Designed by a consortium of users and business partners, these models provide ready-to-use frameworks, built on accepted standards, for modeling and capturing the behavior of real-world objects in a geodatabase." These models may be too simple or too complex for many users, but they are useful in providing a template that you can examine and then modify for your specific need. They can also help as a starting point for discussion. ESRI Data Models are available on line.

It can be possible to get stuck in the database design process. It's important to test some ideas through pilot or case studies before your design is cast in stone. It is also useful to keep your design fluid so you can make changes.

3. Integration with existing database schemes
The AND LTER has an existing information system with a comprehensive database design to document and archive study databases. Ecological databases are managed through the Forest Science Data Bank (FSDB), which houses data sets from over 220 ecological studies. The challenge comes in integrating the spatial data into existing database structures, which is critical to the discovery and access of data through the AND LTER website.

Spatial and tabular data can use the same RDBMS technology, however, some GIS data may need to be managed through middleware, with map-based interfaces. An example of this is using the Spatial Data Engine (SDE) to manage spatial data. The data is edited and viewed using ESRI desktop products (ArcGIS). The data should not be managed within the RDBMS interfaces, as critical linkages can be broken. Decisions need to be made on what data to store within SDE and what data can be accessed through GIS applications without the inherent overhead costs of SDE.

The integration with FSDB might occur through a single catalog of all spatial and tabular data including general metadata elements, with more detailed metadata stored in ArcSDE. For example, the FGDC compliant metadata for geology will be stored within ArcSDE and searchable through an Internet mapping application (e.g., Metadata Explorer). FSDB will store general metadata, but will reference the complete ArcSDE metadata record. Catalog level integration might include relational links from study databases to personnel or theme, place, or taxonomic keywords for data discovery. Study site locations and other reference points will also be stored and managed within FSDB.

The incorporation of web-based applications to provide spatial searches on the Internet will be possible with the development of a comprehensive place keyword thesaurus that includes bounding coordinates for each keyword and a relational design that associates study databases with place keywords. The user will be able to search for study databases within a specific spatial location or described place keyword and have the results presented as a map and as tabular information.

4. Technical Issues:

There is a considerable amount of training and expertise needed to fulfill the vision. For the GIS staff, the conversion to the geodatabase from existing GIS data structures involves retooling for object oriented design and programming, learning relational database concepts, the middleware (SDE) and how to convert and manage data in the new structure, new interfaces for display and query, and internet mapping software (which may include html and java script). The data management staff often needs to be trained on working with spatial data and GIS concepts.

The system administration of a complicated information management system can be overwhelming. The H. J. Andrews system involves a Microsoft server with SQL Server software and SDE, two Unix servers (one for web with Coldfusion, one for ArcIMS), and local PC's with user applications. It can get very complicated, as the pieces are all interrelated. One piece of software going down often has a ripple effect. A capable and flexible system administrator is a necessity.

The conversion process itself can be difficult, especially if there are many legacy databases with minimal documentation. A great deal of effort has been spent converting the in-house spatial documentation to Federal Geographic Data Committee (FGDC) compliant metadata in XML. Once this is completed, the metadata can be stored and accessed through the ARCIMS Metadata Explorer and shared with the FSDB metadata catalog. This conversion is time consuming and tedious at times. However, the metadata tools within ArcGIS are improving. The conversion of the data to a geodatabase through SDE requires patience and constant communication with the system administrator. Decisions need to be made on whether to restructure the data in order to normalize data, what data to merge together for topological reasons, which projections and data shifts to use, and what legacy information should be retained in the new format.

Summary:

Integration of spatial and tabular databases in an information management system is a complicated, yet worthwhile endeavor. It takes the commitment of all the parties involved, and is a process that evolves over time. The technical issues can be overcome with a sound database design, good training for staff, and the appropriate level of computer technical support.

