NCPTT NOTES

National Center for Preservation Technology and Training

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Acid Rain and Beyond

NCPTT's Materials Research Program on CD-ROM

Within the National Center for Preservation Technology and Training, the Materials Research Program continually seeks ways to disseminate research results to the public in an easily accessible form. NCPTT recently developed a multimedia CD-ROM, *Explore the Materials Research Program - Acid Rain and Beyond*. The CD summarizes more than sixteen years of scientific research on the effects of acid deposition on cultural resources decay.

In the early 1980s, the National Acid Precipitation Assessment Program began a series of concurrent investigations into the effects of acidic pollutants on human health, ecological systems and materials in the United States, including cultural resources. NAPAP's ultimate goal was to determine pollutant damage functions and to assess the costs and benefits of cleaning the air. NAPAP's current goal is to monitor the costs and benefits of air pollution reduction.

The National Park Service contributes to the NAPAP effort with funds, resources and staffing by establishing the NPS Acid Rain Program, which later became NCPTT's Materials Research Program. MRP's work includes investigating air pollution effects on cultural resources decay, postulating new mitigation strategies and developing new preservation treatment methodologies. Research is undertaken through cooperative efforts with universities, Federal laboratories, government agencies and non-profit organizations. Since 1997, NCPTT has continued funding innovative research on environmental effects of air pollutants on cultural resources through various arrangements, including its Preservation Technology and Training Grants program.

The multimedia CD-ROM, *Explore the Materials Research Program - Acid Rain and Beyond*, allows the viewer quick access to MRP's goals and accomplishments. The audience can review text, photographs, video images, computer animation, author biographies, bibliographies and Internet links for over 25 projects.

The main menu of the CD allows the viewer to watch video

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Editor
Mary F. Striegel

Contributors
Karen E. K. Brown
Mark Gilberg
Marion Marks
Tim Seaman

Managing Editor
John Robbins

Publications Manager
Sarah B. Luster

Address
NCPTT
NSU Box 5682
Natchitoches, LA 71497

Telephone
318/357-6464

Facsimile
318/357-6421

Electronic mail
ncptt@ncptt.nps.gov

World Wide Web
www.ncptt.nps.gov

Newsletter design
Terra Incognita
www.terraincognita.com

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Send comments on *NCPTT Notes* or submit articles or notices for consideration to NCPTT Publications Manager Sarah B. Luster.

FY2000 PTTGrants Call for Proposals

The National Center for Preservation Technology and Training has issued the FY2000 call for proposals for NCPTT's Preservation Technology and Training Grants program. The PTTGrants program has awarded over $500,000 each year since 1994 for innovative work in research, training and information management on technical issues in historic architecture, archeology, historic landscapes, objects and materials conservation, and interpretation. Grants are available in eight categories –

- Information management
- Training and education
- Applied/fundamental research
- Environmental effects
- Technology transfer
- Analytical facility support
- Conference support
- Publications support

Application deadlines are mid-December 1999, as specified in the call for proposals. *FY2000 PTTGrants Call for Proposals* is available via —

E-mail Send a blank message to <pttgrants@ncptt.nps.gov> and the call for proposals will return automatically.

Fax-on-demand Call 318/357-3214 and follow the recorded instructions to receive a catalog of documents that includes the call for proposals.

Web Visit <www.ncptt.nps.gov> and click on "Preservation Technology and Training Grants."

Brochure The printed brochure for the FY2000 PTTGrants program has been mailed to *NCPTT Notes* subscribers. Request a printed call for proposals by e-mail <ncptt@ncptt.nps.gov>, telephone (318/357-6464), or US mail (NCPTT, NSU Box 5682, Natchitoches, LA 71497).

Exhibit Conservation Guidelines CD

The National Park Service-Division of Conservation recently issued guidelines in CD-ROM format to assist in preparing preservation-responsible exhibits.

Exhibit Conservation Guidelines addresses the important role of conservation in exhibit planning, design and fabrication through technical notes and illustrations. NCPTT assisted the Division of Conservation in publishing the CD. The CD contains 370 pages (35MB) of narrative guidelines, technical notes and illustrations.

The CD is available, upon request, free-of-charge to NPS offices and sites; for others, the CD is available from the Harpers Ferry Historical Association; telephone 800/821-5206, e-mail <hfha@ intrepid.net>, Web <www.nps.gov/hafe/bookshop/catalogue.htm>.

PTTBoard Member Heads Municipal Art Society

Frank Emile Sanchis, III recently was appointed as executive director of the Municipal Art Society of New York. Mr. Sanchis is a charter member of NCPTT's advisory board, and previously served as vice-president for stewardship of historic properties in the National Trust for Historic Preservation.

The Municipal Art Society was founded over a century ago to promote excellence in planning and designing New York's built environment and to preserve the best of the New York's past. The Society's prominent advocacy efforts have been responsible for New York City's most important zoning and preservation laws, many of which have served as models for historic preservation efforts throughout the United States.

New Applications for Advanced Technologies in Archeological Research

In recent years, advanced technologies have revolutionized the theory and practice of archeological research. Two emerging technologies, Global Positioning Systems and Geographic Information Systems, promise to continue this trend.

GIS and GPS have potential for widespread application in archeology. Their combined power stands to change how archeologists approach basic tasks in fieldwork — such as the collecting and analyzing archeological site data —, and how archeologists approach theoretical research issues, particularly sophisticated methods for modeling and analyzing cultural landscapes. Although further research is necessary to realize the full potential of GPS and GIS, archeologists already have made extensive use of these technologies, with impressive results in many cases.

