Chapter 1

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INTRODUCTION

The preservation of this country's prehistoric and historic heritage has a long tradition of community support and academic and political interest. Federal preservation legislation, commencing in 1906,[1] reflects the national value and significance that U.S. prehistoric and historic cultural resources possess, whether managed by Federal, State, or local governments or private citizens. As the *National Historic Preservation Act* asserts,

> . . . the preservation of this irreplaceable heritage is in the public interest so that its vital legacy of cultural, educational, aesthetic, inspirational, economic, and energy benefits will be maintained and enriched for future generations of Americans.[2]

Virtually every congressional district contains federally managed sites, structures, or landscapes of prehistoric and historic interests The ability of Federal agencies to carry out their preservation responsibilities, within the context of managing public lands[4] and other duties, rests increasingly on discovering and using cost-effective techniques, methods, and equipment for studying and protecting these important cultural resources.

This assessment was requested by the House Committee on Interior and Insular Affairs to assist the committee's legislative authorization and oversight of Federal preservation efforts. During 1986, the 20th anniversary of passage of the *National Historic Preservation Act,* the Subcommittee on Public Lands initiated a major review of how Federal agencies implement the provisions of laws relating to prehistoric and historic properties (table 1). The findings of this assessment support the subcommittee's efforts to review how the use of technologies, including methods and techniques, as well as tools and equipment, can assist historic preservation.

As the population of this country has grown and urban centers have become more dense and expanded into the countryside, the stresses on cultural resources have increased dramatically. The destruction of shipwrecks and submerged archaeological sites, particularly along the coasts of Texas and Florida, has also increased significantly in recent years. Currently, the United States is losing its prehistoric and historic cultural resources at an alarming rate[5] in spite of the best efforts of preservation professionals to identify and protect them. Because the national inventory of these cultural resources is far from complete, sites, structures, and landscapes that may have prehistoric or historic significance may not be cataloged and protected before they have been destroyed or dramatically altered.

This assessment provides an overview of technologies relating to the care and preservation of cultural resources. In this assessment, **preservation technology refers broadly to any equipment, methods, and techniques that can be applied to the discovery; analysis; interpretation; restoration; conservation; protection; and management of prehistoric and historic sites, structures, and landscapes.** The assessment also examines a variety of options related *to* the use of preservation technologies and suggests improve-

[1] *The Antiquities Act of 1906* (Public Law 59-209).

[2] National Historic Preservation Act (Public Law 89-665), Sec. 1 (b) (Purpose of the Act), para. 4.

[3] See, for example, the National Register of Historic Places, which lists significant prehistoric and historic places throughout the United States.

[4] For example, the Federal Land Policy and Management Act of 1976, Sec. 102(a)(8), calls for "the public lands [to] be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use. "

[5] For example, experts estimate that fewer than 10 percent of the prehistoric Mimbres sites in southwestern New Mexico are free from damage due to looting and vandalism. See Carol Ann Bassett, "The Culture Thieves," *Science,* July/August 1986, p. 22. In addition, see the extensive discussion in Leslie E. Wildesen, "The Study of Impacts on Archaeological Sites, " *Advances In Archaeological Method and Theory 5,* 1982, pp. 51-96.

Table 1 .—Prehistoric and Historic Preservation Laws and Executive Orders

Laws:
- **The Antiquities Act of** 1906, Public **Law** 59-209 (6 U.S.C. 431-433)
- **The National Park Service Organic Act (An Act of Aug. 25, 1916), (39 Stat. 535, 16 U.S.C. 1)**
- **The Historic Sites Act of 1935, Public Law 74-292 (16 U.S.C. 461-467)**
- **The National Historic Preservation Trust Act of 1949, Public Law 81-408 (63 Stat. 927, 16 U.S.C. 468 et seq.)**
- **The Submerged Lands Act of 1953, Public Law 83-31 (67 Stat 29,** 43 U.S.C. 1301 et seq.)
- Outer Continental **Shelf Lands Act, Public Law 83-212 (67 Stat. 462,** 43 U.S.C. 1331 et **seq.)**
- **The Management of Museum Properties Act of 1955, Public Law 84-69 (16 U.S.C. 18f)**
- **The Reservoir Salvage Act of 1960, Public Law 86-523 (16 U.S.C. 469-469c)**
- [b] **The Department of Transportation Act of 1966, Public Law 89-670 (80 Stat. 931)**
- **The National Historic Preservation Act of 1966, Public Law 89-865 (16 U.S.C. 470)**
- **The National Environmental Policy Act of 1969, Public Law 90-190 (16 U.S.C. 470)**
- **Executive Order 11593, "Protection and Enhancement of the Cultural Environment," May 13, 1971. (36 F.R. 8921)**
- **Alaska Native Claims Settlement Act, Public Law 92-203 (85 Stat. 688,43 U.S.C. 1601-1624)**
- **The Archaeological and Historical Preservation Act of 1974, Public Law 93-291 (88 Stat. 174, 16 U.S.C. 469 et seq.)**
- **American Folklife Preservation Act of 1976, Public Law 94-201 (20 U.S.C. 2101-2107)**
- **The American Indian Religious Freedom Act of 1978, Public Law 95-341 (92** Stat. **46a, 42 U.S.C. 1996)**
- **Central Idaho Wilderness Act of 1980, Public Law 96-312 (94 Stat. 948, 16 U.S.C. 1274)**
- **National Historic Preservation Act Amendments of 1980, Public Law 96-515 (94 Stat. 2987, 16 U.S.C. 470 et seq.)**
- **The Archaeological Resources Protection Act of 1979, Public Law 96-95 (16 U.S.C. 470aa et seq.)**
- **Convention on Cultural Property Implementation Act, Public Law 97-446 (96 Stat. 2360-2-%3,' 19 U.S.C. 2601-2613)**

Legislation under consideration In the 99th Congress:
- **R.M.S. TITANIC Memorial Act of 1985 (H.R. 3272)**
- **The Abandoned Shipwreck Act of 1985 (H. R. 3558 and S. 2569)**
- **The Olmsted Heritage Landscapes Act of 1985 (H. R. 37)**

Regulations: [a]
- *43* **CFR 3 (Antiquities Act)**
- **43 CFR 7 (Archeological Resources Protection Act of 1979)**
- **36 CFR 60 (National Historic Preservation Act of 1966 (NHPA) and EO 11593)**
- **36 CFR 61 (NHPA and EO 11593)**
- **36 CFR 63 (NHPA and EO 11593)**
- **36 CFR 65 (Historic Sites Act of 1935)**
- **36 CFR 66 (Archaeological and Historic Preservation Act of 1974)**
- **36 CFR 68 (NH PA)**
- **36 CFR 800 (NHPA and EO 11593)**
- **40 CFR 1500 (NEPA) "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. "**

Standards and Guidelines for Historic Preservation:

"The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings," National Park Service (revised 1983), booklet.

