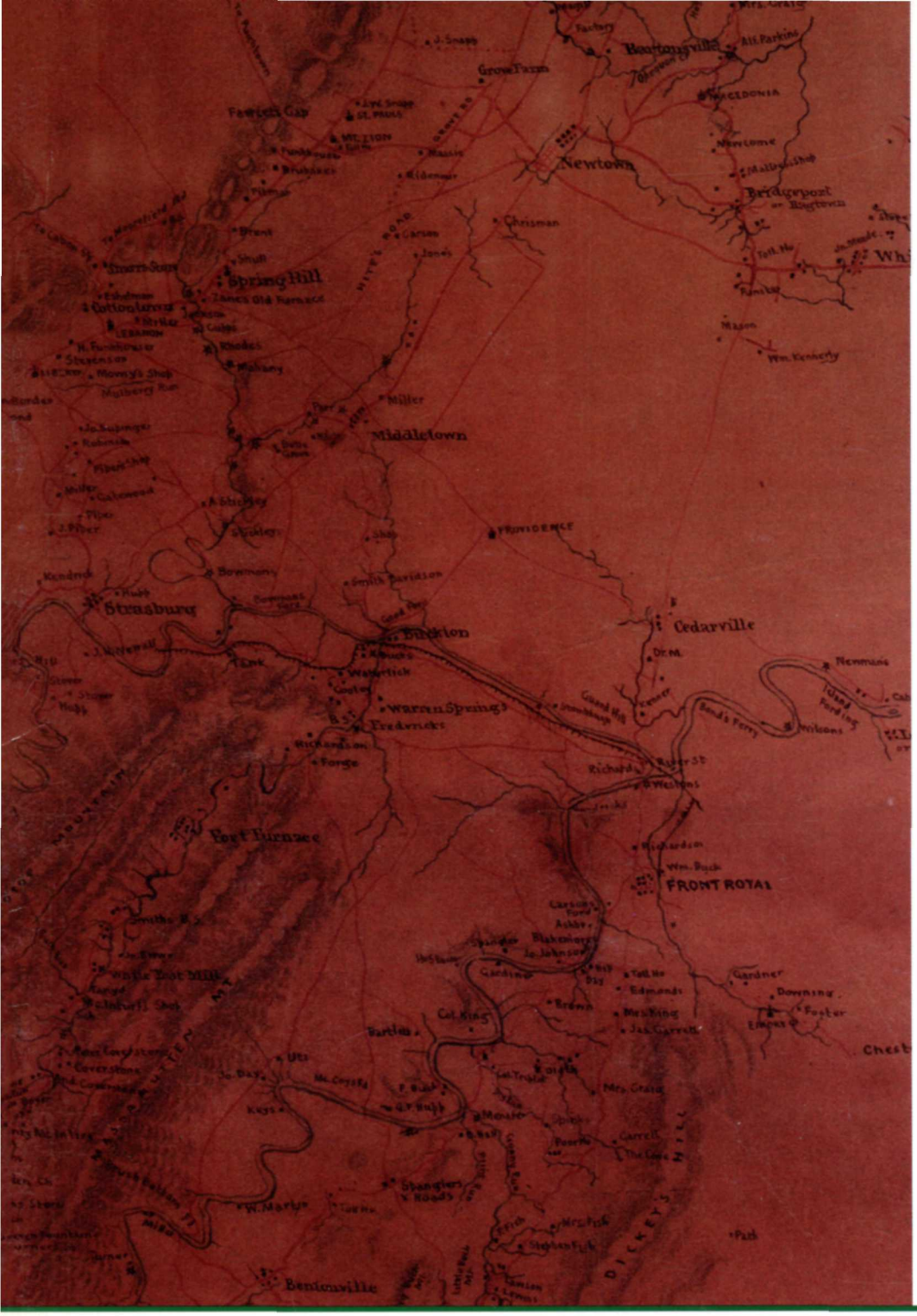


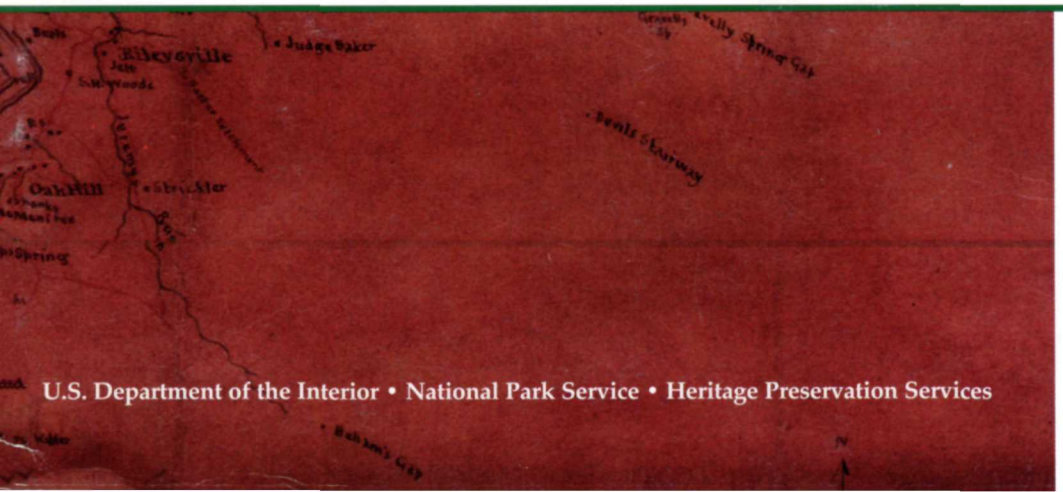
Caring for the Past

Geographic Information Systems

Global Positioning Systems

World Wide Web & the Internet

Mapping and Internet Services for Cultural Resources



Mapping and Information Technologies

U.S. Department of the Interior • National Park Service • Heritage Preservation Services

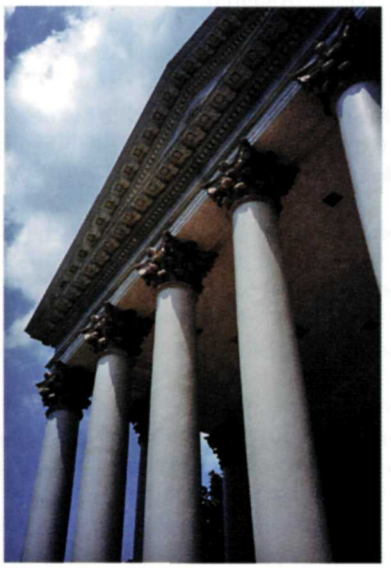
The National Park Service is dedicated to conserving unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Service also manages a wide variety of programs designed to help extend the benefits of natural and cultural resource conservation and outdoor recreation throughout the country and the world.