Links on data integration that might be of interest:
Spatial Data Standards and GIS Interoperability: An ESRI White Paper • January 2003
MESDIP-The Marine Ecosystem Spatial Data Integration Project
King County Metro Transit: Getting the Most from Data Integration with GIS
Web Services: A Standards Based Framework for Integration
Antarctic Geographic Data Integration
Sharing Geographic Information on the Internet- ICIMOD's Metadata/data Server System using ArcIMS
Integration Broadens Appeal of GIS Data
Seamless GIS integration with other software applications
The Nassau County Spatial Data Warehouse - A System Integration Challenge

References:
Environmental Systems Research Institute. Draft Forestry Data Model Reference Document, 2000, http://downloads.esri.com/support/datamodels/Forestry/forestry_datamodel.pdf

Henshaw, Donald L.; Spycher, Gody; Remillard, Suzanne M. 2002. Transition from a legacy databank to an integrated ecological information system. In: Callaos, Nagib; Porter, John; Rishe, Naphtali, eds. The 6th world multiconference on systemics, cybernetics and informatics; Orlando, FL. Orlando, FL: International Institute of Informatics and Systemics: 373-378.

Henshaw, Donald L.; Spycher, Gody. 1999. Evolution of ecological metadata structures at the H.J. Andrews Experimental Forest Long-Term Ecological Research (LTER) site. In: Aguirre-Bravo, Celedonio; Franco, Carlos Rodriguez, eds. North American science symposium: toward a unified framework for inventorying and monitoring forest ecosystem resources; Guadalajara, Mexico. Proceedings RMRS-P-12. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 445-449.

Internet Mapping at Coweeta LTER

- Barrie Collins, Coweeta LTER

Introduction
If you’re looking for piercing insight into the technical workings of Internet mapping software, then this article is not aimed at you. If you’re interested in GIS wizardry from a mental giant, then this article is definitely not aimed at you (as I cannot deliver on that promise). But, if perhaps, you’re interested in what a man working quietly in an office in Athens, Georgia has to say about design…maybe a little wisdom about how to get where we need to be, then give it a chance.

We live life based upon some type of ethic. This ethic, weak or strong, has profound influence upon our work. Following is a little of the Coweeta story, and if you read between the lines, a little of my story.

When Todd Ackerman first approached me about contributing an article to the GIS edition of Databits, I was slightly conflicted. Seeing the significant contributions that my information manager colleagues have made, both directly and indirectly, to the LTER Network and my own efforts, mandated that Coweeta contribute, in spades. My hesitation was because the Internet mapping story, thus far, under whelms. But, there is a story to tell, and perhaps our experience at Coweeta can contribute to the collective knowledge base of the LTER Network.

So here it goes...

In Between Days...
Online mapping, instant access to GIS data, custom-made maps that can be printed on the user's computer- all of these things, connecting users across a vast knowledge base, are desirable; more, they are the future. Whether we're discussing on-line libraries, databases, GIS mapping, genomes, or financial transactions, the information managers of the LTER network are part of a community of pioneers in this effort. We are bridging the gaps, with the future being a collective knowledge base unlike anything in human history.

Software Development, Platforms, and Black Holes...
We all agree that Internet mapping is a good thing, so I'll mosey past the benefits right to the challenges. First, an interjection: One of the key principles of our philosophy of information management for Coweeta LTER is that we should be a 'solutions provider'. Information management is not about wild schemes to demonstrate how brilliant we are. Our job is to support the research. Pragmatism is more important than ego, and it is okay if something we develop does the job quietly, elegantly, and without fanfare. There's a whole "walking before we can run" mantra in there somewhere, but let's move on.

Developing new tools cost money. Bad decisions waste money. Poor planning wastes money exponentially. Software development should be a trickle in the beginning, turning to a torrent when design moves to implementation.

A Word About Open-Source and Standards.
We need the Linus Torvalds' of the world. Coweeta uses Microsoft servers, but for our databases we use Mysql and PHP, not Oracle, not SQL Server. Why? Open-source AND standards. There is HUGE support of knowledge for sharing ideas, implementations, and solutions.

When you evaluate your development platform, make sure that there is widespread support for that platform. A question springs to mind: If this is the decade of synthesis and adherence to standards is critical, we should not be developing a bunch of proprietary, highly customized solutions. But, I digress.

LTER information managers seeking to connect data and research within the LTER and the worldwide community to create a shared knowledge base would be wise to base our development on the existing knowledge base already in place. It's almost poetic.

The 900-Pound Gorilla
Only fools bet against Jack Dangermond (founder of ESRI); my wager is that the future of Internet mapping is ESRI. The stranglehold that ESRI has on the GIS industry rivals (and in my opinion exceeds in influence, if not scale) the power of Microsoft. If we wish to connect to a worldwide community of GIS users, data, and developers, the road runs through Redlands, California. Synthesis is the future, and standards are the ties that bind.