NCPTT-sponsored research at UNC

A recent NCPTT-sponsored project successfully explored one useful application of GIS and GPS in archeological research. Dr. Robert H. Brunswig, Jr. of the Department of Anthropology at the University of Northern Colorado undertook a field testing program to assess the utility of mapping-grade GPS instruments that record locational information with a margin of error of less than one meter. Brunswig's research sought to determine the effects of several factors on the quality of GPS data. His fieldwork, conducted at five archeological sites in northeastern Colorado, was designed to test GPS under a variety of environmental conditions. Four sites were located in the Indian Caves research area, which lies within the Pawnee National Grassland and has topographical features typical of Colorado's high plains region. The fifth, a high-altitude game drive site, was located in mountainous, sub-Alpine terrain on the eastern side of the continental divide in Rocky Mountain National Park. In addition, Brunswig used several methods of data collection and analysis to determine which were most effective under various conditions.

Data collection and analysis

Brunswig faced a significant challenge at the outset of the project: the inherent inaccuracy of raw GPS data. The primary GPS device selected for use during fieldwork was a Trimble ProXR, which receives a relatively low resolution satellite data signal known as "C/A code." By contrast, the higher resolution P-code signal used by military and governmental GPS instruments is significantly more accurate. With C/A code instruments, positional errors ranging from 10 to 100 meters are common, which is far below the level of precision needed for most archeological applications. But in recent years, civilian engineers have developed a system of differential correction that modifies raw C/A code data to produce locational information accurate to within one meter — in many cases, more accurate than data supplied by governmental P-code GPS. Brunswig used two methods of differential correction — post-fieldwork computer processing of GPS data, and real-time data correction using a satellite antenna in the field — and found that each achieved an acceptable level of accuracy for archeological research.

One configuration of a field GPS system includes a notebook computer for on-site mapping

In the field, Brunswig logged GPS point data at the four Indian Caves sites after each had been surveyed by University of Northern Colorado field crews using standard archeological recording methods. Field crew members walked each site at three-meter intervals and marked all visible artifacts and features with pin flags. Brunswig then followed, using GPS to record two classes of data points. The first included archeological artifacts, features and test units. The second was comprised of topographic points, which would later be needed to provide an accurate representation of the physical terrain at the site when the data was entered into a GIS.

Each of the Indian Caves sites presented a different combination of archeological and landscape features. The first, located on a bluff, had a horizon-to-horizon view of the surrounding landscape and afforded Brunswig's GPS receiver excellent exposure to signals from orbiting GPS satellites. Exposed bedrock on the surface of the site revealed dozens of artifacts and nine stone rings that represented the foundations of prehistoric tipi shelters. At the second site, situated in a small, partially enclosed canyon, an exposed foundation from an early

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Correcting improper storage is part of preservation planning

Internet Training for Paper Preservation

The Internet's remarkable growth during the past five years has led to the development of the World Wide Web as a training and learning medium. With Web-based training, an instructor can deliver course materials and conduct interactive bulletin boards and chat rooms with remote audiences. "Preservation 101," a new example of Web-based training, was developed by the Northeast Document Conservation Center with support from a 1998 Preservation Technology and Training Grants award.

In June 1999, Northeast Document Conservation Center offered a free four-week program entitled "Preservation 101: An Internet Course on Paper Preservation." The course was developed as a pilot project designed to assist museums, archives, libraries and historical societies to better understand the nature of paper collections and causes of deterioration. "Preservation 101" focused on preventive preservation, provided practical information to improve storage, care and handling, and addressed environmental issues in paper preservation.

Few institutions have enough time, money, staff and other resources to sustain all necessary activities. Although preservation or conservation activities often are neglected, preservation is an essential function that curators, archivists and librarians must learn to integrate into the daily life of an institution. Preservation practices can begin with systematic planning and simple procedures, such as formalizing handling procedures for fragile materials, providing adequate security, or by improving the quality of enclosures. Good, continuous care is a far cry from the more traditional view of "conservation," where periodic treatments were more remedial in nature. Good collections care seeks to prevent premature deterioration or physical harm, rather than to respond with treatment after damage has occurred. "Preservation 101" encouraged managers to embrace "preventive preservation" by emphasizing activities that benefit collections as a whole, such as modifying the storage environment or writing a disaster plan.

Methodology

Announced via the World Wide Web on a first-come, first-served basis, "Preservation 101" registered sixty students who represented historical organizations, libraries, public record offices and collectors.

"Preservation 101" was delivered electronically using WebCT, an instructional software program developed by Simon Fraser in British Columbia, and e-mail. To supplement course materials, students were directed to online bibliographies and readings. Each Friday during the course, the students had access to a new lesson in which terms were defined and the basics of inherent and external vice were explained. Each lesson served as a prerequisite to subsequent lessons. The first lesson, "What is Paper Preservation?," was followed by "Environmental Damage to Collections" and "Solutions to Collections Care." The final lesson, "Preservation Planning," integrated various course topics by introducing the concept of managing preservation by surveying needs and prioritizing corrective actions. To further assist participants in understanding the essentials, a glossary was developed for the course. In addition, numerous images were used to highlight various problems and solutions in preserving paper objects.

Collections owners can and should protect their holdings, but access to current information and high quality educational opportunities can

Northeast Document Conservation Center

The Northeast Document Conservation Center is the largest nonprofit, regional conservation center in the United States. Its mission is to improve the preservation programs of libraries, archives, museums, and other historical and cultural organizations; to provide the highest quality conservation services to institutions that cannot afford in-house conservation facilities or that require specialized expertise; and to provide leadership to the preservation field. NEDCC also has become a national and international resource for conservation treatment and preservation education.