"The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation," *Federal Register* **48, No. 190, Thursday, Sept. 29, 1983.**

"Final Uniform Regulations, Archaeological Resources Protection Act of 1979," *Federal Register 49, No. 4,* **Friday, Jan. 6, 1984.**

"Draft Guidelines for Historic and Archeological Resource Management: Federal Agency Responsibilities Under Section 110 of the National Historic Preservation Act," National Park Service, Feb. 5, 1986.

Advisory Council on Historic Preservation, Executive Director's "Procedures for Review of Proposals for Treatment of Archaeological Properties: Supplementary Guidance," 45 *Federal Register 78808.*

Advisory Council on Historic Preservation "Protection of Historic Properties," 36 CFR Part 800, *Federal Register 51, No, 169,* **Sept.** *2, 1986.*

[a] **Regulations** are **promulgated, adopted, and** then compiled **in** the Code of Federal Regulations **(CFR),** in order to Implement **Provisions** of **general laws**. The name Of the act it implements follows each Citation.

SOURCE: U.S. Department of the Interior and OTA.

ments in implementing current policy. It does not address the preservation of paintings, books, and other artifacts; however, some technologies used for their preservation are also applicable to sites, structures, and landscapes.

In the course of this assessment, OTA held a series of five workshops that explored the range of issues raised by the application of technologies to prehistoric and historic preservation:

1. Technologies for the Preservation of Archaeological Sites and Structures,
2. Technologies for the Preservation of Historic Structures,
3. Technologies for Underwater Archaeology and Maritime Preservation,
4. Technologies for the Preservation of Planned Landscapes and Other Outdoor Sites, and
5. Technologies for the Physical Protection of Prehistoric and Historic Sites.

More than 100 individuals participated in the workshops, either as invited participants or as observers.

CONTEXT

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MAJOR FINDINGS

The boundaries separating the practice of archaeology and the preservation of historic structures and historic landscapes are becoming increasingly indistinct. Preservation professionals apply many of the same technologies to the study and conservation of sites, structures, and landscapes. In addition, **preservationists in all the associated disciplines share problems of obtaining access to information about technologies, training, and coordinating research.** Finally, they share the constraints of inconsistent funding and a serious lack of coordinated implementation of Federal policy.

New **technologies can extend the scope of our understanding and care of the U.S. cultural her-**

Photo credit: HABS/HARE, National Park Service

Brooklyn Bridge seen from Front Steet.

itage by improving the quality, quantity, type, and usefulness of data gathered. Certain technologies can also improve the authenticity of restoration, and the effectiveness of conservation and maintenance. Yet, **a variety of educational, institutional, managerial, and cost barriers inhibit the broad application of new methods, techniques, and equipment to preservation.**

In many cases, the technologies appropriate to prehistoric and historic preservation have been developed for use in natural science and engineering disciplines, but have not been adequately adapted to preservation requirements. The efficient transfer of technology developed in other disciplines to preservation is impeded by preservation specialists' frequent lack of familiarity with natural science and engineering. It is also slowed by a general lack of formalized interdisciplinary approaches to preservation problems. Similarly, many natural scientists and 'engineers are unfamiliar with the needs and goals of preservation, yet would be receptive to assisting the preservation community in applying new technologies.

If advanced technologies are to assume a greater role in preservation, it is important to find more effective means of transferring technology developed in other fields to prehistoric and historic preservation. These will include:

- training in the use of technologies,
- studying ways to apply known technologies to preservation problems,
- improving information-sharing and coordination,
- finding the appropriate fit of technologies to preservation problems,
- reducing costs of new technologies, and
- developing standards for the application of new technologies.

Improved transfer of technology will also require greater acceptance among preservation specialists of the role technologies play in solving cultural resource problems. It will also require more effective training in the management of cultural resources.

Other countries, particularly in Europe, have been applying technologies to preservation longer than the United States. In part this stems from their longer histories as nations. In part, it is the result of stronger and better coordinated national support for preservation from their Ministries of Culture.

In some cases foreign technologies may represent significant advances over U.S. practices. For example, German methods for recording historic structures are far more complete and result in more detailed drawings and data than U.S. methods. Archaeologists in the United Kingdom employ advanced methods of physics and chemistry in analyzing artifacts more readily than many U.S. archaeologists. European art historians also use more advanced techniques to preserve their prehistoric rock paintings and carvings. European techniques of preserving submerged wooden ships and other maritime artifacts have led U.S. efforts. The French have developed a sophisticated airborne infrared scanner for investigating landscapes, as well as advanced methods for using it effectively. **Foreign experiences with preservation techniques, methods, and equipment should be examined closely for possible transfer to U.S. applications.** The United States would also benefit by increased cooperation with other nations in developing and testing new preservation methods. it could strengthen channels of communication between the United States and other countries by reinforcing its participation in the International Council on Monuments and Sites (ICOMOS).

The preservation of the U.S. cultural heritage often results in economic benefits (such as jobs and increased tourism) to individuals and communities. In order to convince decision makers of the value of retaining the best or most significant historic structures and landscapes, preservationists must better quantify and measure the economic benefits of restoring and rehabilitating them. They must also articulate more effectively the benefits related to quality of life. For example, rehabilitating a historic structure may be cheaper than replacing it with a modern one. In addition, the intangible benefit of retaining a sense of belonging and place by retaining the historic integrity of a neighborhood may outweigh the purely economic benefits.

prehistoric and historic preservation can contribute to our quality of life by increasing our

appreciation and understanding of our Nation's cultural and political history. Public education and interpretation play vital roles in preservation by enhancing the public's appreciation of our cultural heritage and involving the public in the preservation process. Yet competing mission demands within Federal agencies often cause them to neglect public education and interpretation. Hundreds of non-Federal historic organizations, such as Colonial Williamsburg, Virginia; Plimoth Plantation, Massachusetts; Cahokia Mounds State Historic Site, Illinois; and Santa Barbara Mission, California, have made significant contributions to the interpretation of prehistoric and historic cultural resources by instituting a variety of innovative volunteer and public-participation programs.

Because only a limited number of our cultural resources will be preserved with a high degree of authenticity, we must be able to understand the historical context in which prehistoric and historic activities took place. It is important to recognize the national, regional, or local significance of those sites, structures, and landscapes we wish to preserve. **Documentary research conducted at the outset of a project helps define the approach and focus of the preservation efforts. Historic materials are diverse and may include drawings, letters, maps, photographs, printed records, oral histories, and articles.** Even the existing data archives from any government agency are so numerous that current analytical techniques are often inadequate to search and evaluate them satisfactorily. **The vast amount of information available suggests preservation professionals need to gain intellectual and technological control over the knowledge base. New** information databases, automated finding aids, and related techniques are needed. A database of technical information would be particularly important.

