# Department of Defense
# Legacy Resource Management Program

PROJECT 00-101

## Report of Proceedings:
## Cultural Resource Management Workshop
**Patuxent River Naval Air Station, Lexington Park, MD**

Department of Defense (DoD) Strategic Environmental Research and Development Program; DoD Legacy Resource Management Program

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DoD EPA DOE SERDP
Strategic Environmental Research and Development Program
Improving Mission Readiness Through Environmental Research

L E G A C Y

## Report of Proceedings

# CULTURAL RESOURCE MANAGEMENT WORKSHOP

**June 13 - 16, 2000**

**Patuxent River Naval Air Station**
**Lexington Park, MD**

**Jointly Sponsored by:**

**Department of Defense**
**Strategic Environmental Research and Development Program (SERDP)**
**And**
**Legacy Resource Management Program (Legacy)**

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*The opinions expressed in this document are those of the authors, and do not necessarily reflect the policies and positions of the Department of Defense.*

## *EXECUTIVE SUMMARY*
## *CULTURAL RESOURCES MANAGEMENT RELATIVE TO DOD'S MISSION*

This document presents the results of the Strategic Environmental Research and Development Program (SERDP) and Legacy Resource Management Program (Legacy)-sponsored "Cultural Resource Management (CRM) Workshop" held June 13 through 16, 2000, at Patuxent River Naval Air Station (NAS), Lexington Park, MD. The Workshop was organized in response to the co-sponsors recognizing the need to more fully consider the state of CRM and how it impacts the mission of the Department of Defense (DoD). Specifically, the purpose of the Workshop was to identify how research and development, processes and tools and other methodologies, can support CRM requirements on military installations. The Workshop was conducted with a clear consideration of the following assumptions:

- Compatibility between CRM and successful military mission execution is possible.
- Efforts to manage cultural resources will be supportive of specific military missions and to overall military mission readiness.
- Advances in the science of CRM would also be in the interest of the scientific community as well as the general public.
- These efforts will improve the management of cultural resources on DoD lands and waters, including requirements for identification, evaluation, nomination, mitigation, curation, consultation, protection, and preservation.

The principle that management of cultural resources is critical to DoD and the general public was embraced by all participants. Additionally, there was overall agreement that a need exists for more research, development, and demonstration technologies. Requirements for CRM on DoD lands and waters present major opportunities for the following reasons:

- DoD lands and waters include a great quantity and diversity of cultural resources.
- DoD-advanced technologies such as geographic information systems (GIS), remote sensing, and environmental and ecosystem modeling have the potential for immediately and significantly improving efficiency and reducing costs of CRM.
- SERDP, in partnership with Legacy, is in a unique position to take the lead among federal agencies in leveraging its particular research and development and management accomplishments to date to improve the overall state of the art of CRM.

## *ACKNOWLEDGMENTS*

This report summarizes the results of a Workshop sponsored jointly by the DoD SERDP Program and the DoD Legacy Program. The Workshop consisted of 60 participants including leaders in the field of CRM representing academia, the branches of service within DoD, other federal agencies, and the private sector. The writers of this report are especially appreciative of the collective efforts of all Workshop attendees. This report would not have been possible without their creative thinking and productive discussions, recommendations, and conclusions addressing some remarkably complex and difficult issues. The Workshop was held at and hosted by the Patuxent River NAS, Lexington Park, MD, whose staff provided excellent services and support which helped make this Workshop a success.

## *INTRODUCTION*

The DoD is the steward of an immense stockpile of cultural resources that embody our national heritage. Since cultural resources can apply to many different things, the Workshop embraced the definition of cultural resources consistent with DoD Instruction 4715.3. The definition includes:

- Buildings, structures, sites, districts, and objects eligible for or included in the National Register of Historic Places, as defined under regulations (36 CFR 60).

- "Cultural items" as defined under the Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC §3001). These include human remains, associated and unassociated funerary objects, sacred objects and cultural patrimony objects.