Cover: Jedediah Hotchkiss Map, 1862.
The original map is in the archives of the Handley Library, Winchester, VA.

Visit us on the Internet!
http://www.cr.nps.gov

Brochure created by Matthew Nowakowski

Caring for the Past



Mapping & Internet Services for Cultural Resources

U.S. Department of the Interior
National Park Service
National Center for Cultural Resources Stewardship and Partnerships
Heritage Preservation Services
Mapping and Information Technologies

1997

Mapping and Information Technologies

The Branch of Mapping and Information Technologies (BMIT), a unit of Heritage Preservation Services, National Park Service (NPS), is a national program that combines spatial technologies and information management systems for the identification, evaluation, protection and preservation of cultural resources and landscapes. Our activities fall into three main areas: mapping and analysis through Geographic Information Systems (GIS); support, consultation and development for Internet applications and the World Wide Web (WWW); and, providing training and technical support for Heritage Preservation Services and its cooperative partners. BMIT operates the only Cultural Resources Geographic Information System (CRGIS) facility within the NPS.

The mission of BMIT is to:

- Develop an electronic infrastructure that will enable historic preservation professionals and cultural resource managers to access, exchange and distribute information on the location, status and condition of cultural resources.
- Institutionalize the use of Geographic Information Systems through the Cultural Resource Geographic Information System (CRGIS) facility and information management technologies for the use of cultural resource programs, parks and other preservation partners.
- Develop computer applications to assist parks with systematic inventory, resource protection and resource stewardship.
- Explore new spatial technologies as they apply to historic preservation and to implement appropriate techniques and methodologies for data collection and integration.
- Apply new technologies to disseminate cultural resource information to historic preservation professionals and other interested parties.
- Provide training and support services to the historic preservation community.

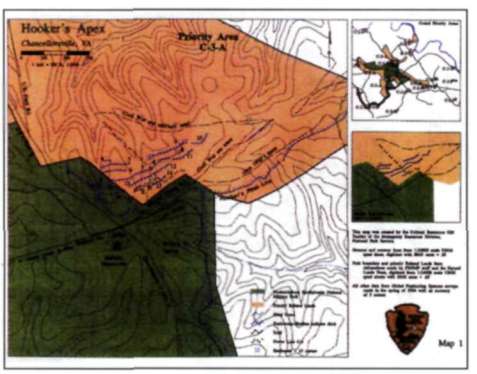
Mapping History Using GIS

John J. Knoerl, PhD

Historic maps like the Map of the Shenandoah Valley complied by Jedediah Hotchkiss in 1862, tell the historian much about the history of the area. Data on roads, settlements, railroads, and even topography are shown on this map. Also, the map has historical significance in its own right. Thomas "Stonewall" Jackson used this map in his 1862 Valley Campaign during the Civil War. Jackson understood the power of maps. Using information on roads and topography to split a larger Union army, he successfully prevented them from reenforcing Union troops surrounding Richmond. His tactics are still studied today by military scholars.

The power of maps to convey information to historians and decision-makers is just as apparent today as it was during Jackson's time. Historical maps tell us how an area developed, they identify where historic events took place, and sometimes even the character of the landscape. Modern maps when used with historic maps help historians decide where to survey for historic or archeological resources or create historic easements. Preservationists and cultural resource managers use both types of maps to research and plan for the preservation of important historic and archeological resources.

Computers have significantly increased the power of maps. For example, a historic road map can be used with elevation data to map the view from historic roads. This "viewshed map" can then be used to assess the impact of proposed development on the visual integrity of the historic setting.



Computers can be used to aid in identifying archeological sites that are attractive because of their accessibility. Also, they can be used to link historic maps with modern maps to assess changes in the landscape. Computers and maps offer the historian new possibilities in conducting research and preserving historic properties. Geographic Information Systems (GIS) are computer programs that do the kinds of analysis mentioned above. A GIS is a set of computer programs that store, merge, analyze, and output spatial information. A central processing unit is required, as well as data storage media. Archeologists have been using computers for many years. This is only natural, because archeologists study the relative location of artifacts and sites to each other. In the late 1960s, archeologists used Harvard's SYMAP as a primitive forerunner of GIS. This program generated maps that interpolated the distribution of data such as sites and artifacts based upon limited observations. During the 1980s, computer hardware costs fell while computing power increased. Programmers improved GIS by expanding its analytical capabilities. This resulted in a new audience of GIS users: land managers and state and local planners were among the first of the new GIS users. They used GIS to create inventories of natural, cultural, and recreational resources.

Use of GIS by preservation professionals is just beginning to occur. Several State Historic Preservation Offices (SHPO), as well as local community organizations are actively building GIS databases in coordination with partner agencies. Because every state has a designated GIS-coordinating agency, we can expect to see more involvement by SHPOs and public historians in the next few years.

Once data is in the GIS, programs can retrieve and manipulate it. The results of GIS analyses can be displayed on video terminals and printed. Hard copy maps are usually printed in color.