Underwater archaeology and maritime preservation have made significant contributions to the understanding of our past, in many cases, as the direct result of the application of sophisticated technologies. If these gains are to continue, the information acquired in such studies must be integrated into the larger body of prehistoric and historic preservation information.

FEDERAL PRESERVATION POLICY

The Federal Government, "in cooperation with other nations and in partnership with States, local governments, Indian tribes, and private organizations and individuals, " is responsible for providing leadership in preserving the Nation's prehistoric and historic cultural resources.[6] The National Historic Preservation Act charges the Secretary of the Interior and the independent Advisory Council on Historic Preservation with administering and guiding Federal preservation efforts. The National Park Service (NPS) acts as the lead agency in technical preservation matters for the Federal Government, and for State and local efforts. NPS, through a variety of "external programs, " oversees the National Register of Historic Places, assists in historic survey and planning, and extends technical assistance to the preservation community, including other Federal agencies, States, and local governments. it administers, with the Internal Revenue Service, the tax incentives program to encourage private sector investment in rehabilitating certified income-producing historic structures. NPS also reviews State historic preservation programs and administers the matching grants-in-aid to the States for historic preservation projects. NPS protects and manages the cultural resources within the National Park system.

Every Federal agency has certain responsibilities for the prehistoric and historic properties under its control,' and must designate a qualified historic preservation officer.[8] The historic preservation officer plans for and coordinates the agency's preservation activities within the agency and with NPS.

[6] National Historic Preservation Act, Sec. 2(2)

[7] "The heads of all Federal agencies shall assume responsibility for the preservation of historic properties which are owned or controlled by such agency. " National Historic Preservation Act, Sec. 110(a)(1).

[8] National Historic Preservation Act, Sec. 11 O(C).

The National Historic Preservation Act also established an independent Advisory Council, whose membership is composed of individuals from the private sector appointed by the President, to "advise the President and the Congress on matters relating to historic preservation, [and to] recommend measures to coordinate activities of Federal, State, and local agencies and private institutions relating to historic preservation. "[9] It also review[s] the policies and programs of Federal Agencies" [10] and writes and distributes general information on historic preservation. W/hen a Federal undertaking would affect a historic property, the Advisory Council must be afforded "a reasonable opportunity to comment" on it. [11]

Additionally, the National Historic Preservation Act authorized and directed the establishment of a National Museum of the Building Arts. Among other things, the museum "shall collect and disseminate information concerning the building arts . . . and research relating to the building arts, "[12] which include information concerning building technologies and skills.

Each State has established a State Historic Preservation Office (SHPO), mandated by the National Historic Preservation Act. The SHPOs and the Certified Local Governments (CLGs), receive yearly matching grants from the Historic Preservation Fund to ensure that regional, State, and community preservation projects are carried out according to the nationally accepted standards. CLGs are approved by States and receive funding from them.

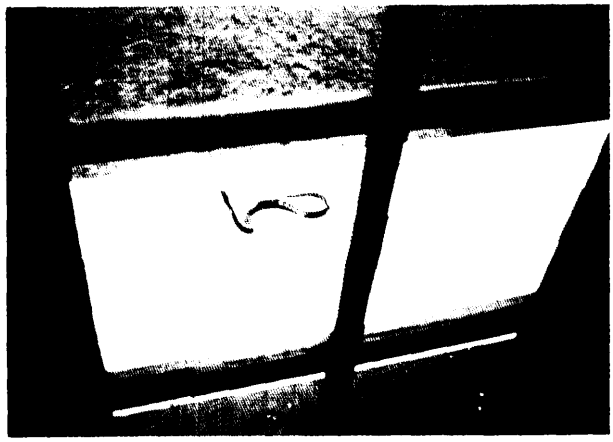
The National Trust for Historic Preservation, chartered and partially funded by Congress,[13] is also a source of information and expertise about technologies for preservation.

Applying Technologies in Prehistoric and Historic Preservation

Federal agencies can provide a variety of means for encouraging and facilitating the use of new technologies for prehistoric and historic preservation. However, participants in this assessment cited the following impediments to the adoption and widespread use of advanced preservation techniques:

- inadequate experience with and acceptance of new technologies,
- inadequate coordination among and with in agencies,
- inadequate funding for technologies,
- inadequate training in the application of technologies, and
- inadequate technical information exchange.

Bird Control Technologies



The imitation snake represents a "low-tech" solution to the problem of damage from bird droppings.

Photo credits: Preservation Assistance Division, National Park Service

The device behind Lincoln's head is an ultrasonic device for preventing birds from roosting on the statue.

'National Historic Preservation Act, Sec. 202(a)(1).
locational Historic Preservation Act, Sec. 202(a)(6).
I I National Historic Preservation Act, Sec. 106.
12National Historic Preservation Act, Sec. 306(a)(1).
13The National Historic Preservation Trust Act of 1949 (Public Law 81 -408; 63 Stat. 927).

Participants in this assessment cited the critical need to establish a federally funded institution as a mechanism to coordinate research, disseminate information, and provide training about new technologies for preservation. Several institutional structures are possible.

Federal Center for Preservation Technology.– Congress could establish such a center within the Department of the Interior or some other Federal agency. The center would assist the transfer of technology from other areas into prehistoric and historic preservation by developing new applications for existing technologies, providing training for preservation professionals, and serving as a clearinghouse for disseminating information on preservation technologies. A center should have a small but highly trained staff and the facilities for developing technologies relevant to all phases of the preservation process.

A Federal center, based within the Department of the Interior, would have the advantage of consolidating much of the specialized technological expertise now spread throughout the Department of the Interior and other Federal agencies. It could also increase administrative efficiency and lower costs by reducing redundancy of personnel and consolidating overhead. In addition to serving as the focal point for technology-related preservation information within the Federal Government, such an institution would provide needed assistance to State and local governments and to the private sector. All agencies and private individuals and groups would have a central place within the Federal Government to look for technical help with preservation problems.

National Center for Preservation Technology. –Alternatively, Congress could create a National Center for Preservation Technology, outside the Federal Government and managed by a consortium of universities. Such an institution would be able to draw on a multitude of different skills in several universities, and in many university departments. Like the Federal center, it would develop and test new applications of technologies, conduct training, and distribute information. However, it would be free to contract with agencies and with States and the private sector to develop technologies of specific interest to them. Because it would also otherwise be free of the institutional constraints and pressures imposed by being housed within the Federal structure, such an organization might be more innovative than a Federal laboratory. Though a National Center would serve as a resource for the Federal Government, like the Federal center outlined above, it would also serve State and local needs.