- American Indian, Eskimo, Aleut, or Native Hawaiian sacred sites for which access is protected under the American Indian Religious Freedom Act (42 USC §1996).

- "Archaeological resources" as defined under the Archaeological Resources Protection Act (16 USC §470 aa-ll). These include any material remains of past human life or activities that are of archaeological interest as determined under ARPA regulations.

- "Archaeological artifact collections and associated records" as defined under the Curation of Federally-Owned and Administered Archaeological Collections (36 CFR 79). Under these guidelines collections include materials remains, such as artifacts, objects, specimens and other physical evidence, that are excavated or removed during a survey, excavation or other study of a prehistoric or historic resource. Associated records include original records (or copies thereof) that document efforts to locate, evaluate, record, study, preserve, or recover a prehistoric or historic resource.

Management of cultural resources on the many and varied military installations in the United States involves compliance with a number of cultural resource management laws and regulations, including, but not limited to, the Archaeological Resources Protection Act (16 USC §470 aa-ll), the National American Graves Protection and Repatriation Act (42 USC §1996) and others.

DoD has two programs that contribute to the research and development efforts to identify and protect these cultural resources - SERDP and Legacy. SERDP was established by an Act of Congress in 1990 and is a DoD corporate environmental research and development (R&D) program, planned and executed in full partnership with the Department of Energy (DOE) and the Environmental Protection Agency (EPA), with participation by numerous other Federal and non-Federal organizations.

SERDP identifies and develops technology to enhance capabilities to meet environmental commitments and to foster the exchange of scientific information and technologies among the participants, other governmental agencies, and the private sector. SERDP leverages and interacts with other environmental programs to identify and solve defense specific needs, extends applications of defense information to others, and builds on existing science and technology to derive more usable

and cost-effective approaches for achieving reductions in environmental risks in areas such as natural and cultural resource management.

In 1990, Congress passed legislation establishing the Legacy Resource Management Program to provide financial assistance to DoD efforts to preserve our natural and cultural heritage. The program assists DoD in protecting and enhancing resources while supporting military readiness. A Legacy project may involve regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, curation of archaeological collections, invasive species control, and/or monitoring and predicting migratory patterns of birds and animals.

Three principles guide the Legacy program: stewardship, leadership, and partnership. Stewardship initiatives assist DoD in safeguarding its irreplaceable resources for future generations. By embracing a leadership role as part of the program, the Department serves as a model for respectful use of natural and cultural resources. Through partnerships, the program strives to access the knowledge and talents of individuals outside of DoD.

Both SERDP and Legacy may address cultural resource management research and development requirements as part of their respective charters. These requirements, however, have not been well defined across DoD. For example, the Park Services Annual Report to Congress on Archeology, which is supposed to account for CRM costs throughout the nation, does not present the information in a format or context that is readily accessible to a DoD analysis. A financial assessment of CRM costs, including those moneys currently going into research and development, would help considerably in defining the "holes" and justifying the need for more CRM research. At present, both Programs are responding to an overwhelming concern from installation level managers regarding the heavy burden in cost and resources required to address cultural resource management issues on their installations. Experience has shown that ample time is required for benefits to be reaped from research and development efforts. This workshop was organized and held as a means to proactively address cultural resource management problem areas confronted by installation and regional managers. The expectation of a workshop of this type is to provide background information and recommend research and development efforts that are needed in a number of areas to address present and future problems.

## *THE WORKSHOP*

A Cultural Resources Management Workshop was organized in response to the need to define how research, development, and demonstration technologies can improve methodologies and processes for the management of DoD's cultural resources while minimizing constraints on the military mission. The goals of the Workshop were:

- To further define DoD's needs pertaining to cultural resources management.
- To define the state-of-the-art in science and technology for CRM.
- To identify potential technologies that can be adapted to reduce cost, effort, and ineffectiveness in meeting cultural resources stewardship requirements. Ideally, identify those technologies that generate environmental solutions from military investments.
- To identify possible avenues of development of frameworks for comprehensive management.
- To identify technology transfer opportunities and single research investments in products designed to be beneficial to the entire DoD CRM community.

