

National Park Service

GIS NEWS



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POST-NBS SERVICEWIDE GIS PROGRAM

Phil Wondra, Division Chief, GISD

The National Biological Survey (NBS) FY 1994 budget that has been submitted to Congress includes provision to transfer all of the staff and resources of the Geographic Information Systems Division (GISD) to NBS on October 1. A proposal is under consideration by the NBS Transition Team and the NPS to transfer some of

INSIDE

. 3 GISD Positions and Project Funds may be passedback to NPS to carry out centralized Servicewide GIS functions. those staff and resources back to NPS to carry out centralized Servicewide GIS functions and to continue project funding to assist regions and parks in implementing GIS.

The evolution and rapid growth of GIS use in the NPS has already lead to actions that transitions GISD's technical support activities to regional technical support centers. This planned decentralization, combined with the technical functions that the NBS GIS function will provide to all DOI bureaus reduces the need for centralized GIS technical support in NPS. Nonetheless, NPS requires some centralized expertise for coordination purposes. This is especially critical in view of the need to pursue additional funding for regional technical support centers and to participate in OMB and DOI efforts to achieve greater efficiencies in the developing and sharing of geographic data and the use of GIS. Continued page 2

NPS Sourcebook Publication Underway

NPS GIS Sourcebook to be Published in August, 1993 Karl Brown, GISD

The efforts of over a year have culminated in the completion of the NPS GIS Sourcebook. Release Number 1 was sent to the printer at the end of July, with Regional GIS Coordinators receiving their advance copies by mid-August. The final Government Printing Office run for the remaining GIS users will probably be delivered to GISD in mid-September, with mailings completed by Oct. 1.

Thank, You, Sourcebook Contributors! Page 28

At just under 700 pages, the Sourcebook can provide both potential and current GIS users with ideas and applications, educational opportunities, design criteria for hardware and software systems, and practical how-to's in many aspects of data access, input, manipulation, and display. Underlying and developing policies and interagency cooperative efforts are also described, as are preliminary standards for spatial data transfer and metadata. Many fast-moving topics were captured in this 'snapshot' of technology, both in GIS and GPS. Continued page 10

GIS '93 Registration Information

The third biennial NPS GIS conference will be held November 15-19, 1993. See page 9

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POST-NBS SERVICEWIDE GIS PROGRAM Continued

Leaving the three currently vacant GISD positions with the NPS is one way to provide for at least some staff to carry out necessary leadership and coordination functions, while NPS attempts to obtain additional funding for technical support regional centers. Additionally, GISD currently manages project funds that were specifically authorized to regions and directly assist parks in implementing GIS. These funds would be most appropriately managed by NPS and should continue to support the same types of projects. The NBS Transition Team and the Acting Associate Director, Natural Resource are considering currently the approach of transferring staff and funds back to NPS for Servicewide program development and coordination and project support.

DRAFT EMERGES: Spatial Data Infrastructure Plan

Donna R. Mahoney, GISD

The draft Strategic Plan for the National Spatial Data Infrastructure (NSDI) outlining a coordinated approach by groups that collect and use GIS data was issued July 15, 1993 by the FGDC. The draft plan is designed to be a starting point for discussions; it outlines the technology as well as the agreements necessary to link the \$2 billion GIS industry though a NSDI.

"One of the things we've struggled with is that every time we talk about NSDI, it's this big, nebulous thing. We hope with this plan we've narrowed it," said Nancy Tosta, staff director of FGDC. "We've been talking about the need for some kind of framework to proceed on NSDI," said Tosta, who added that many of the ideas represented in the strategic plan originated from the National Geo-Data Policy Forum. The Forum, hosted by FGDC, was held in May

and was attended by some 700 federal, state and local representatives as well as many GIS vendors. NPS was represented by several GISD staff members, and the GIS Coordinators from NCR, MARO, and RMRO. To follow up that conference, FGDC held a meeting in Atlanta last week (attended by Phil Wondra, GISD), where ideas incorporated in the strategic plan were up for discussion. Continued next page

SPATIAL DATA INFRASTRUCTURE PLAN

Specifically, the draft strategic plan suggests that federal data coordination efforts be strengthened, a proposal that already has support within OMB. In May, OMB circulated a governmentwide bulletin which requires agencies to report all expenditures for collecting, managing disseminating and geospatial data. With this information, OMB will be looking across departments to "ensure that large pockets of GIS-related activity are represented on FGDC" Tosta said (See Preliminary NPS Results of the OMB Data Call, page 4). This budget crosscut can then be used in fiscal 1995 budget requests. Furthermore, "this will help ensure that federal efforts based on technologies such as remote sensing are included in the NSDI vision" Tosta said.

The plan also proposes support from the White House. It calls for the issuance of an executive order that would direct agencies to participate in FGDC activities and to adhere to data standards as a requirement for later budget approval.

The plan calls for increased coordination at the state level, with the establishment of "geospatial data coordinating councils" to act as a link between agencies and others working with geospatial data, including local governments, academia and private firms.

For private sector, the document proposes that cooperative research and development agreements (CRADAs) be explored to develop efficient approaches to data production and maintenance.

The plan proposes establishing a National Geospatial Data Clearinghouse for querying, searching and accessing geospatial data across networks. FGDC now has a pilot clearinghouse in place through which users tap Internet to access indexes of federal geospatial data. (See <u>WAIS</u>, page 5 and <u>Internet</u> <u>Connectivity Established</u>, this page)

Among other important (however sketchy) suggestions, is the establishment of a national network of global positioning system (GPS) base stations that agencies at all levels of government will cooperate in maintaining and using.

"A lot of questions remain very open. But I have a sense that FGDC has taken the bull by the horns and come up with something to start with," said Louis Hecht, an industry analyst in Silver Spring.

Note: Quotes are excerpted from an article (<u>Policy & Procurement</u>) by Jennifer Jones, carried in the July 26, 1993 edition of Federal Computer Week

NPS Internet Connectivity Established

Harvey Fleet, GISD

By the time you read this, the NPS should have its own Internet connection up and running! The initial connection point is through Denver, i.e., parks and offices must connect to Denver to use the Internet. NPS Internet mail addresses will be [person's name]@[NPS unit].nps.gov, where [person's name] is an individual's login name and [NPS unit] is the four-letter park code or other code uniquely identifying an NPS office or organization.

Initially, through funding from the Inventory and Monitoring and GIS Programs, approximately 20 "routermodems" will be distributed to the field. Using the router modems, parks and offices may connect, via the Internet, to one another, just as if they were connected on a LAN (local area network). The router-modems take care of the dialup and establishment of connections. The user only has to access the desired remote machine, as if he or she were locally connected.

This arrangement is part of a prototype study of using the Internet for managing resource information. Additional I&M money is funding an expert Internet contractor to help the NPS Internet committee come up with a long-term plan for NPS Internet connectivity. We expect a draft of the plan to be ready this fall or winter. Continued

Internet Connectivity Established

The prototype arrangement of 20 parks and offices interconnected through Denver will give us important information on how well the technology works, what benefits it provides and how it can be effectively used for managing resource information, what is involved in administering the program, and how much interest and traffic results.

Preliminary NPS Results of the OMB Data Call

Leslie Manfull, GISD

The National Park Service recently participated

in the OMB Data Call on expenditures for activities related to collection and management of geographic data. All Federal agencies with GIS expenditures exceeding \$500,000 were required to provide information. The Department of Interior Geographic Data Committee (IGDC) issued the call to DOI Bureaus and compiled the required data for a DOI response was submitted early this month. The NPS response was broken out into 7 major budgetary program areas and included information gathered from parks, regions, and program offices.