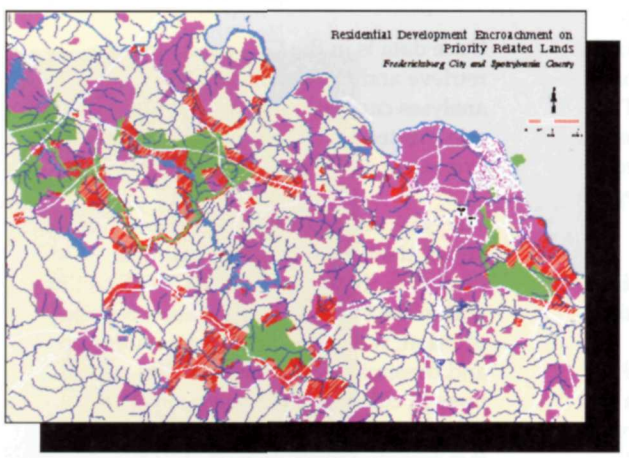
The National Park Service is using GIS to better identify and manage cultural resources. In particular, the CRGIS facility, within the Heritage Preservation Services division, was created to explore, develop, and desseminate examples of GIS applications in cultural resource management.

It is essential that GIS be thought of as a set of tools that can assist the preservationist in solving preservation problems. In this sense, it is important that the right tool be used to do a specific job. BMIT is working—through its CRGIS facility—to accomplish this goal.

Geographical Information Systems

The Branch of Mapping and Information Technologies operates the only Cultural Resources Geographic Information System (CRGIS) facility within the National Park Service. GIS consists of hardware and software programs that combine spatial attributes and thematic map layers (i.e. historic maps, census records, historic site inventories, etc.). GIS can also incorporate data recorded from Global Positioning System (GPS) satellites. A GIS database can provide exact locational information which is extremely helpful for disaster response teams. GIS allows users to analyze, integrate, display and manipulate data sets that are oriented towards specific geographic areas on the earth. To that end, the CRGIS facility is working to provide the NPS with a standard GIS model that can be replicated throughout the park system to provide consistent results. GIS will aid the NPS and its cultural resource partners on many levels: identification of resources; creation of accurate maps showing both natural and cultural resources; establishment of databases to enhance park facilities maintenance; and future interpretive applications for enhanced visitor understanding of the cultural and natural landscape.

The CRGIS facility maintains a number of goals to assist the NPS in fulfilling its mission. These include development of spatial (map-related) and digital applications to assist the parks with systematic resource inventories, resource protection and resource stewardship; encouraging GIS usage at the local park level; and providing GIS training to the parks and cultural resource partners. The CRGIS facility is a research environment where new applications and technologies are being explored to better interpret and protect the cultural landscapes and the vast natural resources whose care is entrusted to the NPS. Projects are developed to assist local and state agencies, tribal governments and federal agencies in creating spatial data, maps, and map interpretation/analysis.



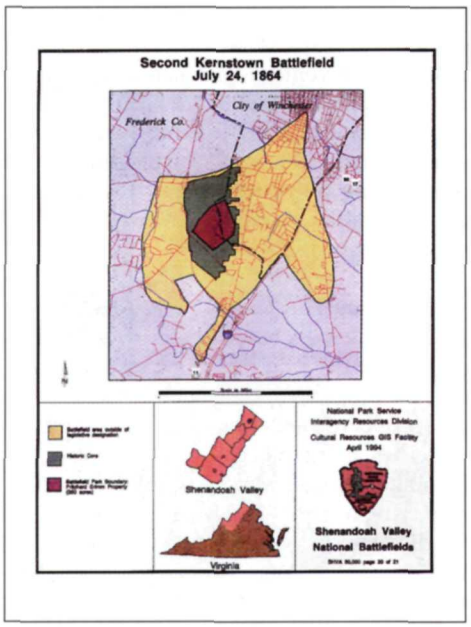
Our GIS/mapping projects are developed to assist state agencies, tribal governments, and federal agencies and cultural resource partners.

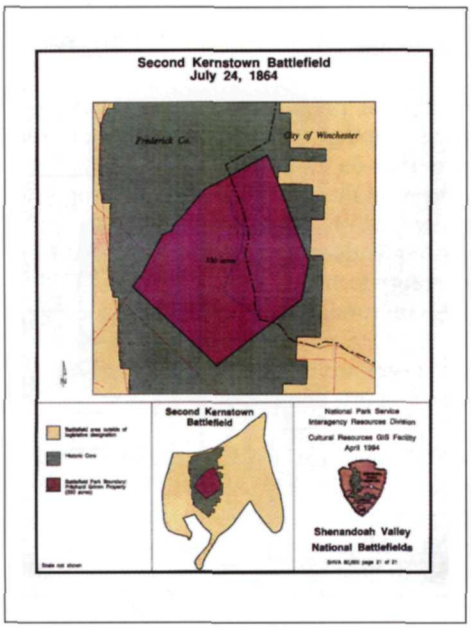
How to Contact Us: Write to the CRGIS Facility, Branch of Mapping and Information Technologies, Heritage Preservation Services, National Park Service, P.O. Box 37127, Washington, DC 20013 (202) 343-2239; e-mail: John_Knoerl@nps.gov *or* visit us on the World Wide Web: http://www.cr.nps.gov

Global Positioning Systems

Creative GPS/GIS... for Parks and Partners

Since its inception in 1916, the National Park Service has depended on the power of maps to inform and educate Rangers, support staff and millions of annual visitors. The CRGIS facility (operated by BMIT) is actively working to harness the power of maps in new and exciting ways through GIS. CRGIS first used GPS/GIS experimentally at the Richmond National Battlefield Park/Cold Harbor Unit. Service has since expanded to many cultural and natural resource sites from coast-to-coast.





Examples of Past and Recent Projects

Coin Maps: In 1995, Congress authorized the sale of commemorative coins to help fund Civil War battlefield land acquisition efforts. BMIT/CRGIS has actively worked to map and survey many of these sites (see Civil War map section, page 11).