NEDCC was founded in 1973 in response to growing alarm about the monumental scope of paper deterioration problems facing collections-holding institutions in New England. In 1980, NEDCC was incorporated as a private, nonprofit organization serving New York, New Jersey and the New England states.

be a challenge for many smaller organizations — especially those in communities remote from conservation expertise. The Internet can be an inexpensive delivery medium that provides flexible, distant, asynchronous learning from any location — indeed, the initial "Preservation 101" class included participants from Louisiana, California, and South Africa.

The course has enhanced recognition of collections care challenges. As the demand for basic preservation information has grown, NEDCC has been a leader in providing low- or no-cost general preservation education to cultural institutions in the northeastern United States and beyond.

Creation and evaluation

"Preservation 101" was developed by two members of NEDCC's staff. Karen Brown, field service representative, acted as instructor while Kim O'Leary, Webmaster/events coordinator, solved the problems of posting a course online. In planning the course, several other online courses, including some in unrelated fields, were examined and evaluated. NEDCC staff felt it was important to keep the course content clear, complete and adaptable to print for future use. Unlike online courses for college credit, students were not required to interact actively. The challenge for this course was to ensure that participants would continue to be involved throughout the program. This was accomplished by scheduled weekly postings, by offering an interactive "bulletin board," and by inviting

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Acid Rain and Beyond

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interviews of NCPTT staff and principal investigators, select projects directly by title, or select projects indirectly by principal investigators. The viewer can read brief abstracts of selected projects on the menu screen, or click a "Show Details" button to see the full articles, images, etc.

Through video clips, viewers can learn about the mission and work of NCPTT and its Materials Research Program. Video clips include interviews with NCPTT Research Coordinator Mark Gilberg and NCPTT Materials Research Program Manager Mary F. Striegel, who provide perspectives on the NCPTT research program. Other choices include interviews with principal investigators such as ElizaBeth Bede, a doctoral candidate at the University of Delaware, who discusses current research on the effects of stone surface texture on pollutant deposition, Victor Mossotti, a geologist with the Minerals Research Survey Team at the US Geological Survey, who discusses long-term approaches to understanding stone deterioration mechanisms, and Kevin Ammons, MRP associate, who discusses MRP efforts to organize and disseminate research results through electronic media.

Each article on the CD includes information about project goals and approaches, principal investigators, significant findings and applications, and a selected bibliography. The main source for these articles is the MRP archives, which include NAPAP and NPS Acid Rain Program/MRP research, literature, reports, photographs and slides.

Explore the Materials Research Program - Acid Rain and Beyond *was produced under contract with M&M Communications Concepts, <www. mmcc.com>, a technology utilization group specializing in multimedia production. The project team for the NCPTT CD included Marion Marks, Joel Rea, John Lomax and Scott Griffin. Dr. Gillian Rudd authored the text for each project article on the CD.*

Contact Dr. Mary F. Striegel for information on CD production techniques used in this project.

The multimedia CD-ROM, *Explore the Materials Research Program - Acid Rain and Beyond* (PTT Publications No. 1999-15), is available upon request after September 10 from NCPTT's Publications Manager.

The minimum requirements to run the CD include —

- Intel 486 or better (Pentium MMX recommended) or fully compatible CPU
- 16MB of system RAM for Win95, 24 MB for Win98, or at least 32MB for WinNT.
- 10MB of free hard drive space for possible installations of system features such as QuickTime 3.0
- 8x or faster CD-ROM drive
- Video display adapter and monitor capable of displaying 800x600 resolution, at 256 colors (High Color/32,768/65,536 colors and a display adapter with at least Windows acceleration and "multimedia" or "video" acceleration features are strongly recommended for playing the videos.)
- Sound card capable of digitized audio playback and speakers/headphones are required for the video interviews.

Spatial Data Management in SHPO Information Systems

Location is central to the management of cultural resources. If the location of a building, district, site or object is unknown, no action can be taken to manage, preserve or protect the resource. In spite of the importance of location, spatial information technologies such as GIS rarely are integrated with everyday State Historic Preservation Office decision-making. Database management technologies are well-established, but the transition to GIS technology is slow in spite of high user demand for geospatial data on cultural resources. A collaborative effort to advance GIS technology for SHPO information systems in the western United States is the subject of recent work completed as part of a 1997 Preservation Technology and Training Grants project.

An interesting exchange appeared a few years ago in the *Society for American Archeology Bulletin* concerning the "best" organizational basis for State Historic Preservation Offices' cultural resource databases[1]. Discussion focused on a serious problem for all cultural resource management information systems. The argument pitted Geographic Information Systems against Relational Database Management Systems as the most appropriate foundation for SHPO information systems. One side argued that the spatial dimension is so crucial to SHPO operations that GIS is the logical technical solution. The other side countered that GIS is a poor technical foundation for basic data management, and that GIS applications are best indirectly linked to a RDBMS foundation.

The interchange was particularly relevant to our situation in New Mexico. The New Mexico Cultural Resource Information System had been upgraded recently to the Oracle RDBMS. We were in the process of integrating GIS technology using ESRI ArcInfo and had just completed our pilot data entry effort. We seemed well-positioned to meet our users' needs, but our experiences suggested that we were far from a long-term solution.

During our pilot GIS project, we found the process of spatial data collection so procedurally complex and labor-intensive that we began questioning the efficiency of GIS. We found that GIS tends to intensify, rather than resolve, problems related to three fundamental information system objectives of data capture, data management and data delivery.