Among DOI bureaus this year, the NPS had the third largest expenditures for data collection and the fourth

largest expenditures for data management. The USGS had the largest expenditures in both of these categories.

shows that the use of GIS in the NPS is growing tremendously and that the most money is spent on data collection. The NPS expenditures for GIS have increased from an estimated \$1 million in 1990 to a total of \$26.25 million for data collection and \$11.2 million for data management in 1993. In the data collection category, most money is spent specifically for the collection of original data, hardware, software, and contracts. The second largest expenditures were in the data management category and were for data integration or preparation, hardware, software, and contracts. In 1993 the least amount of NPS funds were spent on acquisition of existing data from other government agencies and data dissemination to others.

The estimated 1994 and 1995-2000 figures reconfirm a continued growth trend. The total NPS estimate for future funding required to automate geographic data for the years 1995-2000 is \$1,126,380,000. Even though this figure may

> be only an estimate which groups a number GIS or related of expenditures into one, it indicates expected expenditures almost equal to that of USGS at \$1,175,000. BLM is estimated to be the third largest future spender at \$180 million.

These numbers not only show an immense growth in GIS expenditures but also a growth in the use of the technology across Servicewide programs such as Maintenance Planning and and Development. Until by D. R. Mahoney recently GIS, had been applied predominantly Natural to the

The NPS response to the OMB Data Call

Resources and Cultural Resources arenas. Although these two program areas show the largest GIS investments for the present and near future, Planning and Development will substantially exceed budgets for all program areas except for Natural Resources from 1995 and beyond. Continued





Preliminary NPS Results of OMB Data Call

Information gathered in the 93 OMB Data Call shows that an increasing number of DOI bureaus have established "work share agreements" (BLM), cooperator fees for digitizing (FWS National Wetlands Inventory), or cost share programs (USGS National Mapping Division) with other Federal agencies to supplement their expenditures and increase cost effectiveness. Although the NPS is not a data producer like USGS or FWS, we too, have begun these types of programs. One example is the cost sharing of \$370,000 from the Inventory and Monitoring Program for digital base cartographic data in 1993. USGS equally matched these funds and will produce the requested data covering NPS parks and environs. In times of shrinking budgets and greater data needs, partnerships of this sort are a necessity. *For more information/graphs contact Leslie Manfull*.

Wide Area Information Servers (WAIS)

Susan Stitt, GISD

The FGDC (Federal Geographic Data Committee) is creating a prototype of the Geospatial Data Clearinghouse (GDC). The prototype will use the Internet network to access GDC nodes across the country. WAIS, a software system for conducting searches over the Internet is being tested.

WAIS enables users to discover and browse metadata files for spatial data. WAIS enhancements, which are under contract, will also enable searches to be based on geographic coverage as well. WAIS is available in both a non-proprietary and commercial version (much like GRASS). The non-proprietary versions include capabilities for UNIX workstations, as well as dumb terminals dialed into workstations. The non-proprietary version will be used in the prototype testing.

The text-based queries supported by WAIS allow for many data file formats, including ascii text, ftp, gif, pict, postscript and tiff among others. WAIS will index and search based on the content of files or on the name of the file, whichever is deemed appropriate by the local WAIS administrator. Graphics files (e.g. pict, gif) are indexed, and thus searched on filename only, but text files are indexed and searched based on their content. This allows maximum flexibility in data file search and access. As a side benefit, the revised Draft Spatial Metadata Standard will be tested during the Clearinghouse prototype testing.

The Geospatial Data Clearinghouse Prototype test is scheduled to run from now until September 1993, with an evaluation in October of 1993. GISD is participating in the Prototype test. Further information is available in the Summer 1993 FGDC Newsletter available from FGDC Publications, c/o U.S. Geological Survey, 590 National Center, Reston VA 22092, or via FAX at (703)648-5755, or contact Bruce Powell or Susan Stitt of GISD (303)969-2590.

New GIS Reference Book Leslie Manfull, GISD

State Geographic Information Activities Compendium by the Council of State Governments. This book was assembled in 1992 and is more comprehensive and up-to-date than the 50 page 1990 edition of Geographic Information Systems Use in State Government Agencies, a NPS Cultural Resources Information Management Series publication. This new compendium is 600 pages of information and descriptions of state GIS activities and agencies, organized one state per chapter.
 \$79.00 for one copy.
 \$55.00 for 5 or more copies. To order call 1-800-800-1910.

This is not an endorsement or advertisement for the subject publication.

OMB Issues Revised Circular A-130 Donna R. Mahoney	
OMB is revising A-130, Management of Federal Information Resources, in two p document issued June 25, 1993 focuses on information policy, while a second p proposed later this summer, will revise the way government manages its information resources. The first phase updates information dissemination policy by:	hases. The hase, to be technology
. encouraging agencies to make electronic documents available to the public t Depository Library Program,	hrough the
. forbidding agencies from restricting secondary use of information products and mat they cannot set user fees higher than the cost of dissemination,	ndating that
. asking agencies to develop indexes to make it easier for the public to locate information, and	government
. authorizing a senior information resources management official in each agency to encompliance with the circular's requirements.	sure agency
 Copies of revised OMB Circular A-130 can be obtained by calling: OMB at (202) 395-3098 or the Executive Office of the President, Publications Office at (202) 395-7332. 	J

-Large Format Color Raster Plotters-

Harvey Fleet, GISD

Hewlett Packard and Encad have recently announced the availability of large-format color raster plotters. These inkjet devices, capable of 36-inch wide plots, are technological breakthroughs for anyone interested in large-format color raster (and vector) plotting. For about \$10,000 you can buy a machine capable of E-size color plots. We have tested the HP650C, the basic specifications of which are as follows:

E-size (i.e., up to 36 inches wide), any length (uses roll paper).

Seven solid colors, thousands of extended colors through dithering (a fine-grained multi-colored patterning). Accepts HPGL and HPGL-II input.

Accepts PostScript input with an add-on PostScript interface.

300 dpi (dots per inch) resolution.

Requires special (clay-coated) paper (to absorb the water in the ink).

Cost per plot: around one dollar, depending on the amount of paper and ink used.

A detailed writeup of our findings (on the HP650C) is available from me (cc:Mail; phone: 303-969-2593; or Internet: harvey%nps@cerl.cecer.army.mil).

Energy-Star Machines

Mike Mulligan, GISD



In a follow up to the last GIS News article on Power On-Off/Green PCs, it is clear EFA PILLETION PREVENTED that the march of the EPA

Energy-Star compliant models has begun.

Energy-Star machines of various architectures are currently available from:

> IBM Austin ALR Zeos Gateway 2000 (Sept. 1, 1993) AST Nanao (monitors)

Others are sure to follow soon (currently over 60 PC, monitor and printer vendors have indicated they will eventually comply). And, as stated last time, Federal users will have to stipulate preference for Energy-Star items in future procurement actions after 21 July, as directed by President Clinton's April executive order.

To help things along even more, in June Intel announced the release of a new family of more "energy conscious" PC x86 processor chips, the 486SL line. These new chips will provide low level support to system power management and energy monitoring. Intel expects these chips to be available to consumers in new systems by the fourth quarter of 1993 or early in 1994. Eventually, they will replace the entire line of Intel's 486 SX, DX and DX2 OverDrive chip offerings.