The National Astronomical Observatories, which are managed by the Association of Universities for Research in Astronomy, Inc., and funded by the National Science Foundation, might serve as an appropriate model. They not only provide research facilities for the entire astronomical community, but also conduct their own research projects.

Because a national center based in the university community would support Federal preservation efforts, it would require some Federal funding. This option would be an excellent opportunity to strengthen public/private ties for prehistoric and historic preservation, which have always been important features of the preservation movement. Thus, the center could derive a significant percentage of its operating expenses from State and private sources.

Preservation Technology Board.–Additionally, Congress might wish to consider supporting a Preservation Technology Board. Even if one of the two options for creating a Center for Preservation Technology were adopted, a board composed of professionals from all parts of the preservation community would be needed to provide guidance for a center, and to determine current needs for technology, develop standards for the application of new technologies, and assist in disseminating information. The professional societies concerned with archaeology, historic structures, and historic landscapes are likely to be highly supportive of such a Board.

The preservation efforts of the Federal agencies would benefit immeasurably by a Preservation Technology Board. Congress could foster its creation by directing the Federal agencies with major responsibilities for prehistoric and historic preservation to provide initial funding.

Federal Management of Historic Cultural Resources

A thorough assessment of the Federal institutional structure for prehistoric and historic preservation is beyond the scope of this assessment. However, participants in the OTA workshops expressed marked concern over the institutional impediments within the Federal Government that limit its effectiveness in applying a fuller range of technologies to preservation.

The stewardship of prehistoric and historic archaeological resources, historic structures, and historic landscapes has not received sufficient attention within the Department of the Interior. Even within the National Park Service, which carries out many of the Federal responsibilities for prehistoric and historic preservation, the management of programs relating to other Federal, State, and local cultural resources often conflicts with NPS's priorities in caring for natural resources in the Nation's parks. Yet, of the 337 units of the National Park system, two-thirds were established because of their prehistoric and historic resources. All NPS parks contain some prehistoric and historic cultural resources.

In order to implement fully the provisions of historic preservation legislation (table 1), it would be important for the Federal Government, including Congress, to increase its attention to prehistoric and historic preservation. Federal programs have often served as models for the States, local governments, and private preservation efforts.

In view of the concern over the management of the Federal Government's preservation efforts, Congress may wish to consider changing the structure of the Federal Government's preservation efforts. The following paragraphs present options for improving Federal management of cultural resources.

Establish a Separate Agency To Manage and Coordinate All Federal Cultural Programs.–In addition to providing a central focus for all the government's programs in preservation, such an agency would be responsible for administering the National Endowment for the Humanities, the National Endowment for the Arts, and other culturally oriented programs. It would in essence be similar to a Ministry of Culture, which most foreign governments have.

Create an Independent Agency Devoted to the Care and Protection of Prehistoric and Historic Cultural Resources.–Such a policy has the major advantage of providing coherence for the management of U.S. prehistoric and historic preservation programs. It would remove the primary responsibility for cultural resources management from the Department of the Interior, yet it would create a new institution that must be staffed and funded (though many staff, and some funding would result from transfers from existing programs). An independent agency would be the logical place for the Federal Center for Preservation Technology suggested above. However, it would lack the benefits of in-house expertise in the actual ownership and management of historic properties.

Reorganize the Department of the Interior To Provide for an Assistant Secretary for Natural and Cultural Resources.—This option would bring all the cultural programs from NPS and other DOI agencies under the aegis of one office. It would be simpler to effect than creating an independent agency, and would increase the visibility and importance of preservation within the Department of the Interior. However, it would continue the current arrangement of maintaining the preservation function within the department, which as noted earlier, carries disadvantages as well as advantages for the national preservation programs.

Work Within the Current Preservation Structure.–Even if the overall management structure for the Federal preservation effort were left largely unaltered, the agencies could make several changes to improve this Nation's preservation effort, within the direction provided by the National Historic Preservation Act, and other legislation. The initiation and execution of such programs will require direction and continued oversight by Congress. The agencies could:

- inventory their preservation needs and plans for carrying them out;
- develop sustained, organized maintenance programs for historic Federal properties;

- improve coordination and information-sharing among agencies with respect to historic preservation;
- develop a stronger focus on the application of new, efficient technologies for preservation; and
- establish a central office to collect and disseminate information about preservation technologies.

Survey of Prehistoric and Historic Landscapes

The United States has made no comprehensive survey of significant national prehistoric and historic landscapes comparable to its efforts for historic structures. Because prehistoric and historic landscapes are an especially ephemeral resource, some groups are now surveying them. For example, the State of Ohio has an ongoing survey of historic landscapes. New Mexico has also conducted landscape studies.

In 1984 the Historic Preservation Committee of the American Society of Landscape Architects initiated a national survey of historic designed landscapes, which is endorsed by the National Park Service. This important example of a public/private partnership depends primarily on volunteer assistance from many regions of the United States. However, without professional, full-time leadership, relying entirely on volunteers from different regions may lead to inconsistent survey results. The National Park Service could assume a stronger role than it has taken in this effort, in order to assure timely completion of the survey and to standardize the information collected. Congressional oversight may be necessary to assure that this process takes place.

Significant prehistoric and historic landscapes continue to be lost through lack of recognition. The proposed Olmsted Heritage Landscapes Act of 1985[14] (Olmsted Act—H.R. 37), seeks to "encourage the identification, preservation, and commemoration of historic designed landscapes. "[15]

[14]See, however, The *National Historic Preservation Act: An* **Assessment** (Washington, DC: Advisory Council on Historic Preservation, September 1986) for a discussion of many of the broader institutional issues faced by preservation efforts in this country.

[15]Sec. 4 of H.R. 37.