Randolph AFB: In 1992, Congress established the Legacy Program to enhance management of cultural and natural resources under military supervision. Randolph Air Force Base near San Antonio, TX was once known as the "West Point of the Air." BMIT assisted base management in compiling an inventory of historic structures.

Great Smoky Mountains National Park: This national park has the largest collection of historic stone masonry within the park system. Built in the 1930s, none of these stone elements have been mapped. This project was part of an effort to thoroughly document these resources: CRGIS mapped more than 470 stone culverts.

Natchez Trace: Once a major north-south route along the Mississippi River, Park officials contracted with CRGIS to document the Trace as part of a Section 106 survey. Data gathered will also assist reconstruction of the parkway between Jackson and Natchez.

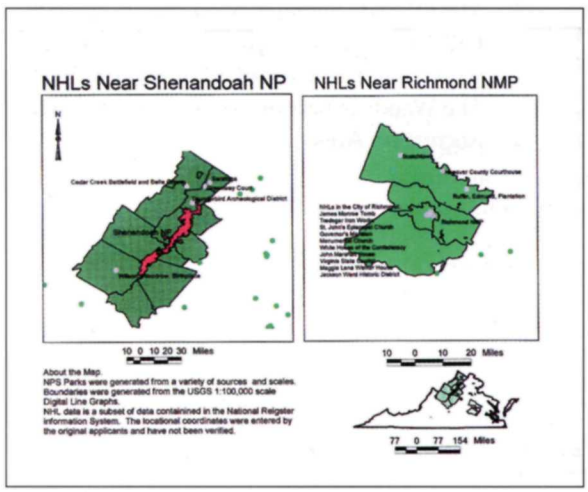
Muir Woods National Monument: In 1996, CRGIS completed a GPS survey of this redwood stand and led a GIS training for staff. The Woods is part of Golden Gate National Recreation Area.

Chesapeake and Ohio National Historical Park: This park stretches along the Potomac River for more than 180 miles; it was severly damaged in 1996 by winter floods. CRGIS is assisting the disaster response team by taking GPS readings and preparing maps of the park's cultural resources.

More Services: Parks & Partners...

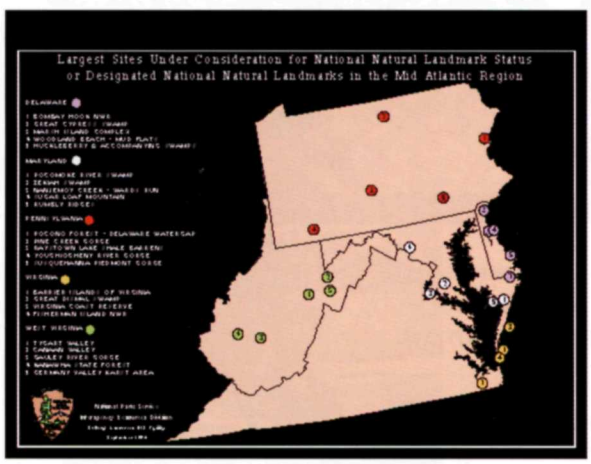
MAPIT – Mapping and Preservation Inventory Tool

What is MAPIT? The National Park Service has adapted a popular Geographic Information System (GIS) software package, ArcView®, to organize State Historic Office statewide inventories. MAPIT is a GIS application designed to fit any SHPO inventory by combining information about where historic properties are located with information about what these properties look like. MAPIT can display inventory information as a map, chart, table, and through a linked database generate standard survey forms, National Register nomination forms and other forms in use by preservationists. This information can be distributed in hard copy, diskette, via the modem or over the Internet.



GIS in State Historic Preservation Offices: We Provide training and guidance in input, editing, analysis, and output of GIS data.

MAPIT will help SHPOs look at their inventory in new ways. Inventory data can be displayed in the context of each SHPO program area such as Review and Compliance, CLGs and Preservation Tax Incentives program to name but a few. The inventory can be looked at in reference to Federal, State, and local agency jurisdictions, correlated with Census demographic, housing, land use or elevation data.



MAPIT presents the SHPO with a "one stop shopping" tool to view information on individual historic properties such as site plans, HABS/HAER drawings, photographs, narrative text, or any other type of digital information. Through a point and click Windows environment the SHPO can view their inventory in three ways. First, the "program view" looks at the inventory on a stateside scale, to see broad patterns and relationships among map themes (e.g., roads, streams, land use, agency jurisdictions etc.) The insights gained from looking at these maps can form a basis for preservation planning, policy review, and other strategic analyses.

At the "project view" data are presented on a county-wide scale to see detailed patterns and relationships among map themes as one basis for project planning such as potential impact of construction projects on historic properties, planning sub-grantee surveys, defining National Register boundaries, or overlaying historic properties onto agency jurisdictions such as park units, forests etc. At this scale US Census data complete with population and housing data can be used in analyzing the population trends and housing enviornments in areas surrounding historic properties.

Finally, the "property view" provides a "one stop shopping" for information about historic properties on the Statewide inventory. The focus is on the individual historic property rather than on a group of properties. Consequently, information is displayed in a inventory format rather than a map. The program running behind the database allows the SHPO to ask more complex questions with faster replies and generate hard copy report reports and forms.

MAPIT represents a National Park Service program initiative designed to bring together the power and functionality of GIS with the traditional query power of databases into a single unified system. One important feature of MAPIT is that current SHPO efforts in automating their inventory can continue and still take advantage of MAPIT. NPS technical assistance in GIS and inventory automation will revolve around MAPIT. Eventually MAPIT will be fitted to cultural resource databases within the National Park Service and linked to Global Positioning Systems.

Putting Cultural Resources on the Map…Cartographic Services

CRGIS is often called upon to work closely with other branches/programs in the National Park Service. The map series depicted here was a joint effort of CRGIS and the National Register of Historic Places. The National Register is the official list of the nation's cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register's 30th anniversary was marked by the creation of these maps as a way to promote heritage tourism into the next century. CRGIS staff created the maps; staff from BMIT and the National Register selected the images from National Register files and wrote the site descriptions located on the maps. The National Register records contain a wealth of information and history and are accessible to the public. The maps have been distributed to State Historic Preservation Offices and other cultural resource partners.