More to "Green" than just energy savings

M.P. Mulligan GISD

GIS users can and do spend long continuous periods with their machines (they've even been known to become very attached to them...usually at the wrists and ankles). Here are some health-related issues to consider:

Does this sound familiar: this year's money has been spent on new computers, networks and associated peripherals, leaving little for such 'nice-to-haves' as new computer furniture. So the new equipment is plunked down on any old utility table (probably already piled high with previous sets of system documentation), and people sit on what ever they can scrounge out of the storage room.

However, managers and end-users alike may have to start paying more attention to the ergonomics of computer environments, if they wish to avoid down-the-line employee health problems. The move toward environmentally friendly computing also encompasses the need to make the computing environment more hospitable for human beings.

Ergonomics is the science of human/machine interface, i.e., the study of the design of equipment to reduce operator fatigue and discomfort. Continued

More to "Green"

Many recent articles attest to a growing awareness of the need for correct usage of computers by people who find themselves at the machines regularly.

The literature reports that the fastest growing reported work-related injury type in the U.S. workplace is RSI (repetive stress injury), according to the Bureau of Labor Statistics. The Occupational Safety and Health Administration reports that they accounted for 56% of work-related illnesses in 1992. Carpal Tunnel Syndrome (CTD) is perhaps the most publicized of this class of ailment. Workers sporting wrist and finger supports are only the most visible sign that ignoring ergonomic considerations can exact a heavy price.

The good news is that some fairly simple precautions and planning foresight by both managers and end-users can greatly reduce the increasingly high incidence of RSI.

Planning for correct ergonomic conditions needs to be part of the entire ADP acquisition process, not an afterthought, as has been the case in some organizations. Managers need to budget for creating appropriately healthful environments before a rash of individual injuries alerts them to a problem. They also need to know something about the causes and symptoms of RSI and be willing to treat such complaints with the credibility they deserve.

For their part, end-users need to learn and to practice good computing habits and be knowledgeable about the onset symptoms of potential injury. Sources caution that no single piece of equipment can alleviate all RSI potential. Rather, most experts recommend a systematic approach in which the body, the workstation, and the way people use both need to be taken into account.

Here are some recommended considerations for healthier computing:

Monitor:

The top of the screen should be no higher than eye level, and your head and keyboard should be little more than two feet away from the screen.

Lighting:

Use a reading lamp for close work.

For general illumination, use indirect light, which is reflected off walls or ceilings; it is less likely to cause Monitor glare.

Keyboard:

The keyboard height should be from 23 to 28¹/₂ inches above the floor. To avoid muscle injury your arms should point straight down from the shoulder, then bend into right angles at the elbows. If the keyboard is too close to allow safe viewing of the CRT, get a keyboard extender cable. Use a wrist rest to prevent sore hand muscles and carpal tunnel syndrome.

Seat:

The chairs's seat height should be adjustable between 14 and 20 inches. Hips and knees should be at right angles, and your feet should both rest flat on the floor. The chair back also need to be adjustable, up/down and backward/forward, for optimal Lumbar support.

Behavior:

Another emphasized recommendation is to vary your task activity in the work place and do not spend the entire day doing the same repetitive operation.

More to "Green"

The net result of ignoring ergonomic issues in the work place, or only paying lip service to them, may produce long term detriments to individuals' health and consequently, the organizations' productivity. In other words, with respect to the outlay of funds to create health-maintaining computing environments, it may be another case of "pay me now, or pay me **more** later".

Further Reading: Furger, R., 1993. Danger at your Finger- tips.PC World, vol.11, no.5, pp. 118-125. Nadel, B. 1993. The Green Machine. PC Magazine, vol.12 no.10, pp.110-137.

-GIS93 REGISTRATION INFORMATION-

GIS93, the third biennial NPS GIS conference, will be held November 15-19, 1993, at the Sheraton Tech Center, Englewood, Colorado. Conference objectives include exploring and exchanging information on the development and use of geographic data and geographic-data technologies, information management, and the emerging and evolving partnership between the NPS and the NBS (National Biological Survey). Participation will include both NPS and NBS employees.

Conference format and topics will include:

- -- poster exhibits highlighting applications of GIS and related technologies (CAD, remote sensing, information management, multimedia, desktop mapping, other) in NPS units;
- -- workshops on technical topics (e.g.,
- -- data issues [metadata, DOI clearinghouse, SDTS, data sources, data quality], Global Positioning Systems, remote sensing, multimedia, networking, hardware, software, legal issues);
- -- a tour of USGS and NPS GIS facilities;
- -- plenary sessions on institutional issues (the NBS, the NPS GIS program during the transition period, Federal and DOI geographic data policies);
- -- a banquet and featured speaker (yet to be named);
- -- participatory/exploratory sessions on a variety of issues including standards, policies, data, personnel, communications, hardware, software, and organization; and, possibly,
- -- vendor exhibits.

Conference announcements with program details, location, call for posters, workshop signup, costs, and registration information will be distributed in late August. Information will be posted on the GIS Bulletin Board and distributed to selected sites via regular mail. The official training announcements will be posted this month; the conference will be an official NPS and NBS training opportunity.

NPS Sourcebook Publication Underway Continued from first page

If you see a section you like, an area you can contribute to, or something that's difficult to understand, please feel free to call Karl Brown, Policy and Planning Branch of GISD at (303) 969-2590 so that we can continue to improve it's readability and usefulness. As a start, please consider park projects in GIS that worked well for you, and supply Karl with a Wordperfect (4.2 or higher) file for inclusion in an update to the Applications chapter. Send project material on any digital media you can use; preferably 3¹/₂" or 5¹/₄" diskettes, or over ccMail if possible [address is Brown, Karl in the main directory].

Updates and maintenance of the Sourcebook will continue through the GIS Division's transition from the National Park Service to the National Biological Survey on October 1, 1993. This task will continue in NBS, possibly resulting in an interagency Department of the Interior Handbook down the road.

GPS News: Base Station Standards in Development

Federal Geodetic Control Subcommittee (FGCS) Interagency GPS Base Station Meeting held May 18-20, 1993 Karl Brown, GISD

The National Geodetic Survey hosted a 3¹/₂ day GPS Base Station workshop in Rockville, Maryland from May 18-20, 1993. William Strange, chair of the Fixed Reference Working Group of FGCS, facilitated the meeting. The National Park Service was represented by Karl Brown, GISD and Paul Handly of NCR. Marie Frias of Prince William Forest Park also attended portions of the workshop.

All aspects of fixed station operation and positioning accuracies were discussed, including millimeter accuracy GPS used for crustal motion sensing by NASA, and real-time dredge monitoring needs of the Corps of Engineers. The Coast Guard identified potential cost share opportunities in base stations collocated with their coastal beacon network sites. Closed data system security measures pose the largest barrier to interagency data sharing at this time.

The NPS, BLM, and USFS all presented land management agency perspectives and concerns regarding accuracies, remote area communications, and data sharing obstacles peculiar to wildland management settings. The last ¹/₂ day session concentrated on the meter level or 'resource' grade accuracy receivers, and the data sharing needs and obstacles of the land management agencies. The representatives universally agreed that electronic bulletin boards for data distribution would alleviate most of the interagency barriers to data sharing.

The results of the workshop are to be compiled and presented to the full FGCS membership in August, 1993. With FGCS approval, the recommended configuration of base stations, and the data sharing mechanisms will be forwarded to the Federal Geographic Data Committee for formal discussion and possible adoption by all the federal agencies during the spring and summer of 1994. In general, the entire group concluded that 1) at least three [accuracy] classes of GPS base stations are utilized by federal agencies; 2) GPS base stations should be supported with an electronic bulletin board for data distribution; and 3) we don't need any more base stations in the lower 48 states, as the network is currently saturated, and in some places overbuilt.