Technology and SHPO collaboration

As our pilot project was nearing completion, the RDBMS industry began to introduce "multidimensional" database products capable of managing spatial and other non-text data types. Simultaneously, the GIS industry was working to overcome some of the operational problems that traditional spatial models created for many users, and started finding ways to integrate RDBMS technology in a more seamless fashion. GIS and RDBMS technologies were converging to provide potential benefits for cultural resource management.

Representatives from the Wyoming, Colorado, Arizona and New Mexico SHPOs met with ESRI engineers in Boulder, Colorado, to discuss the feasibility of using Spatial Database Engine in our cultural resource databases. The complexity and cost of SDE presented major roadblocks, however, so the group decided to look for additional resources.

In 1997, the New Mexico and Wyoming SHPOs received a Preservation Technology and Training Grants award to evaluate the effectiveness of SDE and other similar technologies for SHPO GIS. Two major objectives of the PTTGrants project were to develop a common logical spatial model for cultural resources among New Mexico, Wyoming and other western states, and, based on that model, to develop a spatial database prototype using SDE in New Mexico.

The common data model

At the same time, the Wyoming SHPO was awarded a US Geological Survey-Federal Geographic Data Committee grant to develop cultural resource metadata – data that describe the content, quality, condition and other characteristics of data – and data content standards for the western United States. Since the objectives of the two grants overlapped, especially in the areas of data modeling and metadata training, most of the initial data-modeling tasks for the PTTGrants project were conducted as part of workshops sponsored by the USGS grant.

Representatives from most western states and Federal land management agencies participated in the USGS-sponsored workshops. The workshops focused on identifying basic cultural resource data types and specifying key descriptive — non-spatial — data. Workshop participants developed a spatial data model for the major cultural resource data types and identified key metadata items. Owing to a widespread need to accommodate large amounts of highly variable data in existing cultural resource information systems, this task represents a "best practices" guide rather than a data standard.

The USGS grant provided an opportunity to involve many more states and generated considerable interest and support from Federal land management agencies. Although the process of creating a formal data standard will involve additional levels of review and will take several years, a solid foundation for current cultural resource GIS efforts at the New Mexico and Wyoming SHPOs[2] was initiated.

1. "Point-Counterpoint: Site File Databases and GIS Systems," *SAA Bulletin* 13(4). 1995.
2. The preliminary report on the first Federal Geographic Data Committee workshop is available online at <http://colby.uwyo.edu/fgdcdocs/report1.html>. A revised report based on the second FGDC workshop in February 1999 will be posted at this site soon.

The spatial database prototype

The NMCRIS spatial database prototype consists of three components:

1. The Archaeological Records Management Section server: A UNIX-based computer running the Oracle relational database management system and the ESRI Spatial Database Engine. The server is the main data repository where all information pertaining to cultural resources – spatial and non-spatial – is stored, managed and manipulated.
2. Multiple client PCs running GIS applications that interact with the ARMS server over a local area network. These applications communicate with the ARMS server to insert, modify and query spatial data.
3. Remote client PCs running GIS software: The clients communicate with the ARMS server over the Internet. These applications are limited to query and download functions only.

Installation of Spatial Data Engine was trouble-free. The logical data model was translated to a physical database structure in Oracle, and existing spatial data were transferred from ArcInfo to SDE. As applications were developed for data capture, the New Mexico SHPO staff was able to use SDE immediately for query and analysis tasks using ESRI ArcView as the GIS interface.

The main design goal for the data capture application was to provide a means for non-technical staff to capture geospatial data quickly with minimal training and disruption of work flow. The application accomplishes this goal by allowing users to digitize cultural resources against a familiar background of USGS topographic map images. ARMS staff are able to process and complete documents as received, resulting in significant productivity gains.

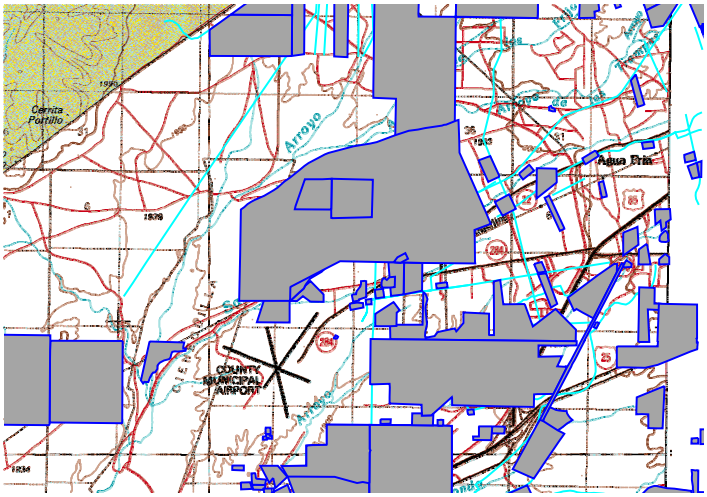
With the help of ESRI consultants, New Mexico SHPO technical staff then created a spatial extension to our existing text-based query tool. Accessed by users via Internet and modem connections since 1993, this aging program has been given a new lease on life by linking the program to SDE. Users now can retrieve complex cultural resource data in a familiar format — easily interpreted maps —, ensuring that comprehensive pre-fieldwork record checks of the geographic area to be investigated are completed.

Evaluation

For GIS technology to improve SHPO operations, GIS technology must be integrated into SHPOs' daily work routines — something that has remained out of reach for most states.

