GIS NEWS -SUMMER 1993

US CORPS OF ENGINEERS AND US FISH AND WILDLIFE SERVICE USE GIS FOR WETLANDS MANAGEMENT IN MONTANA

The U.S. Army Corps of Engineers, Omaha District, and the U.S. Fish and Wildlife Service, Mountain- Prairie Region, are conducting a cooperative project to implement a geographic information system (GIS). The Corps' Omaha District and the Service's Mountain-Prairie Region cover much of the same geographic area in the Rocky Mountai ns and Northern Great Plains. The two agencies are working together to implement GIS technology in each of the District's Regulatory Field Offices. The Corps will use the Service's extensive National Wetlands Inventory digital data as a primary information layer in the GIS. This project was initiated for four primary reasons: 1. to improve the protection of wetlands habitats throughout the Omaha District; 2. to improve the management of large amounts of wetlands information that both agencies utilize; 3. to implement GIS at an operational level within the District; and, 4. to develop a formal mechanism for information and technology exchange between both agencies.

The software being utilized for this project is composed of: Geographic Resources Analysis and Support System (GRASS) GIS software, an interface to link GRASS with the Corps' Regulatory Analysis and Management System (RAMS) (an Informix based system), and a graphical user interface to simplify usage of both programs. The Corps will be using the system for administering Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act. Under this authority, the Corps issues or denies permits for activities such as channel control, bank stabilization, wetland fills, wetland drainage projects, and marina construction. Land owners and developers are required to apply for a permit if their project involves the alteration of a wetland or a navigable water.

Historically, the Corps has used manual methods for collecting and evaluating information needed to make decisions on whether a permit should be issued or denied. Manual methods had also been used to maintain records on permit actions. The Regulatory Biologist had to gather National Wetlands Inventory maps, soil surveys, USGS quad sheets, and other collateral information to evaluate permit applications and determine what action would be taken on a given permit.

Approximately three years ago, the Corps implemented a database management system in each field office to manage information on permit actions. This system, the RAMS, is based on the Informix relational database management system and is implemented on SUN workstations. RAMS is used to record and maintain information such as permit locations, applicant name, permit status, type of activity, area of impact, etc. There are approximately 200 data fields in RAMS that can be used to record information about regulatory permits.

Shortly after the RAMS system became operational the Corps realized the addition of a spatial database component would greatly enhance the permit evaluation process.

The GIS data for the project consists of National Wetlands Inventory 1:24,000 scale database, hydrology, transportation, boundaries, Public Land Survey data from 1:24,000 scale DLG3 files, and vegetation and soils data available from 1:24,000 scale maps. Statewide databases of this information are being developed for the six states in the Omaha District. Although the goal for the database is 1:24,000 scale data, this is not currently available for the entire District from the U.S Geological Survey or other sources for digital data. In several of the states, various state agencies have developed some of the data layers needed by the Corps. In these cases, cooperative data- sharing agreements are being established to obtain this information. Where no 1:24,000 scale data is available, 1:100,000 scale data from TIGER files or USGS DLG3 files are being obtained. Vegetation and soils data is available for only limited areas within the District at the present time. The GIS databases are being developed in a phased approach, and data acquisition will continue throughout the project until statewide coverage of these layers is obtained.

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USGS PLANS FOR A NATIONALLY-DISTRIBUTED GIS DATABASE

The Water-Resources Division of the US Geological Survey has begun development and initial implementation of a nationally- distributed GIS database known as the Distributed Spatial Data Library (DSDL). The purpose of DSDL is to coordinate the development of common databases within the Division and facilitate the sharing of spatial data, techniques, and programs with other USGS offices across the wide area network. Rather than seek to create a single centralized repository of spatial data, DSDL is designed with the recognition that the most valuable holdings of data and techniques are distributed in many offices across the country. The sum of these local stores of spatial data and techniques will comprise the DSDL. Design and initial implementation of DSDL will be in ARC/INFO, the Water-Resources Division GIS package. Future plans are to include a more generic implementation to accommodate other external GIS users. At the core of the DSDL concept are multiple spatially-indexed, locally-stored collections of vector and raster spatial data and programs designed to manipulate the data. Thorough documentation of all spatial data in DSDL will be required through the use of the USGS DOCUMENT command. The DOCUMENT command creates INFO datafiles which become part of the coverage, much the same as other attribute-table datafiles. The documentation (collectively referred to as Metadata) will provide valuable information about the data sets which can be queried by outside users. In addition, spatial data sets will be indexed by their geographic location or`footprint.' Users of DSDL will be able to query the holdings of a database based on a combination of: 1) text terms in thematic data (i.e. streams, springs, contamination), 2) specific fields in the metadata (i.e. scale = 24000, source_date > 1980), and,3) geographic extent of the spatial data through the interactive definition of polygons on the screen. Potential matches to the query will be listed to the users screen and selective retrieval of information from the remote source can be obtained in one of three formats: 1) metadata text, 2) a graphical image (GIF) of the spatial dataset, or 3) the actual spatial dataset itself.