GPS News: Interagency / DOI GPS Contract Under Development

USFS GPS Steering Committee Meeting to be held in Colorado Springs August 24-26, 1993 Karl Brown, GISD

The FY94-95 procurement of GPS 'rover' receivers will be discussed between the USFS / BLM / NPS at the semi-annual meeting of this steering committee. The first day will open with agency perspectives and needs and coordination efforts, industry updates, and an afternoon demonstration of real-time survey grade positioning. The second day of the meeting will involve a full morning of GIS-related topics followed by an afternoon tour of the GPS Control Facility at Falcon Air Force Base. The final third ½ day will be devoted to a review of the committee charter, interagency procurement issues, and agency training programs. Any NPS personnel who would like to attend the meeting are welcome; however, they should confirm their attendance with Karl Brown at GISD, so that tour limits aren't exceeded, and ground transportation will be adequate.

Both the BLM and the NPS have been partners to 3 generations of USFS contracts for GPS products. The last rover contract expired in FY93, and sufficient interest seems to have built in the Department of Interior agencies to either join a new USFS contract, or procure as a DOI sponsored contract. Tim Geary, BLM Denver Equipment Cache Manager, along with Bob Scruggs of the BLM Washington Office, will join Karl Brown from GISD in pursuing this cooperative purchase option with the USFS. Although the USFS has concentrated on Trimble products, they and other government agencies are evaluating civilian access to Precision Lightweight GPS Receiver (PLGR). It is a Rockwell product, 5 channel, C/A Code, P-code, and encrypted Y-code (military accuracy) rover with approximately 16 meters autonomous positioning. Other receivers under consideration include handhelds with the potential for coastal real-time position solutions utilizing the coast guard navigation beacon broadcasted corrections.

This trend in tightening accuracies certainly aides all of our GIS and related positioning efforts.

Although not designed to download to a GIS (or any PC), some inexpensive handhelds may be appropriate for DOI agency personnel in fire and law enforcement, making the overall demand for the joint USFS/BLM/NPS contract greater. Possibly by bundling these products, both GIS downloading units and other non-GIS handhelds may be placed on contract below typical GSA rates.

Please contact GISD with any suggestions or successes with new handheld and GIS compatible GPS products. GISD will attempt to coordinate a sense of demand and accuracy requirements for the Service, and discuss these factors with other DOI contacts and / or the USFS to assemble procurement options suitable for both our needs as well as USFS needs.

INFORMIX and GRASS

Susan Stitt, GISD

The Geographic Information System Division has acquired INFORMIX, a PROPRIETARY data base management system with automatic linkages to GRASS. We are currently testing it and its associated linkages.

The current GRASS-Informix tools consist of the following:

- g.select.inf Select an SQL database to be used in subsequent GRASS-DBMS applications.
- g.table.inf Generate a list of database tables in the currently selected database.
- g.column.inf Generate a list of database columns for a specified table in the currently selected database.
- g.stats.inf Generate a range of simple statistics for the values in a database column.
- r.rescale.inf Generate a raster map layer in which the categories represent values in a database column which have been divided into equal interval units.
- r.reclass.inf Generate a new raster reclass map based on the results of multiple queries to the currently selected database.
- v.reclass.inf Generate a new vector map layer derived from attribute data in the currently selected database.
- d.what.r.inf Report database attributes associated with a raster category value at a specified location.
- d.what.s.inf Report database attributes associated with a specific point location.
- d.what.v.inf Report database attributes associated with vector features.
- d.rast.inf Generate and display a reclass map based on the unique values in a database column.
- d.site.inf Display select sites from a database query.
- d.vect.inf Display select vectors from an existing vector map.

COMMENTS:

Current programs:

Initial comments include that the currently developed programs appear to function cleanly and without bugs.

Limitations:

A limitation in capabilities exists, in that the DBMS information cannot automatically be updated from a GRASS query. For example, one cannot tell INFORMIX to change the value in a given column to "CA" whenever the site falls within the cell category for the State of California. Continued

INFORMIX and GRASS

Training:

In order to utilize these commands, one needs to have an existing Informix data base. In order to build such a data base, one needs to have training in just how to do so. It is not an easily understood process without some sort of background in relational data base construction. Training is likely to be an important issue in the use of Informix.

Comparison with RIM

In comparison with RIM, Informix is much more robust, allowing the full utilization of relational capabilities with the connection to GRASS. The current linkage programs also are more compatible with the current GRASS environment and milieu. Although some may consider the special menu in RIM's connections as a benefit, other users found the menu to get in the way of their use. Also, the command line capabilities of the Informix connections allow for inclusion into scripts and other programs. Note: Personally, I would recommend Informix over RIM without hesitation. (Opinions expressed are my own and not necessarily those of the Government or GISD).

CONTACT:

Contact Susan Stitt via ccMail or at (303) 969-2590 for further information about applications and use of Informix.

LINE TRACE PLUS (LTPlus)

Susan Stitt, GISD

LTPlus is a software package provided with the release of GRASS 4.1. It is a "related" software that converts scanned raster data into vector data and enables the creation of raster DEM surfaces from attributed vector contours. Originally written for PCs, LTPlus was converted to work on UNIX workstations by David Satnik of Central Washington University. The NPS Geographic Information Systems Division has been testing LTPlus during the last few months.

Comments:

Capabilities: The capabilities of LTPlus for raster to vector conversion appear to work cleanly and well. The line thinning algorithm is far superior to that found currently in GRASS. We have successfully imported and processed several scanned maps.

The only format LTPlus accepts from the Tangent scanner is a bit map format. That means a file consists of bits turned on or off. This is not a format directly compatible with GRASS as GRASS uses byte or multiple byte format files.

The capability for creating DEMs does **NOT** appear to be working properly on the UNIX workstations. David Satnik will be looking at this problem, and hopefully some bug fixes will be upcoming.

LINE TRACE PLUS (LTPlus)

Limitations: Because LTPlus was originally a DOS program, which was converted to UNIX and because the Tangent scanner runs in association with a PC, there is a byte swapping problem. To transfer a Tangent scanner file to LTPlus on a SUN, one needs to 'dd conv=swab' the command file, and run cpio -b on the data file, in order to successfully import it into LTPlus. Another limitation is the requirement that the number of columns in the bit map needs to be a multiple of 32, this is again related to the byte swapping issue. As with most software, there are some peculiarities to the actual workings of LTPlus. However, once one sees a demonstration of LTPlus, or is alerted to its peculiarities, one can easily deal with the software. One nice thing about LTPlus is the default menus are set up in such a way that during the processing of a typical scanned file, one moves generally from top to bottom in the menus and commands selected. After I had a demonstration of how the software worked, I was able to pick up and run with it.

Training: The Soil Conservation Service offers LTPlus training, and there is an LTPlus manual with a tutorial. However, the data provided with the software differs from that discussed in the tutorial. The processing is similar, but the file names are different and the problems associated with the data are also different. The tutorial should be used with some caution.

Contacts: For further information regarding LTPlus contact Susan Stitt of the Geographic Information Systems Division at (303) 969-2596 or via ccmail.