What to do? ESRI sells ArcIMS, which has serious limitations as a platform for development. The methods that the software uses to transfer data are old technology, and the current offering is a paper-thin HTML server that has to refresh the client's map across the web every time the user zooms or pans. The entire process is slow and stodgy. The other option, a java-based solution, is slicker, but downloading the necessary software may be too technical for a user. So, what to do?

Wait on Internet mapping, but get your dogs ready to mush
Coweeta has implemented both the Java and HTML versions of ArcIMS. But neither is acceptable as a real solution. Hence they are shelved. Here's where what came before comes together to form a plan…based

upon a philosophy: Here are a few suggestions for an alternative:

-Get rid of ego; researchers want solutions, not gee-whiz gadgetry.
-Developing on ArcIMS is a waste of time and money, unless you view it as a research project preparing for the future.
-Developing on other platforms is (probably) misguided, because eventually ESRI will get it right.
-Spend time on preparing data for the eventual emergence of a valid development platform: GPS points on all project sites, metadata properly prepared for your GIS data, self-executing zip files in a variety of projects and formats.

That's about all I've got to say on Internet mapping right now.

In the end, my goal for this paper was not to state the obvious regarding ArcIMS. My goal was to share, in an informal and conversational manner, a basis for decision-making - the outlines (at a Spartan level) of the beginnings of a management philosophy. If you care to extrapolate some of the issues I raise in this article to other current information management issues and development efforts, then that’s not such a bad thing, I reckon.

Integrating Internet Mapping into Online Data Applications

- Peter McCartney, Central Arizona Phoenix LTER

Environmental data are inherently spatial and maps provide an intuitive medium for visualization. While many internet mapping tools come with a default starter application that is easy to set up, the result is often a self-contained application that attempts to mimic a typical GIS application interface and is difficult to integrate with other existing code. In this contribution, we will look at three internet map applications recently released by The Center for Environmental Studies, Arizona State University which integrate ESRI's ArcIMS software in a customized manner. Two are published within the Southwest Environmental Information Network, discussed in a previous DataBits. The other is an environmental atlas developed jointly between CAP LTER and the Greater Phoenix 2100 project. While these applications vary in complexity and intended audience, they actually share a great deal of code and design principles which contributed greatly to the speed of their development.

Technology

As we discussed in last issue's Databits, online applications at CES have been developed in a tiered architecture based on data, services, and applications. A set of components, referred collectively as Xylopia, provide the core services in a modular, reusable manner, allowing multiple applications to be based on them. For internet mapping, Xylopia includes java classes that provide a simple interface to ArcIMS map server that is interoperable with the other EML and data handling components. When a map is initially requested, a service component in Xylopia receives a XML encoded message requesting a map to be created. This service is actually a wrapper that transforms the message into ArcIMS's AXL language and initializes a new map service, returning the connection to that service back to the calling application.

Most map application require some stateful communication with the service, allowing the user to manipulate or query the map, and to persist settings between each interaction. Certain classes are thus implemented as Java beans that can be used directly by the Java Server Pages (JSP) application hosting the map. This page manipulates the mapping bean in response to user input, which in turn maintain a session with the ArcIMS map service through its Java Application Programming Interface (API). A basic template consisting of the html form containing the map and its controls is customized for each individual application using CSS, XSL and individualized graphics to build the html interfaces.

The purpose behind this design was 1) to simplify the application interface for generating and manipulating maps, and 2) to place a layer between the application and the actual map service engine. While we are currently satisfied with ArcIMS and its license with ASU, there are many other map server tools available (Map Server,OpenMap) . Porting our applications to any one of them would involve writing new java beans or SOAP services to support identical methods and properties, but should have very little impact on the existing applications themselves.

Applications

The simplest application using this toolkit is a spatial viewer for search results of biological collections in SEINet (http://seinet.asu.edu). Shapefiles of specimen collection points are generated dynamically from the text latitude and longitude data in the collections records, and are then added to a base map service using the Xylopia beans (Figure 1). A somewhat more complicated application is the spatial viewer within the Data Analyst section. Here, users select a dataset from the searchable catalog, and are offered options to download, view or analyze data, depending on the data type. Spatial data entities can be viewed as a mapservice, optionally selecting a display attribute from the attribute list. (Figure 2). EML Metadata on the measurement scale of the attribute and the geometry of the gis file are used on the fly by the Xylopia mapping class to determine and then build the appropriate renderer for the map prior to calling the map service (Figure 3).