An important advantage of DSDL's distributed repository architecture is that custody of specific data sets will be explicitly assigned, thereby delegating ownership and maintenance of the data and programs to the source of the data. In addition, the distributed repository architecture eliminates redundant disk storage and the possibility of multiple versions or revisions of data sets on different machines.A fundamental part of the DSDL concept is the use of enhanced Wide Area Information Servers (WAIS) on the internet. In its current text-based implementation, the WAIS software is an extremely flexible and relatively easy-to-use package that permits the user to: 1) choose a remote source of indexed text documents, 2) submit a query to the source for specific key words,3) receive a list of possible documents identified with a numerical score indicating the likely significance of the key-word match, and 4) select a desired document, causing the document to be sent to the user electronically. The WAIS software employs a server-client relationship wherein a server process is established on a host machine that "listens" for queries over the network. The client establishes connections, submits

queries, receives results, and closes connections using the standard information retrieval protocol known as Z39.50. Because the protocol has a limited vocabulary and has read access to only indexed data sets, there is no security threat.In order to manage digital spatial information, the WAIS software has been recently extended by the Center for Networked Information Discovery and Retrieval (CNIDR) at the University of North Carolina to handle a non-proprietary image of the data in GIF format and aspatial 'footprint' or detailed outline of the extent of the spatial data set. With these features managed by the indexer and server processes, a user can pose a mixed query of text and geographic extent in order to isolate data sets around the country. Prototype spatial-data servers were established in Reston, Virginia and Lincoln, Nebraska in the summer of 1992 to test the principles of spatial-data query. A graphical client that operates under X Windows has also been written to allow the user to define search areas of interest against a map backdrop.

The hope is that DSDL will reduce duplication of effort in data and program development within the USGS. Potentially, DSDL could serve as a mechanism to make spatial-data sets publicly available -- akin to publishing the digital data -- once USGS procedures for reviewing and publishing digital data are developed.

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NATIONAL STATES GEOGRAPHIC INFORMATION COUNCIL 1993 ANNUAL MEETING

The Third Annual Meeting of the National States Geographic Information Council (NSGIC) is set for Sept. 26 to Sept. 29, 1993 in Williamsburg, VA. The meeting is hosted by the Commonwealth of Virginia. The Council's purpose is to encourage effective and efficient government through the coordinated development of geographic information and technologies to ensure that information may be integrated at all levels of government. The Council attempts to provide a unified state voice on geographic information and technology issues and to actively promote geographic information integration and development. The upcoming meeting will focus on the work of three of the Council's committees: Geographic Information Standards, National Policy, and Inter-governmental Relations. Specific topics will include metadata guidelines, the Spatial Data Transfer Standard, the National Spatial Data Infrastructure, public access and cost recovery issues, inter-governmental relations, and the Federal Geographic Data Committee.

Montana is a member of NSGIC. Allan Cox from the Natural Resource Information System at the Montana State Library is a State representative and a member of the NSGIC Board of Directors. Other interested persons are encouraged to attend as part of the Montana delegation. For more information, contact Allan Cox at (406) 444- 5355 or Chuck Tyger, Virginia Council on Information Management, Washington Building, Suite 901, 1100 Bank St, Richmond, VA 23219, Phone: (804) 786-8169.

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MONTANA GIS INTERAGENCY MANAGEMENT STEERING COMMITTEE MEETING

The Montana GIS Interagency Management Steering Committee (IMSC) met for the first time on March 18, 1993 in Helena. At that meeting the Committee modified the Interagency Memorandum of Understanding (MOU) to include the Montana Legislative Council as a new signatory. In addition, they made changes to the MOU to broaden the focus beyond the natural resource agencies. Copies of the revised MOU have been distributed to all of the participating agencies.

The Committee approved a charter for the Steering Committee and a provisional charter for the Montana Interagency GIS Technical Working Group (TWG). The TWG charter is provisional pending comments from the TWG. Comments need to be made by the next TWG meeting in August.

The Steering Committee also assigned two tasks to the TWG:

1. Develop Feasibility Studies on Statewide Base Layers. TWG members were asked to select the four geographic layers that are most important to their agency. Once priorities have been determined, the TWG will develop status reports for all the layers and feasibility studies for the completion of the top four incomplete layers.

2. Project Planning Document. TWG members who are currently involved in planning GIS projects where cooperation with other agencies is possible, were asked to develop project plan documents. These documents should be summaries of major project goals and objectives with opportunities for cooperation with other agencies highlighted.