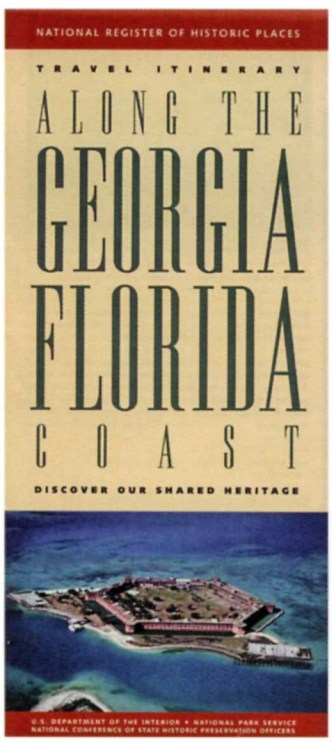
The Travel Itinerary Series can be viewed on the Internet: http://www.cr.nps.gov/nr/

National Register of Historic Places—Travel Itineraries Series: "Discover Our Shared Heritage"

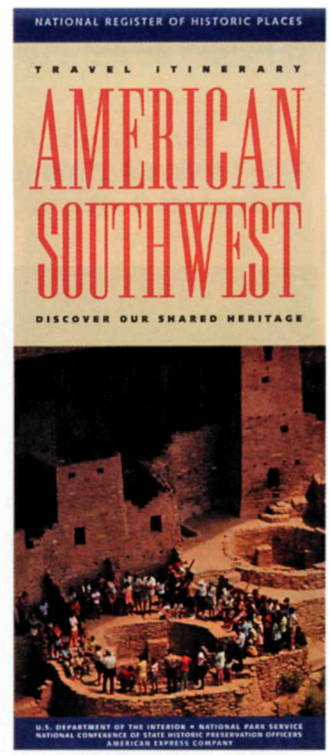
Future series:

California Coast
American Urban Areas

South and West Texas



Along the Georgia – Florida Coast



American Southwest

NPS Park Brochures

Lower Mississippi River Valley: Nile of the New World

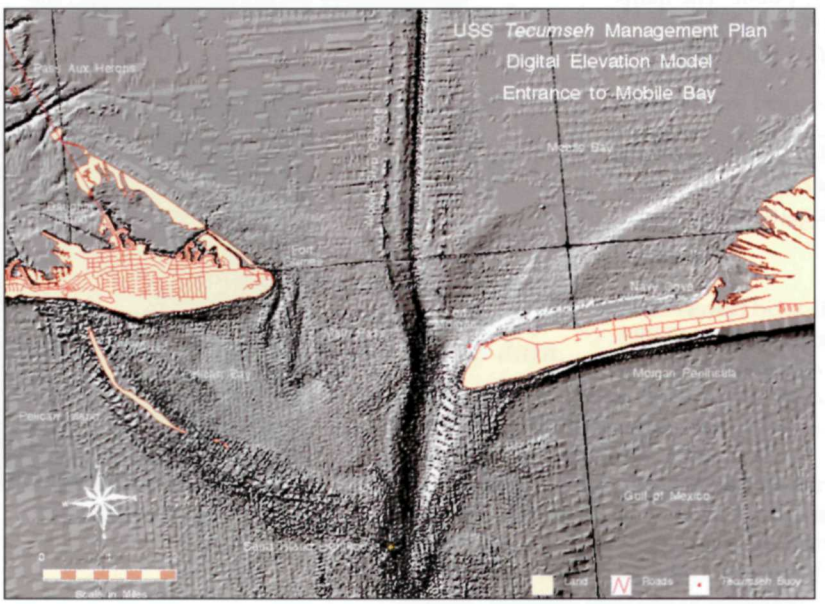
More Services for GPS and GIS...

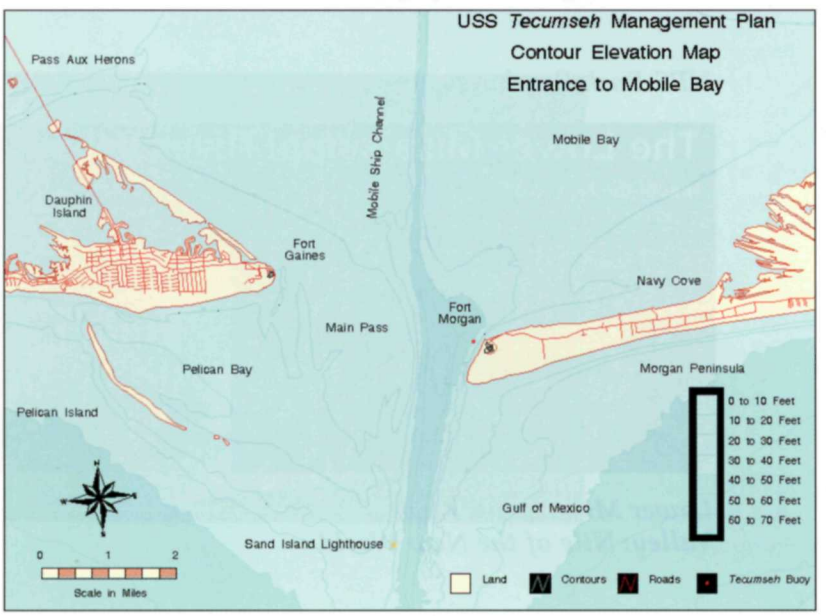
Tribal Lands: CRGIS created a series of maps showing tribal reservations located throughout the United States. These maps will assist both the government and the tribes in their efforts to protect and preserve natural and cultural resources.

Falcon Reservoir: Falcon Resevoir is a unique historic resource in Texas. In 1996, BMIT performed an intensive GPS survey with the goal of creating a database of modern and historic data. A report is being written jointly by BMIT/CRGIS and the Texas Historical Commission for presentation to the International Boundary and Water Commission to attempt to protect the resources formerly submerged in Falcon Reservoir.