The Greater Phoenix 2100 eAtlas (http://www.gp2100.org/eatlas.htm) was developed as an online version of a large-format paper atlas recently published by the Greater Phoenix 2100 organization as a vehicle to underscore the importance of long term ecological trends to urban planning. In this application, the automated renderers in Xylopia are bypassed in favor of stored, customized AXL map definitions that allow more precise control over symbology and colors. An XMLbased menu and document framework allows users to select maps from the table of contents. The requested map service is then generated from the stored AXL and returned to the user using the Xylopia mapping components, customized for a different graphical appearance (Figure 4). An XML config file for each map contains the related text and source data connections. Each data source used in the eAtlas is published through the SEINet system, making it easy to provide a simple link via SEINet to the metadata and data for each source layer in each map. The design of the eAtlas facilitates the creation of an extensible, yet individually customizable series of maps. New maps are being developed for addition to the eAtlas and a new map gallery based on the same design and components will soon be available on the CAP website as medium for scientists to more easily publish maps generated by their LTER research.

Summary

Internet mapping is a popular goal for many environmental researchers, yet is difficult to achieve due to the complexities of the programming APIs or by the clumsy default interfaces. By wrapping map services in a framework more conversant with EML and the basic functions required for spatial visualization, we hope to have made it easier to add spatial viewers to new projects and to facilitate contributions of new internet map projects from our faculty and student researchers.

This material is based on work supported by the National Science Foundation under Grants no. 9983132

Networking our Research Legacy and 9714833 Central Arizona - Phoenix Long-Term Ecological Research. Any opinions, findings or conclusions or recommendations expressed in this material are those of the author (s) and do not necessarily reflect those of the National Science Foundation.

Maximize LTER Mapping

- Todd Ackerman, Niwot Ridge LTER & Barbara Nolen, Jornada Basin LTER

Many months ago, representatives from a handful of sites gathered in San Diego to discuss the status and future of the LTER spatial data situation. At this workshop it was determined standards across the network were needed regarding spatial data. Therefore, we developed the idea of maximizing LTER map accessibility.

In order to determine the network wide spatial status we have included a survey in this issue of Databits so that it can be determined where each site stands in regards to their GIS resources, spatial data layers, and metadata for this spatial data. This survey will then be summarized in order for the NIS group to make suggestions for primary spatial datasets that each site of the network should maintain.

From such a survey, we propose that those sites that are capable of serving spatial information serve spatial data for one or two sites that do not have that capability. In order to maximize the LTER site accessibility, each site should have at least the following information with relevant metadata including all required EML information such as projection, coordinate system, and datum:

Basic Boundary (one that encompasses 85-90% of the study area)
Digital Elevation Model (DEM)
Landsat TM scene (The network office should have most of these here)
Research plot locations (Core research plots GPS'ed)

In order to provide us with a place to start, please take a few minutes to complete the survey below.

2003 LTER Network GIS Capabilities Survey

- Ken Ramsey, Jornada Basin LTER

Objective: This survey is being conducted to develop a strategy for developing and funding Internet Map Services for all LTER sites. Please complete the entire survey form.

1) LTER site name: ____

2) Name of person completing survey: ____

3) Does your site have a GIS specialist (circle choice)? YES / NO
Is the GIS specialist also the site data manager? YES / NO
Please list names and email addresses of GIS specialist(s) below:

____
____
____

4) Does your site have GIS/remote sensing software? YES / NO
GIS software:
ESRI (circle choices): ArcInfo / ArcView / ArcGIS / ArcSDE / ArcIMS / OTHER
OTHER GIS software: ____
Remote sensing software: ____
Visualization software: ____