SDE and similar database technologies provide an environment in which spatial data can be collected, managed and distributed in much the same way as non-spatial data. SDE allows an uncomplicated, transactional approach to spatial data capture. With SDE, cultural resources — rather than space — are the central organizing principle, which allows a more logical and efficient workflow.

Spatial data management is handled by the underlying RDBMS — a mature and robust technology. Spatial and non-spatial records are inserted, modified, indexed and deleted in the same database environment allowing, for example, automatic recovery of digitized site boundaries following a system crash. Administrative costs for spatial data management are rolled into our overall RDBMS administration, resulting in significant savings. Moreover, the integrity and security of spatial data are greatly increased in the RDBMS environment.



An ArcView client application displays archeological inventory areas around Santa Fe, New Mexico, with topography displayed in the background.

No serious technical obstacles in using this technology are known, but cost and complexity are significant factors. For a small agency like the New Mexico SHPO, SDE is a considerable investment. Annual maintenance and staff recruiting, retaining and training are expensive. Implementing SDE and REBMS technology requires skilled technical staff or consultants, and training is essential to retain staff and technical competence. Consultants and partnerships with technically advanced agencies also should be considered.

The practical benefits of applied technology are significant. In New Mexico, we plan to use SDE as the foundation for an Internet-based "call-before-you-dig" information service capable of displaying — to qualified individuals — the location of districts, buildings and sites as easily interpreted maps. With a single, easily accessed data source, we expect fewer conflicts between preservation and development, more informed short- and long-range planning at all levels of government, more efficient SHPO consultations and, most important, enhanced preservation of prehistoric and historic properties.

— Tim Seaman

Mr. Seaman is the Archeological Records Management Section program manager at the New Mexico State Historic Preservation Office.

Copies of the final project report (PTT Publications No. 1999-08) are available from NCPTT's Publications Manager.

New Applications for Advanced Technologies in Archeological Research

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twentieth-century homestead and several prehistoric stone tools were evident. The third site occupied an eroding terrace knoll along Cedar Creek. Field crews excavated three test pits and conducted three shovel tests, revealing artifacts, animal bone, charcoal and fire-cracked rocks that showed that the site had been occupied for several centuries by a series of short-term camps. The fourth site, located on a gently sloping hillside, included an extensive scatter of hundreds of historic and prehistoric artifacts. In all, the Indian Caves sites allowed Brunswig to record GPS data in several different archeological and environmental contexts.

Brunswig encountered entirely different conditions at the fifth site included in the project. Located in the rugged terrain of Rocky Mountain National Park, the Trail Ridge Game Drive site recently was documented as part of a study of high altitude game drive sites in the Front Range mountains of north-central Colorado. Elevations at the site range from 3465 to 3500 meters. Major features include three masonry rock walls and five rock-lined pits designed to channel game from sub-Alpine woods up a steep saddle situated between two mountain knolls. Radiocarbon dating of charcoal, granite weathering studies, and recovered artifacts indicate that the site dates to at least 3000 BC and may have been used as late as 1000 AD. In recording the site, Brunswig sought to assess the utility of GPS for precisely mapping topographic and archeological features in mountainous terrain.

After completing his fieldwork, Brunswig used Pathfinder GPS software to manipulate the data recorded at each of the five sites. Pathfinder is capable of performing several essential functions with data transferred from the GPS field logger into computer files. Chief among these functions is data correction processing, which increases the locational accuracy of raw data recorded in the field. Pathfinder also has the capacity to combine multiple files and data sets to create larger, more complex multi-site files. All data can be saved in a variety of GIS spreadsheet or text formats, including several that give access to information on individual data points recorded during fieldwork. Corrected files can be exported into an external GIS or computer mapping program.

From the statistical information generated by Pathfinder, Brunswig determined that a total of 74.16 acres, or 301,118 square meters, was surveyed at the five test sites. The number of total data points recorded at individual sites ranged from 58 to 193, with an average of 111 per site. The time needed to record each site varied between 388 and 57 minutes. Recording times per point were as high as two minutes at one site and as low as 50 seconds at another. In part, the range of variation was affected by travel time between individual data points — rough terrain, of course, increases travel time. Brunswig found, however, that under most conditions logging times can average less than a minute per point, depending on the size and topographic complexity of the site being surveyed.

Spatial data collection typically takes less than one minute per site per point and several thousand points can be recorded in the GPS data logger.

GPS versus conventional surveying techniques

On the basis of his fieldwork, Brunswig concluded that GPS offers several important advantages over standard archeological survey methods. The efficiency of GPS is especially significant. With average data logging times of less than a minute per point, GPS compares favorably with conventional surveying techniques — and in rough terrain or heavily vegetated areas, it offers substantial advantages. Conventional surveying instruments, which require a clear line-of-sight, must be repositioned frequently under such conditions, increasing field time. By contrast, a GPS operator is able to move quickly over the landscape as necessary to record topographic and archeological features. A GPS survey also requires less manpower. A single person can operate a GPS receiver; two or more persons are needed for a standard survey.

Another advantage of GPS is its accuracy. For each of the five sites surveyed, Brunswig compared raw and corrected data to determine the increase in accuracy possible with post-fieldwork data processing. At the Trail Ridge Game Drive site, for example, the average accuracy of uncorrected data points was ± 3.817 meters. Differential correction improved this figure to ± .21817 meters — an accuracy of under half a meter. Data correction resulted in even greater increases in accuracy for two of the high plains sites. The site located beside Cedar Creek, for instance, had an average uncorrected standard deviation of ± 3.2621 meters, which data correction processing improved to ± .0844 meters — less than 17 centimeters. Brunswig's research demonstrates that GPS can achieve a sufficient level of locational precision for virtually all archeological survey applications.