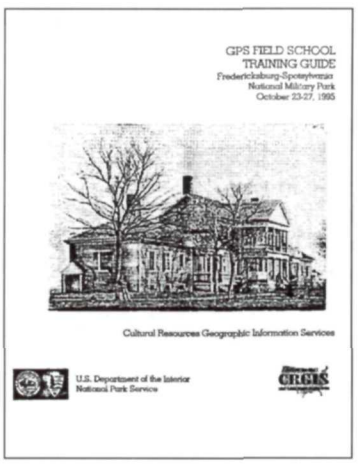
USS Tecumseh Management Plan: A joint project with National Historic Landmarks, Tecumseh lies submerged in Mobile Bay. USGS map data and sonar readings were combined by CRGIS as part of a comprehensive NPS management plan.

Colonial National Historical Park: This historical park encompasses many miles of cultural resources and is the backbone of the "historic triangle." CRGIS's GPS survey of the earthworks in and around Yorktown commenced in 1996.





Training Preservationists in GIS/GPS Technologies...



Training Series:

In addition to actual project work, BMIT, through its CRGIS facility, trains professionals and nonprofessionals alike to use GPS/GIS. Trainings are held for both federal and state parks, as well as for cultural resource partners such as local preservation organizations, as well as international agencies such as US/ICOMOS. *For further information about training, guest speakers or other services, contact BMIT (see page 9 for contact information)*

GPS Training

Rocky Mountain Region
Shiloh National Battlefield
Crater Lake National Park
Fredericksburg & Spotsylvania
National Military Park
Great Smoky Mountains National Park
Presidio
Mid-West Region

GIS Training

Rocky Mountain Region
Southeast/ Mid-Atlantic Region
Pacific Northwest Region
Western Region
GIS for Managers Course
US/ICOMOS

GPS Field School Training Guides, Cultural Resources GIS Facility, National Park Service (1992-96)

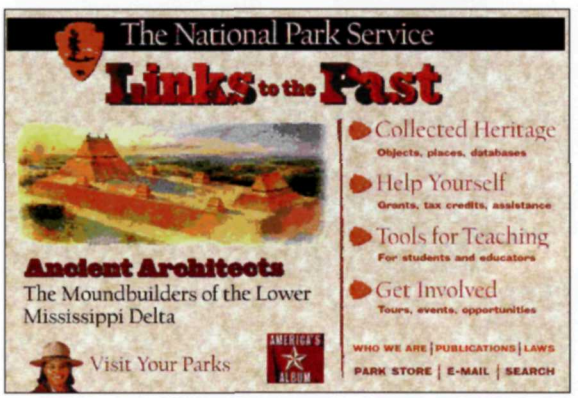
Free from the National Park Service: call or write for title availability (see page 9 for further information).

World Wide Web & the Internet

The Information Revolution...

"World Wide Web is a major research tool with endless educational applications and possibilities. The National Park Service embraces the opportunity to participate in this type of universal database of knowledge."
Roger Kennedy, Director—National Park Service

The NPS Heritage Preservation Services Home Page on the World Wide Web (WWW) is located on a server maintained by the Branch of Mapping and Information Technologies. The Home Page represents the collective work of NPS professionals. Originally developed as a communication tool for researchers, the WWW is a multimedia (audio, graphic, text) information retrieval system which uses the global network of computers known as the Internet. The NPS Home Page (http://www.nps.gov) became operational in March 1995 in anticipation of National Park Week. In conjunction with the overall development of the NPS Home Page, the "Links to the Past" Home Page was developed to provide information about each of the various cultural resource programs. Both sites allow people from across the globe to learn more about a wide range of NPS topics and activities from the National Trails System to the many properties listed on the National Register of Historic Places. The NPS Cultural Resource Home Page was officially on-line in May 1995.



BMIT is in the process of setting-up an electronic Bulletin Board Service (BBS) to disseminate free GPS information. Interested parties should contact BMIT (page 9) for further information.

The primary goal of the the Cultural Resource NPS WWW Home Page is to provide the public with access to information about the cultural and natural resources and related programs under the purview of the NPS. The Internet has enabled the NPS to reach a wider and more diverse audience of individuals and organizations. It is a natural "fit:" as more people utilize resources and programs maintained and supported by the NPS, the greater the need to reach as many people as possible in an era of fiscal restraint.

The public has and continues to benefit from faster access to detailed information on programs administered by the NPS. Now, a user can quickly access information about GPS/GIS technologies, Civil War battlefields, the Certified Local Government program and a wealth of information related to tribal concerns and historic preservation. Someone planning the rehabilitation of a historic property can access information about preservation. This enhanced access to NPS programs will serve to encourage private sector partnerships and increased private involvement.

Since its inception, the Cultural Resource NPS Home Page is and continues to be a popular and widely accessed Internet site. Since its inception, the NPS Cultural Resource site has received more than 3 million unique accesses or "hits." Users can easily send electronic mail to the site administrator and they often do: responses range from critiques of the Home Page to specific inquiries for information on historic property tax credits and Civil War battlefields.

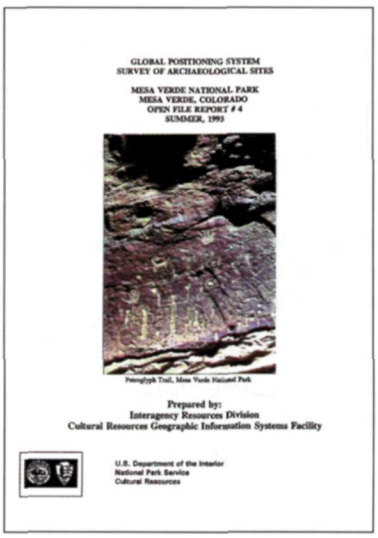
More Services...the Internet

The staff of the Branch of Mapping and Information Technologies is committed to providing the National Park Service and its partners with the most comprehensive assistance and support available for almost every facet of the Internet.