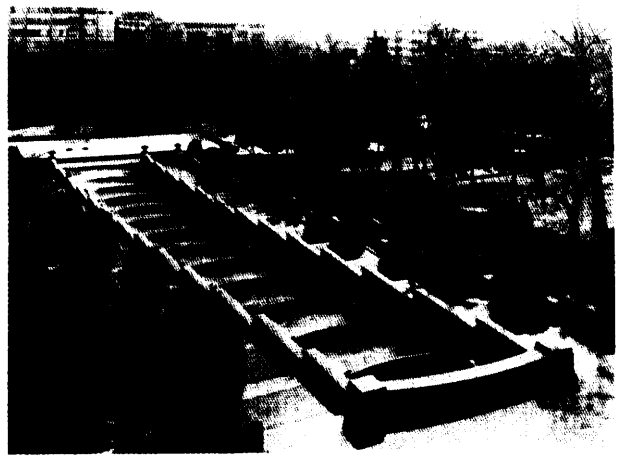


Photo credit: HABS/HAER, National Park Service

Cascade area, Meridian Hill Park, Washington, DC

Limited surveys have been conducted on Olmsted landscapes by the National Association of Olmsted Parks and the Massachusetts Association of Olmsted parks. These primarily volunteer efforts cannot discover all significant Olmsted landscapes. Although the Olmsted Act is directed toward the parks designed by Frederick Law Olmsted's firms, which include some of the most famous and historically significant of U.S. parks,[16] **passage and implementation of the Olmsted Act would materially aid the collection of information on all U.S. historic designed landscapes. Focusing attention on the Olmsted landscapes would also enhance public awareness of other significant landscapes.**

Historic Shipwrecks and Other Submerged Cultural Resources

The United States has not undertaken a national inventory of submerged cultural resources, which include submerged villages and other sites as well as shipwrecks. Although some States have made substantial progress in surveying their own coastal and riverine areas, and locating submerged resources, no States have comprehensive data on file.

[16]Over three generations, the Olmsted firms, whose Brook line, MA, office is now a National Historic Site, managed by the National Park Service, designed such parks as Central Park in New York City, Franklin Park in Brookline, MA, and Prospect Park in Brooklyn, NY, as well as estates, universities, park systems, institutional properties, and urban plans.

Historic shipwrecks in coastal waters contain a wealth of important information concerning the exploration and settlement of this country. Yet efforts to protect them for research and public interpretation are hampered by current Admiralty Laws, under which historic shipwrecks are treated as abandoned property. Their contents may be recovered by salvers. Such recovery often destroys valuable information related to the Nation's maritime history. **Passage and implementation of the proposed Abandoned Shipwrecks Act (H. R. 3558/S. 2569) would make it possible to preserve significant historic shipwrecks for future generations by ceding jurisdiction, ownership, and oversight of them to the States.** The Senate version is almost identical to the House version, and maintains incentives for sportdivers and salvers to continue searching for historic shipwrecks. It would also guarantee salvers "reasonable compensation' for work undertaken u rider its terms.

The important additional attention to submerged prehistoric and historic cultural resources that passage of the Abandoned Shipwrecks Act implies may require the National Park Service and the National Oceanic and Atmospheric Administration to increase their funding and other support of submerged cultural resources activities.

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Congressional oversight may be necessary to guarantee that such requirements are met.

Protection of Prehistoric and Historic Cultural Resources

Looting and vandalism are serious threats to the management and conservation of prehistoric and historic cultural resources. The activities of looters are particularly damaging to prehistoric sites because they destroy important and valuable scientific information. Painting graffiti, breaking windows, destroying shrubs, and other acts of vandalism reduce the value of historic structures and landscapes and make them much less attractive to visitors. Advanced monitoring and observation devices may aid the law enforcement process. However, they cannot substitute for the presence of trained officers in the field. Adaptive reuse of cultural resources imparts a natural element of protection by giving them value beyond their historic value.

The high value placed on some items in national and international markets and the lack of consistent law enforcement in dealing with illicit excavation on public lands and trafficking in stolen artifacts, make protection of sites and structures as well as prosecution for illegal activities extremely difficult. Professional thieves are technologically well-equipped and motivated by strong economic incentives to continue their activities. **In addition to employing trained personnel and applying appropriate technologies, the United States needs to improve the enforcement of its policies for dealing with illicit excavation and trafficking in stolen artifacts.** Congressional oversight of the implementation of existing legislation may be necessary to encourage such enforcement.

Recent technological advances could enable relatively easy registration and coding of artifacts for sale. To assist in stemming the illegal loss of irreplaceable artifacts from public lands, and the concomitant damage that looting causes, **it may be appropriate to amend the Archaeological Resources Protection Act of 1979 and other statutes to permit private registration of antiquities obtained in the course of archaeological excavations, conducted by trained archaeologists on**

private land. Registration would make it easier for law enforcement officials to obtain convictions for illegal sale of unregistered artifacts taken from public lands, by shifting the burden of proof that the artifact was dug on private land from the government to its owner. To be most effective, registration should include sufficient information about the artifact to allow the owner to understand its archaeological origins and connection to the prehistoric peoples from which it derives.

Registration of scientifically excavated artifacts is likely to enhance the value of registered artifacts relative to unregistered ones. Such increase in value might provide economic incentives for private landowners to have their sites properly excavated and recorded, rather than dug solely for their marketable artifacts. Registration might also assist in educating landowners to the scientific value of using the best possible excavation methods. However, sale of artifacts from excavations would have the disadvantage of dispersing some collections, rendering them less available for restudy.

The Convention on Cultural Property implementation Act[17] prohibits importation of stolen cultural property that is documented as belonging to the inventory of a public monument, museum, or similar institution in a State party to the UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property.[18] It also restricts archaeological or ethnological materials from other countries upon request and subsequent agreement by the United States. However, it is just being implemented and further experience will be needed to test its efficacy in stemming the international flow of cultural property.

U.S. law does not protect against export of irreplaceable items of U.S. cultural history from the United States to other countries. The UNESCO Convention encourages each State party to register cultural property[19] for the purposes of controlling import into other countries. **As experience is gained with implementing the Convention on Cultural Property Implementation Act, it may be appropriate for the United States to explore ways in which the registration of artifacts suggested above could be expanded to other prehistoric and historic cultural property for international trade.**

[17] Public Law 97-446.

[18] Fifty-eight countries have signed the UNESCO Convention.

[19] See articles 6 and 10 of the UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property.

THE PRESERVATION PROCESS

The process of sound cultural resource research and management is extremely complex and involves individuals from a variety of disciplines. It can be divided into the following components, which are not necessarily listed in order of application:

- discovery (identification and survey);
- recording and measurement;
- analysis and evaluation;
- restoration, conservation, and maintenance;
- protection from catastrophic losses;
- data and information storage and retrieval; and
- public education and involvement.

These components make use of a broad array of rudimentary, as well as sophisticated, technologies. Many new technologies promise to enhance the process of prehistoric and historic preservation. However, they must be appropriate to the task to which they are applied. In some cases, traditional methods (so-called low-tech solutions) may be the most appropriate and cost-effective.

Discovery

Archival investigation is an important first step in the discovery phase of the preservation process. Before beginning actual fieldwork, archival materials and oral histories related to the project should be collected and studied. They are especially helpful in focusing the research problem and aiding creation of a detailed research plan. Efficient data management systems are needed

Box A.—Some Research Technologies Discussed in the Report

Discovery

Remote Sensing.—Includes techniques of imaging Earth from spacecraft and aircraft. Also includes surface methods and geophysical methods that penetrate below the surface of the Earth, or underwater.