5) Does your site have GIS layers? YES / NO
(If yes, complete the following section. Otherwise, skip to Section 6.)
a) What GIS file format(s) does your site use?
Circle choices: SHAPEFILE / COVERAGE / GEODATABASE / OTHER
If OTHER, please list: ____
____
b) Do you have any of the following GIS layers for your site (circle choices)?
i) Boundary - bounding box indicating the primary location of the LTER site studies? YES / NO
ii) Location - center location of primary LTER site and study areas? YES / NO
iii) Digital elevation model for the site area? YES / NO Resolution: _________
iv) Landsat TM for the site area? YES / NO Date(s): ___________________
____
____
v) Digital Ortho-Photo Quarter Quads (DOQQ's) for the site area? YES / NO
If so, please circle types: COLOR / B&W
If so, indicate year of photography: _______
vi) Public towns, roads, highways, rivers, streams and state or province boundary for overview or locator map? YES / NO
(Please list layers, whether metadata is available, and layer format below)

Layer	Metadata?	Format
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________

vii) Do you have GIS layers that locate one or more core research sites? YES / NO
(Please list layers, whether metadata is available, and layer format below)

Layer	Metadata?	Format
______________________________	Yes/No	______________________________
______________________________	Yes/No	______________________________

____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________

Are associated data sets available on-line? YES / NO

Are associated data set documentation files available in EML format? YES / NO

viii) Are any other layers available to include? YES / NO

(Please list layers, whether metadata is available, and layer format below)

Layer	Metadata?	Format
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________
____________________	Yes/No	____________________

6) Does your site have access to a GPS unit? YES / NO

If yes, what is the highest resolution? ________________________________

7) Does your site have GIS/remote sensing data available on-line? YES / NO

If yes, please provide URL(s): ________________________________

____

____

____

8) Does your site have an Internet Map site? YES / NO

If yes, please provide URL(s): ________________________________

____

____

____

9) Are you integrating your spatial data with your long-term study data sets? YES / NO

If yes, briefly describe your efforts: ________________________________

____

____

____

____

10) At what level would you describe your site's expertise/deployment of GIS techniques?

BLEEDING EDGE / OPERATIONAL / BEGINNER / NON-EXISTANT

11) What obstacles or challenges does your site face in moving towards bleeding edge?

____

12) What types of resources do you need at your site to move towards bleeding edge?

____

Thank you for completing this survey.

News Bits

Journal of Environmental Informatics - CALL FOR SUBMISSIONS AND SUBSCRIPTIONS

- John Porter, Virginia Coastal Reserve

Journal of Environmental Informatics (JEI) is an international, peer-reviewed, and interdisciplinary publication designed to foster innovative research on systems science and information technology for environmental management. The journal aims to motivate and enhance the integration of environmental information and systems analysis to help develop management solutions that are consensus-oriented, risk-informed, scientifically-based and cost-effective. The topics addressed by the journal include:

- Decision and risk analysis for environmental management
- Mathematical methods for systems modeling and optimization
- Environmental Statistics and its applications
- Environmental data and information management
- Environmental and ecological modeling and assessment
- Simulation, optimization, and control of waste treatment and pollution reduction processes
- Environmental, ecological and resources management and planning
- Environmental geomatics
- GIS, RS, and other spatial information technologies
- Geographical analysis for urban and regional development
- Monitoring and analytical techniques of environmental quality
- Artificial intelligence and expert systems for environmental applications
- Computer graphics and visualization for environmental decision support
- Other areas of environmental systems science and information technology

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Subscription rates: US/Canada: US$88/Can$120. Other countries: US$95/Can$130.

Good Reads

Good Read: The Humane Interface

- Theresa Valentine, Andrews LTER, USDA Forest Service, PNW Corvallis Forest Science Laboratory

Raskin, Jeff. The Humane Interface: New Directions for Designing Interactive Systems. Pearson Education, 2000.

The creator of the Macintosh goes beyond today's graphic user interfaces to show how the Web, computers, and information appliances can be made easier to learn and use.

Good Read: BioScience January 2003 Special Issue

- Karen Baker, Palmer Station

John E. Hobbie (ed), 2003. A Special Section on the US Long Term Ecological Research Network. BioScience 53(1).

A special section in Bioscience about LTER provides a comprehensive historical context for long-term research from pre International Biological Program (IBP) time through the work of LTER today. Two articles summarizing the LTER program and its accomplishments are followed by six articles on cross-site research topics: climate forcing, land-use, biodiversity, system disturbance, system variability, and mechanistic modeling. The collection of articles presents the LTER community, highlighting its mission and selected ecological the rich intellectual and data resources, the series gives insight both to the research community approach as well as to the long-term data legacy. The overview offers an opportunity to consider the LTER process as a whole.