For further information about training, introductory HTML, World Wide Web demonstrations, guest speakers or other services, contact BMIT (see page 2 for contact information).

What we do...

- Server system administration
- Maintaining the WWW site
- HTML for Web Masters
- Using the Internet
- Accessing the WWW
- Web Site Development



More Services...Publications from BMIT/CRGIS

Open File Reports are descriptions of completed and ongoing projects that involve the application of GIS and GPS technologies to mapping, documenting and managing cultural resources. Projects have been conducted at national and state parks with the goal of promoting and establishing the use of GIS/GPS as a management tool.

Free from BMIT!

Single copies may be requested by contacting Heritage Preservation Services Information Desk (2255), National Center for Cultural Resource Stewardship and Partnerships, P.O. Box 37127, Washington, DC 20013-7127.

Or phone: (202) 343-9583, FAX: (202) 343-3803, e-mail: hps-info@nps.gov

GIS Project Open File Reports

Open File Report No. 1: "Survey of Battlefield Features at the Civil War Site of Stones River, Murfreesboro, Tennessee" (Winter 1993)

Open File Report No. 2: "Atlas of Civil War Battlefields in the Shenandoah Valley of Virginia" (Summer 1993)

Open File Report No. 3: "Survey of Battlefield Features at the Civil War Site of Perryville, Kentucky" (Summer 1993)

Open File Report No. 4: "GPS Survey of Archeological Sites in Mesa Verde National Park, Mesa Verde, Colorado" (Summer 1993)

Open File Report No. 5: "Atlas of Principal Civil War Battlefields in the Seventh Congressional District, Virginia" (September 1993)

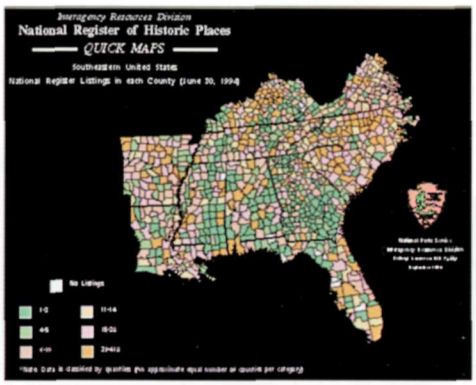
Open File Report No. 6: "Historic Stone Masonry of Great Smoky Mountains National Park" (1995)

Open File Report No. 7: "Siege of Port Hudson, Louisiana: GPS Survey 1993-1994" (Summer 1994)

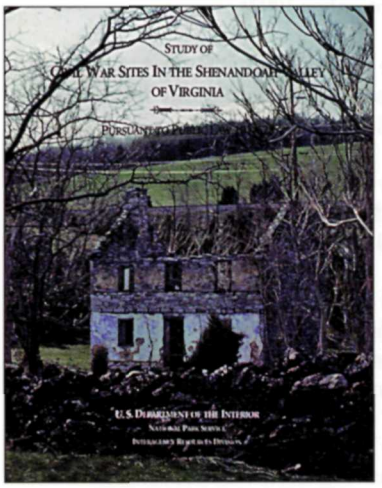
Open File Report No. 8: "Mammoth Cave National Park, Cooperative Project Phase II, Information Management Assessment Survey" (September 1994)

Open File Report No. 9: "GPS Survey of Surviving Civil War Features in Corinth and Alcorn County, Mississippi" (Summer 1995)

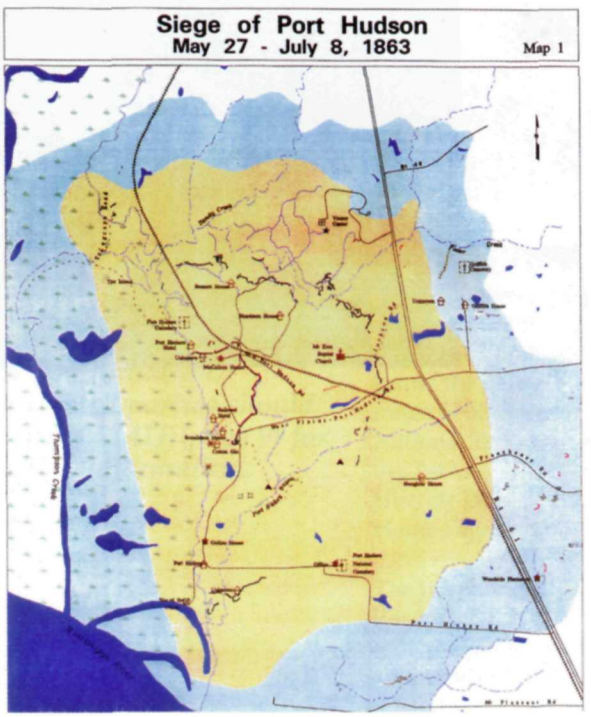
Open File Report No. 10: "Chancellorsville: Hooker's Apex, GPS Survey 1994" (Summer 1995)



More Services...More Publications



In 1993, the Civil War Sites Advisory Commission (mandated by Congress) established a list of 384 principal Cival War battelfields ranked by preservation priorities. Of these, 50 were identified as "Priority One Battlefields" in danger of development. Within the Priority One classification are battlefields designated either Class A or Class B in historic significance. To date, the CRGIS facility has assisted in the documentation and mapping of 9 of 20 battlefield sites designated Class A, while actively assisting in the documentation of 11 of 30 sites designated as Class B battlefields. CRGIS has mapped more than 90 miles of earthworks at many Civil War battlefield sites and trained hundreds of professionals in GPS/GIS technology.



Manuals

"American Battlefield Protection Program Battlefield Survey Manual: Civil War Sites Advisory Commission Methodology" (1995)

Selected Studies

Study of Civil War Sites in the Shenandoah Valley of Virginia. Washington, D.C.: National Park Service, September 1992.