Aircraft and spacecraft methods:

- *photography*: black and white, color, and infrared at a wide variety of scales;
- *multispectral scanning*: electronic sensing and processing of visual images in many spectral bands, including infrared; and
- *imaging radar*: builds image of surface topography by analyzing a series of microwave radar scans. It can even be used to penetrate below the surface of dry soil;

Subsurface methods:

- *georadar*: detects reflections of microwaves, transmitted by radar carried along the surface, from cultural material below the surface;
- *soil resistivity meter*: measures electrical resistance of soil to the passage of a small current from probes placed in soil; cultural material generally displays different resistance from surrounding soil;
- *soil conductivity meter*: measures conduction of current passed between two probes placed in soil; cultural material generally displays different conductivity from surrounding soil;
- *magnetometer*: registers changes in the local magnetic field as detector passes over iron-bearing cultural material; and
- *metal detector*: finds subsurface metals by detecting small electric currents (eddy currents) generated in the metal by electromagnetic pulses transmitted by the instrument.

Underwater methods:

- *side-scan sonar*: locates shipwrecks and sites on the bottom surface by detecting the echoes of high-frequency acoustic pulses transmitted from instrument towed behind ship;
- *sub-bottom profiler*: locates shipwrecks and sites below the ocean bottom by detecting the return signals of lower frequency acoustic pulses from instrument towed behind ship;
- *magnetometer*: similar in principle to the magnetometer for use on land. It detects changes in the magnetic field as detector passes over iron-bearing cultural material. It can be used from a ship or an airplane; and
- *remotely operated vehicles (ROVs)*: a variety of submersible vehicles that can carry photographic or video cameras to image submerged objects. ROVs can also retrieve samples from the bottom.

Surface methods:

- *video*: color and black and white; and
- *photographic cameras*: can be operated in infrared as well as color and black and white.

Predictive Locational Modeling.—This term is applied to a group of techniques, often requiring a computer, employed to predict the distribution of archaeologically significant material in a region by analyzing such factors as climate, soil characteristics, landform characteristics, and the availability of crops and game.

Documentation

Photogrammetry.—This precision recording technique makes use of a stereo pair of photographs, the details of which are analyzed in a stereo comparator and plotted on a precision plotter. Most recent versions of the method, called analytical plotting, make use of computers to assume most or all of the burden of analyzing the stereo photographs. The method can be used to record extremely fine details of a site, structure, or landscape for later three-dimensional analysis.

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The scanned version of the page was almost entirely black and not usable.

for archival investigation. These include subject-accessible keyword systems and finding aids that relate to the geographic location of sites. Careful notation of the field survey and inventory data for later use and archival storage requires the design of collection forms that can be easily read by automated information systems.[20]

Remote sensing techniques using both aircraft and spacecraft, as well as close-range sensors, appear to offer great promise in extending our ability to discover, characterize, and study archaeological sites and historic landscapes. Yet, high costs of equipment and lack of familiarity with remote sensing techniques have inhibited their use i n archaeology and landscape studies. Although remote sensing techniques are little used in identifying historic structures, they can improve our understanding of the significance of these structures by revealing new contextual information.

Geographic information systems and predictive modeling methods are also finding utility for survey and identification of archaeological sites and landscapes. Ultimately, locational predictive modeling techniques, analytical tools for predicting the distribution of archaeologically significant material across large regions, are likely to prove powerful aids for research and management of cultural resources, especially in the vast public lands of the Southwest and West. However, such models need considerable refinement, and may never reduce the overall costs of surveying and identifying archaeological sites.

Underwater archaeology depends primarily on technologies borrowed from the oil and gas exploration industry. The costs of using such survey technologies as side-scan sonar, sub-bottom profilers, remotely operated vehicles, and precision positioning systems are likely to remain extremely high. However, the data for initial surveys in shallow coastal waters may be available from the exploration firms and the Minerals Management Service at extremely low cost. Magnetometry, the most widely used of underwater locational technologies is less costly, but responds only to ferrous material. Using airborne magnetometers would reduce the costs of surveys by allowing rapid coverage of large areas of water.

Video technology, because it is relatively simple and inexpensive to use has broad applications for survey and identification, can store vast amounts of information about the context of his-

[20]For example, the Wisconsin State Historic Preservation Office has devised a sites and structures form, which can be read efficiently by an optical character reader.

Radar Image of Death Valley, California

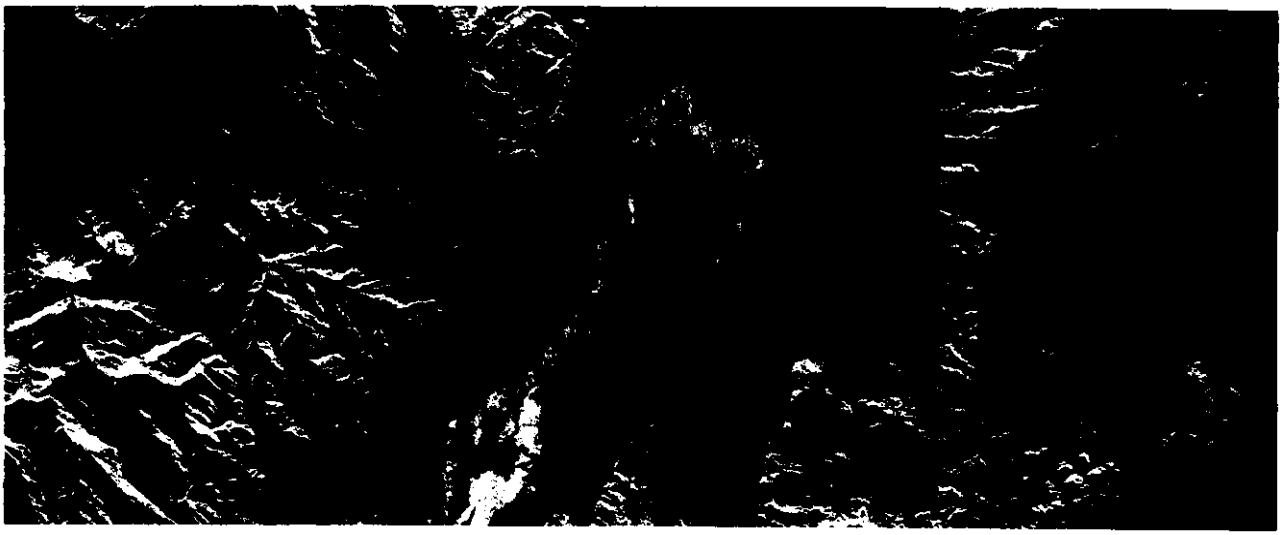

Photo credit: Jet Propulsion Laboratory and National Aeronautics and Space Administration

A variety of geologic features can be seen in this radar image acquired by the Shuttle Imaging Radar-B carried aboard the space shuttle, Oct. 11, 1984.

toric structures, and is capable of imparting a sense of presence, place, and context that individual photographs cannot. It has also found considerable use in underwater archaeology, for survey and interpretation of submerged resources to the public.