Historically Black Colleges and Universities (HBCU) Summer Seminar in GIS

Sponsored by USGS and NPS Leslie Manfull, GISD

The Ninth HBCU Faculty Summer Seminar was held the weeks of July 26 and August 2,1993 at the USGS Applications Assistance Facility, Stennis Space Center in Mississippi. This was the third year the NPS GISD has co-sponsored this training with USGS.

There were 15 faculty members present from 12 institutions. Training for the faculty members included a 3 day GPS workshop by the NCRO RTSC and two days training by George McKay of the RMRO RTSC in GRASS and GIS applications. The group also spent a day touring the Gulf Islands National Seashore GIS unit and the park. Other sessions presented were about digital orthophoto data, remote sensing, and wetland interpretation. There were also hands on software sessions with Atlas GIS, tMAP, and PC-GRASS.

Thanks to all of you that helped make this training a success. Any volunteers for next year? Contact Leslie Manfull for more information.

REGIONAL BITS

-Alaska Region-

George Dickison

Until now we have always talked about the GIS efforts in the Regional office. Suffice it to say, these have been keeping us very busy this summer with the active land cover mapping efforts in Bering Land Bridge, Kobuk Valley and Gates of the Arctic. We have also been involved with producing land status maps and cartographic products in support of proposed land acquisition activities in Kenai Fjords National Park. We have added two additional workstations, ARC/INFO, ERDAS, AutoCAD, and ArcCAD to our hardware and software repertoire. Rather than expound further on these projects we thought that we would use this opportunity to highlight some of the other GIS efforts underway in the Region. Future newsletters will feature some of the additional GIS projects in the Region.

Glacier Bay National Park

Philip N. Hooge

Glacier Bay National Park & Preserve (GLBA) received funding from GISD in May to add GIS capabilities to their networked integrated Research/Resource Management data system. This grant funded the purchase of ARC/INFO, ArcView, an Altek digitizer, a Hewlett-Packard color scanner, enhanced storage/backup capacity and slide output of maps.

All data collected in the Park since the establishment of the Research Division in 1991 have been spatially referenced and standardized using a specially written data dictionary-database integration system built on Xbase data structures. All Park databases are stored on a Novell server which is sharing data over multiple architectures, including Workstations. Intel-based PC's and Sun ARC/INFO and ARCView were chosen to allow high-end GIS processing on a dedicated Workstation, while using Intel-based PC's running Windows to conduct the majority of GIS manipulation, attribute editing, and statistical analysis. These Windows-based tools, with their learning curves, are available to all reduced

machines on the network (i.e. ArcView, the Database Integration System, and SPSS for Windows). The objective was to make the entire GIS/data system available to all of the Research/Resource Management and management staff. In addition, all Intel machines on the network are capable of accessing ARC/INFO on the Workstation by using X-Windows emulation software.

GLBA is currently undertaking legislatively mandated research on two major issues which require the creation of a GIS system: 1) the impacts of vessels on Park wildlife, and 2) the effects of commercial fishing on the marine ecosystem. The goal this year was to develop the data infrastructure capable of handling and integrating a large amount of data gathered from a diversity of research staff, including both Park-based workers and independent scientists. Our hope is that through standardization, integration and the availability of usable tools, managers in the park will be able to use the data from these studies effectively.

-Alaska Region-

Coastal Programs Division

Gail Irvine

The Coastal Programs Division of the Alaska Regional Office is developing a PC based GIS to facilitate both knowledge of and resource management of coastal regions. The Exxon Valdez oil spill of 1989 highlighted the need for information along the NPS coastal areas, and led to the formation of this division and germination of the idea for the production of coastal atlases and GIS.

Aerial photography at a scale of 1:24000 is being acquired and will be used a base for other data layers including: geomorphology, biological information, archaeological information, subsistence sites, oiling data, etc. The software being used includes: autoCAD, ArcCAD, CadOverlay, and ArcView. The project is still in its infancy, but we hope to create a system that is easily transferable to the parks and enhances resource management.

Katmai National Park and Preserve

Katmai National Park and Preserve has initiated efforts to make the park GIS-capable in the near future. Driving this process is a need for powerful tools to analyze data from a multi-year coastal brown bear study in the park. Currently, more than 50 radio-collared brown bears are providing data regarding their seasonal distributions and movements. Using the analytical tools of GIS, we plan to analyze brown bear habitat partitioning, habitat selection, home range size and seasonal movements. This information will be useful to not only park managers but bear biologists in general. Additionally, we hope to initiate wolf research this fall in Katmai and utilize GIS to assist elucidation of their distribution, abundance, and interaction with habitat.

A Sun Sparcstation 10 workstation and ARC/INFO software have been ordered. GRASS software will also be loaded on the workstation. Additionally, a small format (11" x 17") color raster plotter and digitizing tablet will complete system hardware. Katmai will have full GIS functionality by fall of 1993. Larger plots will be available by sending information over a modem to the ARO-GIS center in Anchorage to be plotted on their large format Versatec plotter.

In order to take advantage of the summer field season, ARO-GIS staff produced a preliminary classified (95 classes) TM scene that covered most of the park. Large scale maps (big enough to see individual pixels) were produced for use in ground truthing. Approximately 8 of these 36" x 48" maps were produced. The results of the summer's field work will be used to create a preliminary vegetation classification map providing an important theme for GIS-assisted wildlife research in the park.

-Mid-Atlantic Region-

DESIGNING BETTER MAPS USING GEOGRAPHIC INFORMATION SYSTEMS A Short Course

by John Fels, Jean Marie McManus, Dr. Hugh Devine, Charles Rafkind

In June, 1992, Colonial National Historical Park hosted a *Short Course in Cartographic Design for GIS Users*. This course was sponsored by the National Park Service, Office of the Regional Chief Scientist, Mid-Atlantic Region, and offered through the GIS Research Program at the College of Forest Resources, North Carolina State University (NCSU). The course instructors were John Fels, formerly faculty of the internationally recognized Cartography and GIS Programs at Sir Sandford Fleming College, Ontario, Canada, and Jean Marie McManus, Laboratory Manager for the GIS Research Program at NCSU. Fifteen persons attended the four-day course, representing the National Park Service (MAR, NCR, WASO), the Virginia Institute of Marine Science, and James City County, Virginia.

The purpose of the course was to provide GIS specialists and managers with exposure to the diverse issues and decisions affecting cartographic design and communications. Course topics included cartographic data structures and their influences on visual representation, the design of qualitative and quantitative map symbols, principles and strategies of color symbolism and design, the design and utilization of typographic symbols, the organization of complex cartographic presentations, and issues in the physical production of GIS-based maps. The course also included seminar sessions, in which examples of GIS-cartographic products were analyzed and critiqued, and workshop sessions in which participants applied design principles to their specific map production situations. As a result of the course, participants are able to communicate more effectively in the visual medium of maps.

Geographic information systems present both opportunities and limitations for cartographic communication, and the design of maps in the GIS environment is a significant challenge for all cartographers. Workshops like this provide an opportunity for GIS users to gain vital knowledge of map design principles and approaches, apply these in their own professional circumstances, and take greater advantage of new technologies to produce maps that are not only visually appealing but communicate effectively. In the future, more courses of this type will benefit the growing number of natural and cultural resource management professionals who use or manage geographic information systems.

John Fels is a Ph.d candidate at NCSU and cartographic consultant, Jean Marie McManus is the laboratory manager at the NCSU-GIS Research Program, Dr. Hugh Devine is the Director of NCSU-GIS Research Program and NPS, Mid-Atlantic Regional Technical Support Center, Chuck Rafkind is GIS Coordinator and Natural Resource Management Specialist at Colonial NHP. For further information contact either Dr. Hugh Devine 919-515-3682 or Chuck Rafkind, 804-898-8677.