New & Proposed Publication Initiatives for 1997

Open File Report: "GPS Survey of Cape Cod National Seashore"

Open File Report: "GPS Survey of the Natchez Trace and GIS Database Development for the Natchez Trace Parkway"

Open File Report: "GIS Database Development for Fredericksburg & Spotsylvania National Military Park and Spotsylvania County, VA"

Open File Report: "GPS Survey of Surviving Civil War Features in Yorktown National Military Park, Yorktown, Virginia"

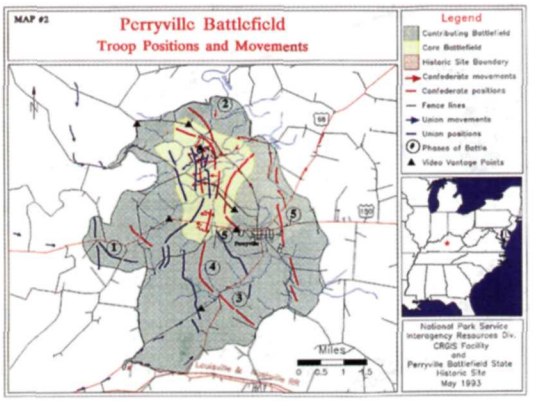
Open File Report: "GPS Survey versus Conventional Archeological Survey at Glen Canyon National Recreation Area, Utah"

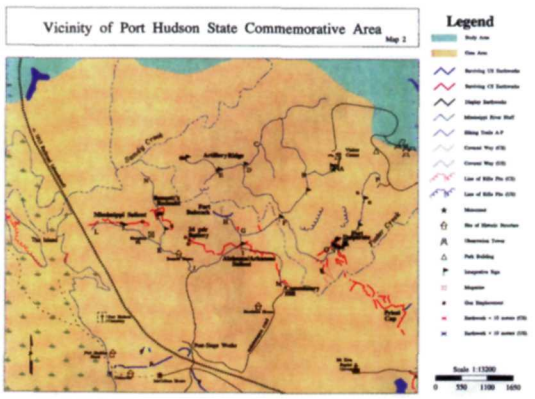
Open File Report: "GPS Survey of Surviving Civil War Features in the Vicinity of Corinth, MS and Shiloh National Military Park, TN"

Technical Paper: "Linking the List of Classified Structures with GIS in Harpers Ferry National Park"

Technical Paper: " Development of a Geographic Information System for Cultural Resources in State Historic Preservation Offices"

More Services...mapping Civil War Battlefields





Seventh District Civil War Battlefield Project: VA's Seventh Congressional district (Richmond) was the focus of an intensive mapping survey to create a database of Civil War-related sites. One-fifth of VA's battlefields are located within or adjacent to the Richmond-Petersburg area.

Coin Maps: In 1992 Congress authorized the sale of commemorative coins to help fund Civil War battlefield land acquisition efforts. BMIT/CRGIS has actively worked to map and survey many of these sites, including: Malvern Hill, Cedar Creek, Shenandoah Valley, VA; Prairie Grove, AR; Perryville, Mill Springs, KY; and Rich Mountain, WV.

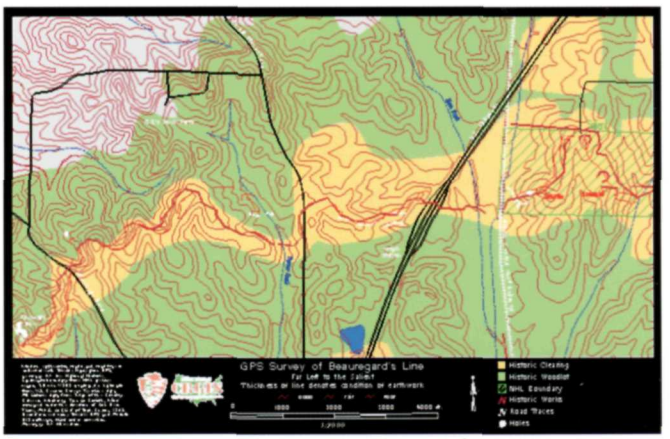
Battle Profile Maps: In 1993 the Civil War Sites Advisory Commission established a list of 384 principal Cival War battelfields ranked by preservation priorities. This series of maps were created using GPS and existing mapping data to record Priority I sites in danger from inappropriate development.

Fredericksburg-Spotsylvania National Military Park: The GIS database development for Fredericksburg-Spotsylvania National Military Park began in 1993. It was completed in 1996, with the addition of the Stonewall Jackson Shrine park unit to the database. The database was been used for numerous purposes, including the creation of maps arguing for the closure of the Sunken Road to automobile traffic at the Fredericksburg Unit. A potential use of the data could be as an interpretive display of battlefield troop movements.

Corinth, MS: There was heavy fighting at Corinth between North and South: most battlefield land is at-risk for inappropriate development. In 1995, Local groups contracted with BMIT to prepare GIS-generated maps showing the location of the area's historic resources. The database contains modern and historic data on roads, earthworks, house sites, gun positions, routes of the armies, and land cover. BMIT determined that the earthworks in hardwood forest stood the best chance of survival. Using elevation data, it was also determined that slope did not have a large impact on earthworks preservation.

Fort Marcy, VA: At the start of the Civil War, a ring of forts was constructed around Washington. Only a few remain, including Fort Marcy. An in-depth, comprehensive survey of Fort Marcy and its associated fieldworks was completed in 1996. GPS data was used as the basis for a three-dimensional model of the Fort.

Chickamauga-Chattanooga National Military Park: A GPS survey of Chickamauga-Chattanooga consisted of recording the locations of monuments and troop position markers, as well as some earthworks and many road traces. The road traces are of particular interest as an integral part of a cultural landscape inventory of the area.



In addition to working closely with parks and partners, BMIT and it's CRGIS facility are linked with the American Battlefield Protection Program (ABPP) created by Congress to safeguard Civil War and other battlefield resources. BMIT has surveyed and mapped many areas showing how development will impact common cultural resources.