As an additional assessment of GPS in archeological research, Brunswig exported the differentially corrected data files for each of the five sites into GIS and the SURFER computer mapping software program. For each site, Brunswig constructed two types of data files: one containing all differentially corrected points

(an X, Y and Z data set) and another comprised of three-dimensional point data (also an X, Y and Z data set) on specific archeological and environmental features. The SURFER program then used these files to generate contour and three-dimensional surface maps of each site. Since Brunswig's differentially corrected data was accurate to within one meter, the maps were extremely precise. Maps generated by the SURFER program also can be graphically enhanced with symbols and labels for archeological and topographical features. For the Trail Ridge Game Drive site map, for instance, Brunswig created identifying labels for the rock walls, game pits and the drive corridor that provide useful information for analyzing and interpreting the site. Labels for environmental features such as water drainage routes and seasonal wind flow patterns, which are critically important for understanding some sites, also can be added.

Utility for practitioners

The project was successful on several levels and clearly demonstrates the utility of GPS in archeological research. First, the process used by Brunswig proved effective in recording large volumes of GPS data with precision acceptable for most archeological applications. Second, the advantages of using GPS to record sites located in difficult terrain became evident during Brunswig's fieldwork. GPS is at least as easy to use and efficient as conventional surveying methods, which rely heavily on compass readings, measuring tapes and sketch maps. In addition, GPS data can be transferred into a variety of computer software formats and used in computer mapping programs — a tremendous benefit that facilitates post-fieldwork analysis of recorded sites.

The larger implications of Brunswig's work point to the ways archeologists may use GPS and GIS in the future. In practical terms, GPS stands to expedite and reduce the costs of archeological fieldwork. GPS offers archeologists a tool for collecting precise data on the location of archeological sites, features and artifacts that can be used to create computer-generated maps and for statistical analysis. In broader terms, GPS and GIS technology offers archeologists a means of exploring a wide range of theoretical research issues. The ability of GIS to manipulate multiple classes of archeological and environmental data makes sophisticated modeling of past cultural and physical landscapes possible. GPS and GIS ultimately may allow more comprehensive analysis of the archeological record — and the relationships among human activity, physical landscapes and natural ecosystems revealed in the archeological record — than ever before possible.

WWWeb

www.mtsu.edu/~then

The Heritage Education Network is designed for K-12 teachers, personnel at historic sites, museums, historical societies, State Historic Preservation Offices and other groups interested in heritage education. A valuable aspect of THEN is the links to related Web sites. The Heritage Education Network is a project of the Center for Historic Preservation at Middle Tennessee State University and NCPTT.

www.ncptt.nps.gov

"All in all, [NCPTT's] website was beautifully and intelligently designed to provide simple access to a wealth of preservation technology information."

"Web Watch," *Discovering Archaeology*. May/June 1999, p. 30.

"Preservation 101"

Continued from page 5

personal e-mail among students, the Webmaster and the instructor. These dynamic features provided students with further means of gathering details that complemented the more general course content.

Several observers were invited to critique the structure, feel, look, activity and usefulness of the course. Their comments before, during and after the course — as well as responses submitted by students using an online evaluation form — direct the program's future improvements. NEDCC expects to present this program again early in 2000, to be announced via the World Wide Web and in *NCPTT Notes*' Preservation Calendar. NEDCC plans to increase the number of students who may be registered at one time, and hopes to offer two additional lessons, "Disaster Planning," and "Care of Photographs." For future sessions, NEDCC is considering a partnership with an academic institution that would offer courses for academic credit. NEDCC intends to continue offering "Preservation 101" at no charge and plans to explore unique Internet capabilities for expanding access to preservation education.

— Karen E. K. Brown

As NEDCC's field service representative, Ms Brown organizes and conducts preservation surveys and workshops, provides technical advice to libraries, museums and archives, and advises on disaster planning and recovery.

September 1999 - May 2000

NCPTT welcomes calendar items sent in care of NCPTT's Publications Manager. Items with minimum two-month lead will be considered for publication. A more extensive listing of conferences, training and other preservation events is available in the Resources section of NCPTT's Web site, <www.ncptt.nps.gov>.

September

22-26 International Cultural Heritage Informatics Meeting in Washington DC, sponsored by Archives & Museum Informatics. The meeting includes half day, one day and two-day workshops, and a conference. For information, contact Archives & Museum Informatics; telephone 412/422-8530, Web <www.archimuse.com/ichim99>.

29 Annual meeting of the American Association for State and Local History and the Mid-Atlantic Association of Museums, September 29-Octoer 2, in Baltimore, Maryland. The meeting topic is "Caring for our Treasures at the Millenium." For information, contact AASLH; telephone 615/320-3203, e-mail <history@aaslh.org>, Web <www.aaslh.org>.

30 Preserving the Walls and the Wilderness of America's Western National Parks conference in Mt. Rainier National Park, Washington, September 30-October 3, sponsored by the American Institute for Architects-Historic Resources Committee. For information, contact AIA; facsimile-on-demand 800/242-3837 (option 8, document 142), Web <www.e-architect.com/pia/hrcmora/intro.asp>.

30 Call for papers deadline for Preserving the Recent Past II conference, sponsored by the National Park Service-Heritage Preservation Services and others in Philadelphia, Pennsylvania, October 11-13, 2000. For information about the call for papers, telephone 202/343-6011; for information about the conference, visit <www2.cr.nps.gov/tps/recentpast2>.