Other action at the Steering Committee meeting included the election of officers for two year terms. Allan Cox, Natural Resource Information System, Montana State Library, Helena, was elected Chair, and David Heilig, U.S. Soil Conservation Service, Bozeman, was elected Vice-chair.

At the direction of the Steering Committee, Cox will appoint a Task Review Subcommittee of the Steering Committee to work on a regular basis with the TWG on projects and tasks. The committee will be comprised of two federal representatives, one state representative, and the Steering Committee Chair (state) and will meet three times per year. The entire Steering Committee will meet once a year in conjunction with the Montana Natural Resource Interagency Coordinating Committee.

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GIS AND IMAGE PROCESSING NEWS FROM MONTANA STATE UNIVERSITY

The faculty and students affiliated with the Montana State University Geographic Information and Analysis Center are currently working on a number of GIS- and remote sensing-related instruction, research, and outreach projects. The hardware and software resource now includes digitizers and scanners for data input; high-performance workstations and PCs running multiple copies of ArcCAD, ARC/INFO, ArcView, AutoCAD, ERDAS, IDRISI, and PC ARC/INFO; and laser printers, 4- and 8- color pen plotters, an electrostatic plotter and a film recorder for output.

Four GIS and remote sensing classes were added to the Earth Sciences curriculum with the switch to semesters two years ago. An "Introduction to GIS" class is offered every autumn semester and includes a laboratory component utilizing IDRISI and PC ARC/INFO. Students can follow this up with an Individual Problems class to expand their ARC/INFO skills. This class is offered on demand and utilizes the "Understanding GIS: The ARC/INFO Method" teaching materials. Advanced GIS and Remote Sensing classes are offered in alternate years (spring semester). The "hands-on" components in these classes are still evolving but they already or will in the future make use of the ArcCAD, ARC/INFO, ArcView, AutoCAD, ERDAS and IDRISI resources spread around campus. These and other undergraduate classes that affect modern geoprocessing (aerial photography, cartography, computer-aided design, etc.) have been grouped together in a GIS Minor which is available to all students.

Further development and refinement of GIS-related classes is likely with the appointment of Jian-yi Liu (to replace Bob Taylor who retired this past year) as an Assistant Professor of Geography and the release of the second edition of the World Regional Geography Workbook written by Bill Wyckoff, Joe Ashley, and John Wilson this month. The workbook includes a special ArcView supplement and the current plan calls for making the ArcWorld 1:25M database available to students via ArcView in either the Library and/or one or more Student Computer Laboratories scattered around the campus. Gerry Nielsen has also incorporated several IDRISI exercises into his image interpretation and soil survey classes. A new class exploring the connections

between GIS and environmental modeling has been added to the graduate geography curriculum.

Most of our GIS and remote sensing efforts with graduate students involve internships and thesis projects. Three graduate students are working as GIS interns for local governments around the state this summer and approximately two dozen graduate students in Biology, Civil Engineering, Earth Sciences, Entomology, Plant and Soil Science, Public Administration, Range Science, and Reclamation Research have thesis projects with significant GIS and remote sensing components. We have space to mention only a few of the students and projects here: Ed de Young is working with Bill Locke on a landslide modeling project in Yellowstone County, Tom Keck is finishing up his Ph.D. with Gerry Nielsen on the use of GIS and a variety of geostatistical techniques for characterizing mine soils, Steven Lindberg is working with Doug Dollholf on a GIS/GPS application for salvaging minesite soils, Kerri Skinner is working with Bill Kemp and using GIS and remotely sensed imagery to quantify the structure of grasshopper communities in Colorado and Montana, and Jonathan Wheatley is working with John Wilson on a vegetation classification and mapping project in the Little Missouri Grassland of North Dakota.

The number and variety of faculty interested in using GIS and remote sensing in their research programs continues to grow as well. Duane Griffith, Jeff Jacobsen, Gerry Nielsen and John Wilson have continued their work using GIS to evaluate potential groundwater contamination from agricultural chemicals. Bill Kemp is using GIS and remote sensing to explore the spatial and temporal fluctuations in grasshopper populations. Henry Shovic (Yellowstone National Park) and John Wilson are working on a GIS-based soil classification model for Yellowstone National Park. Andy Hansen, Robin Patten, Roly Redmond (University of Montana), Jay Rotella and John Wilson have launched a major landscape ecology project that will cover parts of Yellowstone National Park and the Gallatin and Targhee National Forests. And finally, Bill Inskeep, Jon Wraith and John Wilson were recently funded by the USDA-CSRS Water Quality Program to combine several solute transport models with selected GIS databases to evaluate the spatial and temporal patterns in pesticide transport.