-National Capitol Region-

GIS NEWS FROM NCR

Patrick Gregerson

<u>GPS Training</u> <u>at the</u> <u>Stennis Space Center</u>

At the request of GISD, the Field Technical Support Center (FTSC) of NCR conducted a three day training course at the USGS office located at the Stennis Space Center, Mississippi. The trainees were 14 Professors of Geography from 11 Historically Black Colleges and Universities. The training covered the following: fundamentals of GPS, components of a resource based GPS, hands on introduction to the Trimble Pathfinder Professional, Pre-mission planning for a successful GPS project, creating a data dictionary, field mapping exercises, post processing GPS data, and exporting the data into Atlas GIS.

<u>Using GPS at Manassas</u> National Battlefield Park

A project was identified to map the horse and pedestrian trails in the park. The FTSC decided to make this a pilot project creating a "Hit Team" by using as many GPS units as possible. Five GPS units were used with assistance from Antietam National Battlefield personnel. Approximately 20 miles of trail were mapped the first day, identifying bridges, streams and trail connections along the way. Each Hit Team had at least one member that was familiar with the park's terrain for obvious reasons. The size of the National Capital Region is so small that we are able to use other park's staff to accomplish in a day or two what would usually take a week or more to do. With the success of this project, we plan on continuing the process at other locations.

New Location for the FTSC

The FTSC has moved from the Regional office building on Haines Point to the Ecology Lab at the Center for Urban Ecology (CUE). CUE is the Region's science laboratories that deal with hydrology, soils, water resources, ecology, agronomy and integrated pest management. The lab is a temporary measure until a GIS Lab is constructed at CUE. The new digs allows us to provide training courses, and accommodate up to 5 people working at the same time. We have added a new PC for use with Atlas GIS. We are also networking with the Wildlife Lab that is adjacent to our lab. They have a Sparc 1+ and are also running Atlas GIS on their PC.

List of Classified Structures - continued

The cultural resource team that is using GPS to identify structures along the C&O Canal have successfully downloaded their data into the LCS. This data not only contains the UTM coordinates, but includes approximately 20 attributes as well. This data will be used in various forms from GIS uses to identifying the structures condition and maintenance needs. Continued

List of Classified Structures

If you have any questions, contact either Stephen Ziegenfuss at 202-205-5519 or Lincoln Fairchild at 202-343-8149.

Watershed for GWMP

An oil spill took place in May that affected part of the Potomac River and shoreline along the George Washington Parkway. To combat any future spills, GWMP has instigated a comprehensive watershed model for Northern Virginia. The model will include the following: landuse, land cover, USGS DLGs, zoning, sewer maps, oil and gas station locations, elevations and pipelines. The park hopes to use this information for oil spill mitigation and If there is anyone out there that has response. already prepared a similar model, it would be helpful to the park and Region to get this information. Please contact Dan Sealy at 703-285-2598 or the FTSC.

CHOH goes GIS!

C&O Canal Historic Park is having 1:2400 scale survey maps digitized under an indefinite quantities digitizing contract supervised by WASO-GIS. This marks the park's first major leap into developing an active/useful GIS! The data, which is mainly hypsography, will be used as base for GPS mapping projects in the future. The park is also digitizing it's boundary using approximately 100 1:2400 scale segment maps.

Chesapeake and Ohio Canal Historic Park and the Center for Urban Ecology are developing a long term plant succession monitoring strategy for field areas along the Potomac River. GIS and GPS technology are being used to establish baseline data and to map and record plant distribution and growth in the study area. Segment maps of the project area, acquired from the NPS's Philadelphia Lands Office, were used to digitized field boundaries for the project area. GRASS4.0 was used to identify sample sites for the project and will be used in future analysis of field results. Trimble Pathfinder Professional GPS units are being used to collect database information about and locations of samples in the field. For more detailed information, contact Pat Toops @ CHOH or John Hadidian @ CUE via CC:MAIL.

> Paul Handly is on detail to Voyageurs National Park through the month of August. If you have any reason to contact him, good luck, not really. If he's not out looking for bald eagle nests or canoeing, (some detail, eh?) he can be reached via cc:mail or at 218-283-9821.

-North Atlantic Region-

Nigel Shaw

Numerous GIS projects are underway in the North Atlantic. These include:

- initial GIS implementation at Minute Man NHP (MIMA) and Roosevelt-Vanderbilt NHS (ROVA);
- data development at Acadia NP (ACAD), Saratoga NHP (SARA), Morristown NHP (MORR), ROVA, Saint-Gaudens NHS (SAGA), Cape Cod NS (CACO), Fire Island NS (FIIS), and Gateway NRA (GATE);
- coastal and water management applications at CACO, ACAD, FIIS, and GATE;
- staff training on GIS and GPS (3 training courses and 2 workshops this year);
- land management/planning applications at ACAD and CACO;
- trail planning application at MIMA;
- shoreline monitoring at GATE;
- viewshed mapping at ROVA;
- flora and fauna management at SARA, CACO, ROVA, and MORR.

Ever more park and Regional Office staff are involved in collecting GIS compatible data and applications development. A significant number of these individuals work in cultural resource management, horticulture, maintenance, integrated pest management or other areas outside natural resource management. This has the welcome effect of broadening the scope and usefulness of the GIS program Regionwide and, in particular, the perspective of the Regional GIS Coordinator working with all these people!

Right now we are developing a workshop on collecting GIS compatible data, determining locational accuracy requirements and affordable options, and identifying appropriate classification systems for spatial data. The workshop will be designed for NAR staff who design methods, oversee the data collection process, or write contracts to collect spatial data.

-North Atlantic Region-

Shoreline Monitoring at Sandy Hook Gateway NRA

Sandy Hook, NJ is an 11 mile long sand spit extending northwards into New York Harbor. The southern 4 miles are groined and seawalled along the Atlantic Ocean and are largely residential. The northern 7 miles are part of Gateway NRA which rings New York Harbor. This includes 1 mile of seawall and groins and 6 miles of very dynamic, natural shoreline. Beach erosion due to sediment starvation averages over 100 feet per year and threatens access for the 2 million visitors.

During the 1980's Congress allocated a total of over 24 million dollars to nourish the open beaches at Sandy Hook by "recycling" sand from the end of the spit and depositing it between the groins. Large scale aerial photography (1:9600) was taken bi-annually from 1980 to 1992 enabling a qualitative assessment of the beach nourishment effects, but there was little quantitative data applicable to the entire peninsula for monitoring or modeling sand transport and resulting shoreline change.

Jim Allen, Regional Coastal Geomorphologist, photointerpreted the shoreline and sand/vegetation edges onto mylar overlays. He also located over 40 GPS established control points selected for their visibility on each set of photos. The shoreline and sand/vegetation edges are now being entered and simultaneously georeferenced in GRASS where they can be overlayed to examine net direction and magnitude of sand transport over the years, acreage changes, and shoreline configuration changes both within and between groins as well as over the peninsula as a whole.

Depending on the results of these analyses, the data may also be used in the Digital Shoreline Analysis System (DSAS), an analytical program that uses spatially referenced shoreline data as input to calculate rates of change at a user-specified interval along the shoreline. The advantage of having a digital map series instead of traditional shore-perpendicular transects is that the density of samples can be increased according to the complexity of the shoreline or alternative intervals can be selected to examine the results for stationarity.