Good Read: Steps Towards an Ecology of Infrastructure

- Karen Baker, Palmer Station & Helena Karasti, Univ of Oulu Dept of Information Processing Science

Susan Leigh Star and Karen Ruhleder, 1994. Steps Towards an Ecology of Infrastructure: Complex problems in design and access for large-scale collective systems. In Transcending Boundaries: Proceedings of the conference on Computer Supported Cooperative Work (CSCWb 94), 22-26 October, Chapel Hill, NC. ACM Press, New York, p. 253-264.

The LTER represents one model of a networked community organization. The Worm Community System (WCS), a distributed software environment with successes and challenges similar to and different from LTER, represents another collaboratory model. Star and Ruhleder (1994), using ethnographic methods to conduct research on the WCS, present an analytic framework using multiple levels of understandings to capture this community's not-so-well-structured structures and not-so-well-expressed tensions.

The traditional "wires and pipes" infrastructure metaphor is broadened to encompass relationships with system users and change within organizations. Such multidimensional views of infrastructure are important to collaboratory participants facing choices about how technology standards will be used to support site science, how technology decisions will influence data practices, and how design approaches influence information system development. This work describes explicitly how local practices interface with large-scale structure, demonstrating how local customization is in tension with the development of common standards. The complexity and interdependence of everyday work practices are found to be critical elements when considering both technical and sociotechnical challenges.

Calendar

September 18, - September 21st: 2003 Long Term Ecological Research Network All Scientists Meeting. Seattle, WA.

Friday, September 19. 1:30 - 4:30 pm: Workshop 1: Information Technology for the Decade of Synthesis: Tools for Data Synthesis in the Present and the Future

The Decade of Synthesis will require the LTER Network to integrate diverse data sets from individual site-based research programs in order to foster cross-site studies. The focus of this workshop will be on tools that are currently being developed to aid in such integration as well as on desires for future products. We will explore data integration methods through formal presentations of current synthesis research, tools in development, and the needs for future products. Round table discussions will follow the presentations to solicit researcher needs.

Saturday, September 20. 8:00 - 10:30 am: Workshop 2: Information Technology for the Decade of Synthesis: LTER Partners and Projects - Leveraging Resources and Metadata to Meet a Common Goal

One of the greatest challenges facing the LTER Network is how to foster cross-site and cross-disciplinary synthesis. This workshop focuses on existing and potential partnerships being developed between the LTER Network and other organizations to help researchers in performing cross-site synthesis. These partnerships help members distribute and share resources and minimize duplicated efforts for solutions to common problems encountered. This workshop highlights some of the current partnerships and projects as well as potential partnerships that could be created in the future to support synthesis.

Saturday, September 20. 1:30 - 4:30 pm: Workshop 3: Information Technology for the

Decade of Synthesis: Accessing Remote Sensing and GIS Data Through Web Services and 3D Visualization

One of the greatest challenges facing the LTER Network is how to support cross-site and cross-disciplinary synthesis. This workshop focuses on work being conducted by individual LTER sites, LTER partners, and collaborations to develop and publish GIS web services to aid researchers in the discovery, access, normalization, and visualization of remote sensing, GIS, and ecological data sets. These web services will provide a valuable set of tools for researchers conducting synthetic research by providing new ways of accessing, visualizing, and analyzing ecological data.

Sunday, September 21. 8:00 am - 4:00 pm: Workshops 4 and 5: A Future Vision for Enabling Information Technologies for LTER Science

As we embark on a decade of synthesis it is critical that we take advantage of appropriate enabling information technologies. Concomitantly, we have a wonderful opportunity to help shape the future information technologies that can better enable LTER synthesis. This day-long workshop has four complimentary parts. First, three LTER scientists will offer a compelling vision for the information technologies that are required to enable LTER science (e.g., synthesis, broad-scale in situ and remote sensing, and broad-scale modeling). Second, four LTER ecoinformaticians will present brief descriptions of currently available and progressing information technology tools that can meet current and future scientific needs. Third, leading edge information technology researchers from the supercomputer centers and academic community will present their vision for emerging information technologies. Finally, a moderated roundtable discussion will attempt to reconcile the scientific and information technology visions.

Monday, September 22. 8:00 am - 5:00 pm: LTER Information Managers Meeting. Seattle, WA.