The outreach activities are built around a suite of ESRI-certified courses. The 3-day Introduction to ArcCAD and 5-day Introduction to PC ARC/INFO classes are being added to the 3-day Introduction to PC ARC/INFO class that we have offered for the past couple of years. Registration for the 3- and 5- day courses normally closes a week before the classes are taught and they cost $495 and $745 per student, respectively. The 3-day ArcCAD class teaches basic GIS concepts and ArcCAD skills and complements the AutoCAD classes offered through the Department of Mechanical Engineering. The 5- day PC ARC/INFO class is very similar to the 5-day Introduction to ARC/INFO class taught by ESRI. It teaches basic GIS concepts and PC ARC/INFO skills. These classes normally enroll between 6 and 12 students and approximately one half of the time in each class is taken up with "hands-on" laboratory exercises and tutorials. Students also receive their own copies of the lecture notes, exercises, and sample data sets.

The schedule for the first half of 1994 follows: Introduction to ArcCAD Introduction to PC ARC/INFO 5-7 Jan 1994 11-13 Jan 1994 18-20 May 1994 14-18 Mar 1994

For further information about the GIS and remote sensing facilities at Montana State University and their use for instructional, research and outreach projects write to John Wilson, Director, Geographic Information and Analysis Center, Montana State University, Bozeman, MT 59717-0348 (Tel: 994-6907; Fax: 994- 6923; Internet: UESJW@MSU.OSCS.MONTANA.EDU).

John Wilson 22 July 1993

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MONTANA SPOT ARCHIVE

The Montana Interagency Technical Working Group (ITWG) and SPOT Image Corporation have finalized an agreement forming an archive of SPOT satellite imagery for the State of Montana. This archive will allow participating federal, state, and local government agencies to obtain SPOT imagery at substantially reduced costs.

A SPOT product is placed into the archive when a participating agency purchases the product at list price and pays a $50 archiving fee. The archive is not date-dependent. This means that any product placed in the archive will be regenerated with the most current imagery available if desired. After a product is placed in the archive any other participating agency may purchase the same product for 35% of the current list price. Any currently-licensed SPOT product can be placed in the archive by paying the $50 archiving fee.

Any digital added-value products may be exchanged among participating members for a fee of $150 per product. Hardcopy value added products may be exchanged at no additional cost.

The Montana Natural Resource Information System (NRIS) maintains an inventory of products in the archive. Figure 2 shows currently archived SPOT Products. If you have SPOT products you would like to place in the archive or if you would like to find out what products are currently archived, contact NRIS at (406) 444-5354.

If you want to find out more about SPOT products, contact Eric Karver of SPOT Image Corporation at (415) 579-6635.

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MONTANA 7.5 MINUTE DIGITAL DATA PRODUCTS

The Montana Natural Resource Information System (NRIS) periodically receives updates from the U.S. Geological Survey (USGS) and the U.S. Forest Service (USFS) on availability of digital data corresponding to 1:24,000 scale USGS topographic quadrangles.

Figure 1shows availability of USGS 1:24,000 scale Digital Line Graphs (DLG) and 30-meter resolution Digital Elevation Models (DEM) as of February, 1993, and of USFS Cartographic Feature Files (CFF) as of August, 1992. The areas shown as having "Most USGS DLG Layers" available have at least the Public Land Survey, boundaries, and transportation categories available. Other DLG categories which may be available include hydrography, contours, cultural features, vegetation, and other surface features. Contact NRIS or the USGS to find out exactly what is available for a specific area.

USGS DLG and DEM products are available at a cost of seven dollars per category per quadrangle, plus a 90 dollar fee per order. For more information, contact the Rocky Mountain Mapping Center; National Cartographic Information Center; USGS; Box 25046, Stop 504 Federal Center; Denver, Colorado, 80225; phone (303) 236-5835.

USFS CFFs include hydrography, transportation, Public Land Survey, boundaries, cultural features, and some point features such as peaks and control points. For more information, contact the Geometronics Service Center; 2222 West 2300 South; Salt Lake City, Utah 84119; phone Marcie Norris at (801) 975-3440.

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NRIS TO DISSEMINATE REVISED USGS TOPOGRAPHIC MAPS

The Montana Natural Resource Information System (NRIS) has recently become the point of contact for the receipt and distribution of revised U.S. Geological Survey (USGS) topographical maps (1:24,000 - 1:100,000). NRIS will receive copies of each new or revised map and distribute them, free of charge, to all interested state agencies. NRIS will also make available to other interested federal, state, and local agencies or organizations any extra copies. If your organization would like to receive the maps as they are issued, or would like to be notified about which revised maps are available, contact NRIS at (406) 444-5354.

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