Traditional methods do not allow for this degree of flexibility or robust examination of the effect of analytical methods. With GPS and GIS it is cheaper to perform the analysis and possible to refine or even redesign the analysis by altering data input selections. With traditional baseline measurement methods the onetime setting out of transects precludes alternative data input selections.

The quantitative results will clarify the magnitude of the present sediment deficit in the "Critical Zone", and provide a spatial *model of erosion and redeposition elsewhere, and reveal the less dramatic but cumulatively significant alterations to habitat elsewhere on Sandy Hook. This will be useful to the park in managing the beaches themselves as well as the natural and cultural resources associated with and affected by the beach.

-Pacific Northwest Region-

Regional News

Craig Dalby

North Cascades National Park received funding from FIREPRO to purchase ARC/INFO off the USGS GISII contract. This will be the third park and fifth site using ARC/INFO within the Region.

Craters of the Moon National Monument is in the process of purchasing hardware and software for a PC-based GIS. The software will consist of ArcCAD and ArcView for Windows. The park already has a good base of data compiled last year at the CPSU, University of Idaho.

Tom Sturm of the USGS Western Mapping Center in Menlo Park, California visited the Regional office at the end of June to discuss digital mapping standards. The session was well attended by GIS specialists from the parks as well as several individuals from the Regional office. We were all interested to learn just how inaccurate digitizing

tables can be. Tom had some useful suggestions on testing digitizer accuracy, and stressed the importance of keeping the puck in the same orientation throughout the data collection process.

The Region will soon obtain all DEMs in and around Park Service lands in Washington from the Washington State Department of Natural Resources. The Region will reciprocate by providing DNR with copies of all hydrographic data which has been digitized at North Cascades National Park, as well as several quads of DLG-hydro and DEM data from Olympic National Park. The State DNR is leading a group of federal and state agencies in a cooperative effort to complete all DEM coverage within Washington. The project is nearing completion with only a few quads missing on the Olympic Peninsula, the North Cascades, and the Columbia Plateau in the eastern half of the state.

The new draft Regional GIS Plan is currently under review by the Region and GISD.

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Mapping the Intertidal Habitats of Olympic National Park

Roger Hoffman

In 1988, the wilderness coastline of Olympic National Park was struck with oil from a storm-damaged barge. The resources lost to the oil were not only invaluable, they were for the most part undocumented. The park knew very little about the intertidal plant and animal communities damaged by the spill. When a fishing vessel sank just offshore in 1991, spilling even more oil into the waters and onto the beaches, we knew little more about those coastal resources than we did three years previously. Now we have a chance to change this pattern. The park is currently engaged in a pair of complementary projects of intensive intertidal surveys (using permanent transects) and intertidal habitat mapping. Continued

Mapping the Intertidal Habitats of Olympic National Park

This article describes the habitat mapping portion of this project. The park's intertidal habitats are being classified using a combination of low altitude (ca 1:5,000) color aerial photography and extensive ground verification. The classification scheme being used is that of Diether which has become the de facto standard for classifying Washington State coastlines. Diether's classification scheme expands on the more widely known Cowardin scheme by differentiating more substrate types (cobbles, boulders, etc) and adding a modifier to describe the energy level (exposed versus protected or semi-protected). Identification of the various habitat types is being accomplished through a combination of photo interpretation and ground verification. Habitat codes are written on color photocopies of the original aerial photos (to protect the originals while in the field). The original photos have been scanned (using an HPIIc desktop color scanner) at 300 dpi (a trade off between resolution and file size was made) and registered to a real-world coordinate system using ARC-INFO's register and rectify routines. The boundaries of the different habitat types are then digitized on screen using the scanned photo as a backdrop.

The coordinates for control points (features identifiable both on the photos and on the beach) required to register the photos are being collected using Trimble Pathfinder GPS receivers. These GPS points are differentially corrected and averaged to maximize accuracy. The manufacturer's estimated accuracy of points gathered this way is about 7.5 meters (assuming 95% confidence). Ultimately, we plan to measure the accuracy of the receivers (relative to monumented benchmarks) under typical field conditions for ourselves.

Because we are mapping intertidal habitats with virtually no elevation change (from sea level) distortion due to terrain displacement should be minimal. We are in the process of evaluating the extent of distortion due to other factors (we would like to hear from those of you with some experience with this type of problem). Even considering these sources of error, we believe this process will be more accurate than using a zoom transfer scope to transfer the habitat boundaries (fuzzy as they may be) to USGS $7\frac{1}{2}$ ' maps because of the loss of resolution going from 1:5,000 photos to 1:24,000 maps. However, we still plan to map some sections of the coastline each way to compare the efficiency and accuracy.

The primary purpose of this mapping is to provide a database which, along with the data from the intensive intertidal surveys, will allow quantitative assessments of damage to the park's coastal resources resulting from future oil spills (which, unfortunately could happen any time). Hopefully, this information will also help protect the resource rather than just document the damage. A digital database of the park's coastal resources (including cultural resources), when combined with databases including access points, helispots, currents etc. should also help in spill response operations such as prioritizing sensitive areas for booming, identifying areas to avoid (some habitats are better off without human efforts to clean them, or may need special care such as is the case with cultural sites). In addition to the analyses that can be performed using this database, with a raster plotter, the habitat polygons can be printed as overlays on the scanned photos or on scanned quads (depending on the scale and type of information necessary on the output) for specific needs (such as choosing new permanent transects for inventory and monitoring efforts).

During the collection of ground control coordinates, the alternate meaning of the acronym GPS (Good Points...Sometimes) was truly appreciated. We thought sharing some of our experiences with GPS data collection would be valuable to those of you who may be planning such projects in the near future. Some things that can (and will) go wrong:

Mapping the Intertidal Habitats of Olympic National Park

1) Inability to track enough (4 or more) satellites for a good 3D position at certain times of the day (mission planning is critical: especially when faced with planning your data collection around a tight schedule such as low tide).

2) Finding the local community base station no longer records data for weekends or before 7am local time (the best tides are usually very early in the morning). Without base station data, you cannot differentially correct your rover data and the accuracy falls to around 30m (95% confidence) - not nearly good enough for most purposes.

3) Rovers tracking different satellites than the base station (these rover positions cannot be differentially corrected either). This supposedly isn't a problem when the rover is within 300 miles of the base station and the rover's elevation mask is set high enough (15 degrees or so). However, our rovers are only about 120 miles from the base, but the mountain ranges in between are apparently blocking the base station's view of satellites the rovers are tracking over the Pacific. Collecting several minutes of points (300-400 points) at a given location not only allows for better accuracy through averaging but also serves as a hedge against the problem of the rover tracking different satellites than the base; with more points, the odds improve of having at least some points which can be differentially corrected.

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Mount Rainier GIS Activities

Darin Swinney

Ongoing work at Mount Rainier includes the conversion of existing GRASS data to recently acquired ARC/INFO. Other database development involves relating external Natural Resource tabular databases to GIS spatial data. Attempts are being made to link dBase with ARC/INFO to create an external database link.

Mount Rainier has been using GPS to map previously unmapped cultural and natural resources. Experiments are underway to evaluate the use GPS on fixed-wing aircraft to analyze search patterns of aerial elk surveys. These same methods may also be used in search and rescue operations within the park.

Mount Rainier has been declared a "Decade Volcano" igniting various research projects within the park. Researchers studying the geology of the volcano's cone are using GIS in their mapping



efforts. Research involving the crustal controls of subduction zone magmatism are using GIS to calculate the volume of the volcano's cone.