October

1-2 Interpreting Aalto: Baker House and MIT conference in Cambridge, Massachusetts, sponsored by Massachusetts Institute of Technology. For information, contact MIT; telephone 617/253-4412, facsimile 617/253-8993, Web <http://architecture.mit.edu/events/aac>.

3-4 Preserving the 20th Century Building Envelope conference in Cambridge, Massachusetts, sponsored by Technology & Conservation and others. For information, contact Technology & Conservation; telephone 617/623-4488, facsimile 617/623-2253.

5-9 The Broad Spectrum: The Art and Science of Conserving Colored Media on Paper conference in Chicago, Illinois, sponsored by the Art Institute of Chicago and others. For information, contact Harriet Stratis; telephone 312/857-7662, facsimile 312/443-0085, e-mail <hstratis@artic.edu>, Web <www.artic.edu/aic/collections/dept_prints/prints.html>.

8-10 Ground-Penetrating Radar Techniques for Discovering and Mapping Buried Archaeological Sites workshop in Denver, Colorado, sponsored by the University of Denver and NCPTT. For information, contact University of Denver; telephone 303/871-2684, Web <www.du.edu/anthro/GPRCLASS2.html>.
■ *This workshop developed from research work supported by NCPTT's 1996 Preservation Technology and Training Grants program. The research project on new data and image processing techniques was summarized in* NCPTT Notes *26, page 4.*

12-16 National Lighthouse conference in Key West, Florida, sponsored by US Lighthouse Society and others. For information, contact National Lighthouse Conference 1999, 3501 South Roosevelt Boulevard, Key West, Florida 33040; telephone 305/296-1702, facsimile 305/296-6202, e-mail <maine1898@aol.com>, Web <www.keywest.com/lighthouse>.

13-15 Fundamentals of Preservation workshop in Andover, Massachusetts, sponsored by the Northeast Document Conservation Center; first in a series of five "Managing Preservation" workshops that continue January 10-12, April 5-7, June 1-2 and September 21-22. For information, contact Steve Dalton or Karen E.K. Brown at NEDCC; telephone 978/470-1010, Web <www.nedcc.org/coord.htm>.

15 Call for abstracts (100-150 words) **deadline** for *CRM* on disasters' impacts on cultural resources, with high priority given to articles on planning, mitigation and response. For information, contact David Look; telephone 415/427-1401, facsimile 415/427-1484, e-mail <David_W_Look@nps.gov>.

17-23 XII General Assembly of ICOMOS and World Congress of Conservation of Monumental Heritage in Mexico City, Guanajuato, Morelia and Guadalajara, Mexico. For information, contact ICOMOS; e-mail <icomosmex99@compuserve.com.mx>, Web <www.icomos.org>.

19-24 National Trust for Historic Preservation's National Preservation Conference in Washington, DC. For information, contact NTHP; telephone 202/588-6100, facsimile-on-demand 202/588-6444, Web <www.nationaltrust.org>.
■ *NCPTT contributes support to NTHP's Statewides Initiative; the Statewides meetings at the conference are October 19 and 20.*

20-21 Structural Condition Assessment for Existing Structures seminar in Honolulu, Hawaii, sponsored by the American Society of Civil Engineers. For information, contact ASCE; telephone 703/295-6300, Web <www.asce.org/conted/index.html>. For other locations and dates, see October 28-29, December 2-3, January 20-21 and March 23-24.

20-23 Association for Preservation Technology International annual meeting in Banff, Alberta. For information, contact APT; e-mail <infor@apti99.ab.ca>.

21-23 Historic Bridges Conference in Wheeling, West Virginia. For information, contact the Institute for the History of Technology and Industrial Archeology, West Virginia University, 1535 Mileground, Morgantown, WV 26505; telephone 304/293-7169, facsimile304/293-2449, e-mail <Lsypolt@wvu.edu>.

24-26 Association for Preservation Technology International training sessions in Banff, Alberta, including Information Technology and Heritage Conservation, Cultural Landscapes, and Conservation and Protection of Exterior Wood. For information, contact Pat Buchik at Canadian Heritage-Parks Canada; telephone 403/292-4703, facsimile 403/292-4886, e-mail <pat-buchik@phc.gc.ca>.
■ *NCPTT will participate in the Information Technology and Heritage Conservation training session. For information, contact David Whiting; telephone 403/247-8711, e-mail <dwhiting@icomos.org>.*

26-29 Preservation Options in a Digital World: To Film or To Scan workshop in Austin, Texas, sponsored by the Northeast Document Conservation Center. For information, contact NEDCC; telephone 978/470-1010, e-mail Gay Tracy<tracy@nedcc.org>, Web <www.nedcc.org>. For another location on other dates, see March 30-April 1, 2000.

28-29 Structural Condition Assessment for Existing Structures seminar in Pittsburgh, Pennsylvania, sponsored by the American Society of Civil Engineers. For information, contact ASCE; telephone 703/295-6300, Web <www.asce.org/conted/index.html>. For other

locations and dates, see October 20-21, December 2-3, January 20-21 and March 23-24.

November

1 One of two annual postmark deadlines (the other is March 15) for grants under the **American Association of Museum's Museum Assessment Program**, including MAP I, II and III. For information, contact MAP; telephone 202/289-9118, facsimile 202/289-6578, e-mail <map@aam-us.org>.

7-9 **Restoration & Renovation** trade exhibition and conference in Charleston, South Carolina. For information, contact EGI Exhibitions; telephone 978/664-6455, facsimile 978/664-5822, e-mail <show@egiexhib.com>, Web <www.egiexhib.com>.