During the last two decades, significant strides have been made in the drive to recognize significant landscapes. However, only within the last year have landscapes been incorporated within the significance categories for the National Register of Historic Places.[21] Such an omission has constituted a major barrier to nominating landscapes to the Register.

Recording and Measurement

Photogrammetric stereo recording of archaeological sites, historic buildings, and landscapes is underutilized in the United States, in large part because of a lack of appreciation of its benefits in heightened accuracy and speed of execution, as well as the requirement for trained staff and specialized equipment. Recent advances in computer software, brought about by extensive research on remote sensing from aircraft and spacecraft, coupled with relatively inexpensive image digitizers, promise to lower costs dramatically. Stereo photogrammetric techniques are also being applied to documenting submerged cultural resources.

Excavation is necessarily destructive. There is therefore a strong need to improve the quantity and quality of archaeological data recording. It is also important to refine the techniques for locating the most suitable sites for excavation. **Many experts feel that archaeologists need to excavate less and record sites more carefully. They might also benefit from standardizing the process of gathering data so there is less onsite analysis. Microanalytic soil and plant techniques have improved dramatically in the past decade. in addition to storing records and artifacts, archaeologists would benefit from saving** soil samples, corings, and excavation profiles for future reanalysis of sites when techniques have improved still further.

Underwater archaeologists need greater access to the dramatically improved deepwater remotely operated exploratory vessels developed for the U.S. Navy, and the oil, gas, and mineral industries. Because submerged wooden vessels, the largest of all artifacts, are extremely fragile, they would also benefit from the development of technologies that would enable shipwrecks to be examined and their contents excavated with minimal disturbance to the structures themselves.

The detailed examination of the surfaces of historic structures benefits immeasurably by using infrared and ultraviolet techniques. X-ray and neutron-gamma ray devices make possible the nondestructive examination of internal or hidden structural details.

Optical disk technology allows the storage and retrieval of diverse kinds of information on all preservation issues. Photographs, videos, test results, field notes, and other kinds of information can be stored together in one place to facilitate access.

[21] See J. Timothy Keller and Genevieve P. Keller, "How To Evaluate and Nominate Designed Historic Landscapes, " Bulletin #18, National Park Service, 1986. This document represents the first attempt within the U.S. preservation movement formally to signify the importance of landscapes to the U.S. cultural heritage. The preservation of cultural landscapes has also received relatively little attention. See Robert Z. Melnick, *Cultural Landscapes: Rural Historic Districts Within the National Park Service* (Washington, DC: National Park Service, U.S. Department of the Interior, 1984).

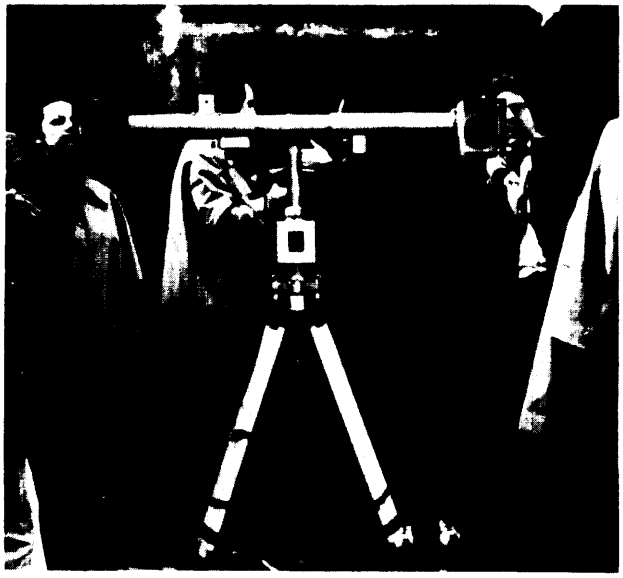

Photo credit: Preservation Assistance Division, National Park Service

Stereo photogrammetry in Rome

Analysis and Evaluation

Accurate dating of archaeological materials plays an important part in understanding prehistoric cultures. The several dating techniques developed for archaeology are excellent examples of the transfer of technology from the natural sciences into archaeology. Traditional radiocarbon dating techniques, which were developed by chemists, have proved powerful tools for determining the ages of organic material. However, because many of the artifacts archaeologists wish to date are extremely small, they are limited by the amount of the sample (about a gram) needed compared to the size and mass of the artifacts. Recent advances in radiocarbon dating yield acceptable results with samples 1,000 to 1 million times smaller. Other advances in dating techniques, such as archaeomagnetic dating, which was developed by geophysicists and depends on measuring changes in the Earth's magnetic field over time, have dramatically extended the archaeologists' ability to date archaeological remains.

Archaeologists have usefully applied the analytical techniques derived from soil science and geomorphology for many years. Techniques derived from the earth sciences have much to contribute to the management of archaeological sites and historic landscapes. Continued improvements in such techniques will be important in assisting the research of archaeologists and landscape historians.

Landscapes are subtle and constantly changing as a result of both natural and human processes. Computer modeling and remote sensing techniques provide a powerful set of techniques for the analysis and evaluation of large-scale landscapes. Analysis of landscapes requires understanding of plant types and plant variations. For historic gardens, the identification and retrieval of historic plant types is particularly important. There is a strong need to develop databases on the types of plantings used historically. Such databases will also depend on maintaining archives on the types of plants used historically in the United States.

Even though historic structures were built in stages and are composed of many different subsystems, they nevertheless function as a total interdependent system. It **is essential to analyze their performance as a whole, rather than a sum of independent component parts.** Architects must be trained correctly to analyze and predict the behavior of structural elements over time in different environmental conditions. Structures also exist as part of a total landscape and should be analyzed within that context rather than being considered independent of their surroundings.

Considerably more progress is needed in nondestructive assessment of structural condition. X-ray and gamma-ray devices can locate hidden features of structures. They can also be used to determine and diagnose moisture and deterioration of structural elements.

Restoration, Conservation, and Maintenance

Regular, periodic maintenance plays a crucial part in conserving prehistoric and historic sites, structures, and landscapes and enhances their value. **Yet relatively little attention has been given to training for maintenance** or **applying technology to improving maintenance management. Long-range management is especially important. Expert systems and optical disk technology can vastly improve the delivery of quality training** in restoration, repair, and maintenance. Craftspeople skilled in restoration techniques should be made part of the decision making process for restoration, conservation, and maintenance. Proper cyclic maintenance for sites, structures, and landscapes includes a thorough understanding of both traditional and advanced techniques.