-Rocky Mountain Region-

Sarah Wynn

Our Systems Administrator, George McKay, began work in the RMR Technical Support Center (TSC) May 17. George is working with Peter Strong and Dave Duran of WASO GISD to learn how the TSC is networked to GISD as WASO Air Quality. George is responsible for dealing with park and Region GIS technical support. He can be reached directly by dialing 303-987-6706. George will be offering to set up park workstations in a manner consistent with those at the TSC in order to facilitate his providing parks technical support. Chris Theriault, GIS Technician, will continue to copy data to media that parks can use, to process data for parks, and to plot and scan data for parks. Chris can be reached at 303-987-6708. Please contact our Division Secretary, Sylvia Alameddin (303-987-6710), to reserve a GPS for use. The GPSs are currently booked through September but will be available for use starting in October. Bighorn Canyon NRA and Rocky Mountain NP have just purchased Trimble Pathfinder Professional units, joining at least 8 other RMR parks who have these units. Dial-up NPS base stations are operating at Mesa Verde NP and Jewel Cave NM.

The TSC is purchasing a Gateway 2000 which the systems administrator will be using with a Tektronix emulator software to administer the RTS system. We believe the Gateway 2000 is what we will be recommending parks buy for PC GIS systems. We have also purchased an optical disk to provide more disk space for our two existing work stations.

Jennifer Swenson, a co-op student who is starting a Master's program in Geography/GIS at San Diego State, worked at the TSC from June 15-July 30. She will be working with us the next two summers. Jennifer worked on dBase databases for us and processed DEM data. Michelle Gudorf, a student at the University of Colorado, is volunteering 16 hours a week to process DEM data and update data bases. She will also be preparing ARCVIEW coverages to be used with that software. We will be putting copies of ARCVIEW out into the Interpretation Division and the Planning Directorate in order to make GIS data available to Regional office users. We will also be trying copies of this software out at PC GIS candidate parks, such as Great Sand Dunes and Arches National Monuments and Wind Cave National Park.

Jennifer Norton from Capitol Reef spent a week at the TSC plotting out data in preparation for a General Management Plan meeting. Regional Director, Bob Baker, will be visiting Capitol Reef at the end of August and will be viewing the park's GIS system and how it is being utilized at the park.

Due to a variety of circumstances, we have scheduled and rescheduled our Regional GIS Meeting. We have finalized it for November 15, 1993, the day before GIS93, the biannual NPS GIS Conference. We will meet in Room 153, RMRO starting at 8:30am. The intent of the meeting is to review the FY93 Regional program and provide an opportunity for park input into the FY94 program. With 12 GIS specialists in the Rocky Mountain Region, the meeting will provide a good opportunity for us to identify areas of expertise that we can share with one another. George and Chris will be demonstrating ARCVIEW and OSIRIS Grassworks. Please contact me about further topics of interest for that meeting.

I continue to assist parks with GIS plans. Plans are currently in progress for Dinosaur (including Fossil Butte), Grant Kohrs (Big Hole National Battlefield), and Zion (Cedar Breaks and Pipe Springs), while Badlands is beginning a GIS plan. Curecanti (Black Canyon, Florissant and Great Sand Dunes) and Canyonlands (Arches, Colorado National Monument, and Natural Bridges) will be finalizing their GIS plans this coming fiscal year. A special thanks to Dan Foster of Bryce Canyon for updating Bryce's GIS plan.

-Rocky Mountain Region-

STEPS IN DEVELOPING GRIZZLY BEAR BIOLOGICAL ASSESSMENT USING GRASS GRAND TETON NATIONAL PARK

Sue Fullerton, GIS Specialist Grand Teton National Park

The John D. Rockefeller, Jr. Memorial Parkway, lying between Grand Teton National Park and Yellowstone National Park, is under the administrative jurisdiction of Grand Teton. Since the entire Parkway is located

within the Grizzly Bear recovery area, recent proposals for additional development at Flagg Ranch, located just south of Yellowstone, necessitated a Biological Assessment of the projected impacts of new development upon the grizzly. This requirement was met by the Resource Management staff at Grand Teton National Park in the spring of 1993. GRASS procedures were used for a number of the steps in this analysis.

Appropriate data themes present in the Grand Teton GIS system at the time were limited to: Roads/Trails (USGS), Hydrograpy (USGS) and Habitat/Cover (developed throughout the recovery area for Grizzly Bear Cumulative Effects Modeling). Running the Cumulative Effects Model (CEM) was not an option, as data addressing an entire Bear Management Unit (BMU



- the basic area of analysis for the model) were not available. It was decided that we should proceed with an assessment duplicating the procedures and using factors devised for the CEM, while limiting the project to the boundaries of the Parkway.

For purposes of this analysis, roads and trails for the Parkway were brought up to date using the Altek digitizer. Current and proposed developments were also digitized. The Habitat/Cover theme was available for pre-1988 conditions. This data was used with written acknowledgement of this variation which affected a limited area along the east boundary. All analyses were then masked to the Parkway boundary, rather than a BMU boundary.

Scenarios were developed for the Current and Proposed conditions, each with a separate analysis for spring, summer and fall (6 scenarios in all). Development features were numerically categorized according to the standards of the CEM (combinations of: linear/polygon, motorized/non-motorized activity, high use/low use). The <u>extent</u> and <u>degree</u> of impact were assigned to each category according to CEM guidelines.

For each scenario the role of GIS was to:

1). determine the <u>extent</u> of impact associated with each feature (established as buffer zones at a distance of either .25 miles or .50 miles). Continued

STEPS IN DEVELOPING GRIZZLY BEAR BIOLOGICAL ASSESSMENT

2). overlay all buffered impact features upon the Habitat/Cover data layer to identify and quantify unique combinations of impact type(s) upon each habitat type.

3). quantify zones of interface (ecotones) between forested/non-forested habitats, and determine the extent to which each impact combination affects these "edge" areas.

For each scenario, the following steps comprised the analysis for 1-3 above:

1). Buffer zones were established at the correct distance (<u>extent</u> of impact) for each feature (r.buffer) and features of like category were patched together (r.patch). This resulted in raster layers categorized from 1 through 10.

2). All (patched) impact layers were analyzed against the Habitat/Cover layer (r.stats). This produced a table showing the area of each habitat type affected by each particular impact combination. Output was expressed in square meters. (sample table attached)

3). Habitat types were reclassified into two major groups: Forested/Non-forested (v.reclass). Used as vector lines, rather than <u>area</u> lines, this layer was then converted to raster form (v.to.rast). All (patched) impact layers were then analyzed against this layer of rasterized "edges" (r.stats). This produced a table showing the extent to which the forest/non-forest ecotone was affected by each particular impact combination. Output was expressed in square meters. By comparing areas of impacted "edge" zones to the total area of "edge" in the Parkway, relative losses of this ecological component to each category of impact could be determined.

Tabular output (from #2, #3) was then transferred to DOS where completion of the analysis was done by park biologists, using LOTUS techniques. Briefly, this involved:

--converting tabular areas to acres;

--interpreting each uniquely impacted habitat type with respect to the <u>degree</u> of impact by category and the seasonal <u>importance</u> of each habitat type to the grizzly (established CEM factors);

--losses of the forest/non-forest ecotone were used in discussion in the final report, although this feature is not a part of the CEM analysis.

This information allowed biologists to draw conclusions projecting the decline of grizzly habitat in the Parkway which would result from the proposed additional development and associated human activities.

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