30 **Call for presentations deadline** for *Africanisms in America: Places of Cultural Memory* conference in New Orleans, Louisiana, September 26-30, 2000, sponsored by the National Park Service and others. For information on the conference, telephone 888/358-8388. For information about the call for presentations, contact Toni Lee, National Park Service, Heritage Preservation Services, 1849 C Street NW - NC300, Washington, DC 20240; facsimile 202/343-3921, e-mail <Toni_Lee@nps.gov>.

December

2-3 **Structural Condition Assessment for Existing Structures** seminar in Nashville, Tennessee, sponsored by the American Society of Civil Engineers. For information, contact ASCE; telephone 703/295-6300, Web <www.asce.org/conted/index.html>. For other locations and dates, see October 20-21, October 28-29, January 20-21 and March 23-24.

2-4 **Conserving the Painted Past** conference on wall painting conservation, sponsored by English Heritage in London. For information, contact Amanda Holgate, English Heritage, 23 Savile Row-Room 227, London W1X 1AB, United Kingdom; telephone 0171/973-3000, facsimile 0171/973-3001, Web <www.english-heritage.org.uk>.

17 **Application postmark deadline for** NCPTT's **FY2000 Preservation Technology and Training Grants**. See page 2 in this edition of *NCPTT Notes* for Call for Proposals information.

27-30 **Archaeological Institute of America** annual meeting in Dallas, Texas. For information, contact AIA; telephone 617/353-9361, facsimile 617/353-6550.

January

10-12 **Emergency Preparedness** workshop in Andover, Massachusetts, sponsored by the Northeast Document Conservation Center; second of a series of five "Managing Preservation" workshops that continue April 5-7, June 1-2 and September 21-22. For information, contact Steve Dalton or Karen E.K. Brown at NEDCC; telephone 978/470-1010, Web <www.nedcc.org/coord.htm>.

20-21 **Structural Condition Assessment for Existing Structures** seminar in San Diego, California, sponsored by the American Society of Civil Engineers. For information, contact ASCE; telephone 703/295-6300, Web <www.asce.org/conted/index.html>. For other locations and dates, see October 20-21, October 28-29, December 2-3 and March 23-24.

March

15 One of two annual postmark deadlines (the other is November 1) for grants under the **American Association of Museum's Museum Assessment Program**, including MAP I, II and III. For information, contact MAP; telephone 202/289-9118, facsimile 202/289-6578, e-mail <map@aam-us.org>.

23-24 **Structural Condition Assessment for Existing Structures** seminar in Orlando, Florida, sponsored by the American Society of Civil Engineers. For information, contact ASCE; telephone 703/295-6300, Web <www.asce.org/conted/index.html>. For other locations and dates, see October 20-21, October 28-29, December 2-3 and January 20-21.

30 **Preservation Options in a Digital World: To Film or Scan** workshop, March 30-April 1 in Providence, Rhode Island, sponsored by the Northeast Document Conservation Center. For information, contact NEDCC; telephone 978/470-1010, e-mail Sona Naroian <sona@nedcc.org>, Web <www.nedcc.org>. For another location on other dates, see October 26-29, 1999.

April

5-7 **Collections Maintenance** workshop in Andover, Massachusetts, sponsored by the Northeast Document Conservation Center; third in a series of five "Managing Preservation" workshops that continue June 1-2 and September 21-22. For information, contact Steve Dalton or Karen E.K. Brown at NEDCC; telephone 978/470-1010, Web <www.nedcc.org/coord.htm>.

5-9 **Society for American Archaeology** annual meeting in Philadelphia, Pennsylvania. For information, contact Winifred Creamer, Society for American Archaeology, 900 Second Street NE #12, Washington, DC 20002-3557; telephone 202/789-8200, facsimile 202/789-0284, e-mail <meetings@saa.org>, Web <www.saa.org>.

■ *NCPTT will participate in a poster session on digital access.*

6-9 **Preserving the Historic Road in America** conference in Morristown, New Jersey, sponsored by the National Trust for Historic Preservation and others. For information, contact Dan Marriott at NTHP; telephone 202/588-6279, e-mail <dan_marriott@nthp.org>.

May

11-13 **Terra 2000**-8th international conference on the study and conservation of earthen architecture, sponsored by English Heritage and others. For information, contact the Centre for Earthen Architecture, University of Plymouth-Faculty of Technology, Drake Circus, Plymouth PL4 8AA, United Kingdom; e-mail <terra2000@plymouth.ac.uk>.

Search for Conferences at the NCPTT Web Site

A database of preservation-related conferences is available at NCPTT's Web site. Users can search by keyword, location, discipline or date — individually or in combination.

Access the database in the Resources section of the Web site or directly at <www.ncptt.nps.gov/conferences>. A training and education opportunities database and a jobs database will be online soon.

Our Mission

United States Department of the Interior
The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and to honor our trust responsibilities to tribes.

National Park Service
The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education and inspiration of this and future generations. The Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

National Center for Preservation Technology and Training
The National Center for Preservation Technology and Training promotes and enhances the preservation of prehistoric and historic resources in the United States for present and future generations through the advancement and dissemination of preservation technology and training.

NCPTT, created by Congress, is an interdisciplinary effort by the National Park Service to advance the art, craft and science of historic preservation in the fields of archeology, historic architecture, historic landscapes, objects and materials conservation, and interpretation. NCPTT serves public and private practitioners through research, education and information management.

National Center for Preservation Technology and Training
NSU Box 5682
Natchitoches, LA 71497