Materials recovered from submerged sites pose particularly difficult conservation problems. They become highly vulnerable to the process of decomposition almost immediately after being removed from the water, and require perpetual, not just cyclic, attention.

Because local residents often have a major stake in the subsequent use of a preservation project, they should be consulted during the analysis of sites, structures, or landscapes prior to restoration. A variety of analytic interview techniques speed this process and make it more ac-

Structural Damage

Photo credits: Preservation Ass/stance *Division, National Park Service*

Upper photo, brownstone deterioration as a result of splashback from traffic on stairs. Lower photo, ice damage to stone.

curate. It is also important to gather and store interview materials properly in archives so they may be used effectively.

participants in this assessment noted that **many contemporary buildings reflect inadequate knowledge of materials and construction methods. They could become the preservation problems of the future.** It is important to give more attention both to understanding materials and developing standards for construction. Information that is collected in the investigation of historic building materials may be extremely useful for refining current building techniques and developing proper maintenance plans. In particular, **reinforced concrete, one of the most common of building materials, is failing in both modern and historic structures because its behavior has not been well understood. Reinforced concrete constitutes a growing and burdensome conservation problem for the future.** Effective conservation treatments should be found and that information widely shared.

Environmental stresses on historic structures have increased markedly in the last century. Technologies for conserving historic structures against rapidly accelerating degradation by chemicals and water in the atmosphere and soil are needed.

In an effort to reduce costs, or meet local building codes, substitute materials are often employed in restoring historic structures. The behavior of these substitute materials also requires detailed analysis before they are used in order to assure that they will last and will be compatible with the original materials and appropriate to the structure.

The Federal effort at stabilizing and conserving prehistoric and historic sites and structures suffers from lack of agency coordination. Considerably more research needs to be done, for example, on technologies for site monitoring, and the stabilization of adobe, stone, and wood.

The conservation of prehistoric and historic rock art[22] has received very little attention from

[22] Rock art includes rock painting (pictographs) and rock carving, incising, and pecking (petroglyphs).

Federal agencies. **Because of the importance of rock art to understanding prehistoric Native American culture, a focused effort to develop appropriate conservation technologies is very important.** Conservation of rock art is also important to many contemporary Native Americans as it is part of their cultural heritage.

As a result of the multitude of stresses that the urbanization of the United States places on the natural environment, it is more important than ever to identify and manage significant prehistoric and historic landscapes. **The United States is losing significant numbers of historic plant species. In order to reduce such losses, and make it possible to restore historic gardens accurately, it may be necessary to establish arboretums to conserve and propagate historic plant species.** Arboretums, such as the one at Jefferson's home, Monticello, and many historic gardens, could also play an important role in maintaining the diversity of plant species.

Records that document the maintenance and preservation of sites, structures, or landscapes can be used to make informed decisions about which technologies will work best and be most cost-effective. Yet such important documents are often not retained because they are considered unimportant as "housekeeping" information.

Protection From Catastrophic Losses

Prehistoric and historic sites, structures, and landscapes are subject to a variety of catastrophic losses, including fire, earthquake, looting, and vandalism. **Under certain circumstances, technologies for the detection and surveillance of intruders and potential arsonists or vandals can enhance the protection of cultural resources. However, the costs of such technologies are extremely high. In addition, patrols by trained law enforcement officials are also necessary.** Urban, rural, and underwater environments require different approaches to law enforcement. Public educational and other regular and constant uses of historic properties can contribute to their protection by ensuring that people are often present at times of high potential risk.

Cultural resources on Federal lands belong to the Nation and are held in trust by Federal agencies for the benefit and enjoyment of al I citizens. Increasing the effectiveness of law enforcement for the protection of cultural resources on Federal lands will require better coordination among Federal agencies for training and sharing of information.

Methods for protecting historic structures located within earthquake zones, particularly in cities, has begun and should continue. However, historic structures are more frequently lost from neglect than from catastrophic events. Some are deliberately destroyed by their owners because they have little notion of why they should be preserved.

Historic structures are particularly vulnerable to arson and intrusion. Devices designed to monitor for fire and intrusion must be simple to operate and maintain. Those that can be operated and understood only by trained experts may do more harm than good if they malfunction or create a false sense of security.

Preservation Information

Efficient access to information remains one of the greatest impediments to effective management of cultural resources. New means of recording, storing, retrieving, and manipulating data and information promise to improve dramatically our ability to identify and preserve significant prehistoric and historic sites, structures, and landscapes. The most consequential advances are expected from the application of optical disk technology in various forms, which will allow the storage and retrieval of prints, photographs, and video as well as text. Optical character readers for translating text to machine readable format will improve preservationists' ability to create databases and enhance the flow of information. However, making effective use of such technologies will require the development of standardized formats for data collection and recording. Improved coordination within the preservation community could assist the development of such standards.

Participants in this study expressed considerable concern about the long-term stability and storage quality of new data and information media and equipment. **It will be essential to con-**

Photo credit: Jack *Boucher, National Park Service*

Carson House, Eureka, California

tinue to study the longevity of such media and equipment and to develop systems that are evolutionary, rather than revolutionary, in order to reduce the costs and disruption to records that abrupt technological shifts might cause.

Public Education

Public education and interpretation are among the most effective means of preserving prehistoric and historic sites, structures, and landscapes for future generations to enjoy. Long-term storage issues aside, creative use of video and interactive optical disk technologies can significantly enhance the quality of preservation education and interpretation. Electronic media make possible public involvement with the educational materials because they allow direct interaction with the media. Programs on optical disks, especially, could encourage viewers to select different paths of information and to individualize their educational experience.

Many people are simply not aware of the threat that vandalism and looting pose for this country's cultural resources. Improved education concerning the benefits of preserving our cultural resources would enhance efforts to protect them.

The Federal Government should take a leading role in educating citizens about the loss of U.S. cultural resources and what they can do to help preserve them. It should also demonstrate strong management policies with respect to the properties it oversees.

Museums are a major source of public education about U.S. cultural resources. Yet they often fail to inform the public adequately on the need to preserve prehistoric and historic cultural resources. They should be encouraged to provide better education concerning the threats to cultural resources in the United States and abroad. This may require modest amounts of additional funding for museums.

Techniques that allow the public to observe safely the course of an excavation or restoration add significantly to its understanding and sympathy for the goals of prehistoric and historic preservation. The process itself then functions as an educational tool.

Historians can provide the broad historical context needed for interpreting the past. Historians, particularly those involved in public history studies and programs, should be involved in the interpretation process from its beginning through production of the end product or performance.

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