The Workshop was held June 13 through 16, 2000 at the Patuxent River NAS, Lexington Park, Maryland.

The Workshop included an introductory session, a plenary session, four breakout groups, field trips, and a concluding session. The introductory session set the focus and expected outcomes for the Workshop and the current status of CRM across DoD. The plenary session allowed the chairpersons of the four breakout groups to "set the stage" concerning matters that would most likely be discussed by their respective teams, and provide a basis to initiate discussions during breakout sessions.

Four focus areas defined the remarkable breadth of issues related to the management of cultural resources (i.e., "Find-It", "Conserve/Preserve-It", "Manage-It", "Apply-It" – "It" refers to cultural resources). Each focus area group was tasked with defining the major knowledge gaps, as well as the research, development and demonstration needs that addressed the interests of their focus area.

- "Find-It" addressed the application of new and emerging technologies, particularly remote sensing, predictive modeling and geophysical prospection to locate and assess cultural resources and impacts to cultural resources including sites, structures, and artifacts. This group also touched upon major problems associated with the role of sampling and curation in CRM.
- "Preserve/Conserve-It" concentrated on those difficult-to-solve management and policy issues related to the conservation and preservation of buildings, artifacts, and documents currently in great jeopardy because of long-term nationwide neglect.

- "Manage-It" dealt primarily with advances in the science of information management and how these new developments can profoundly change the strategies for more efficiently and cost-effectively accomplishing a very wide variety of CRM responsibilities.

- "Apply-It" centered on communication issues relevant to stakeholders such as American Indian tribes, public groups, and regulatory bodies.

This report of the Workshop identifies important R&D gaps that need to be addressed to advance the management of DoD's cultural resources.

## *"FIND-IT" FOCUS AREA*

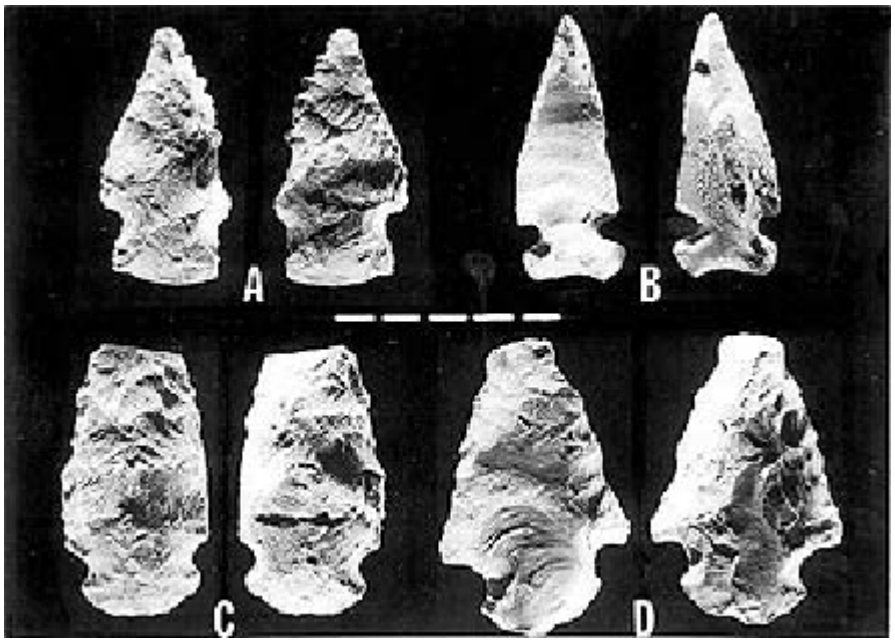
### I. INTRODUCTION

This focus area addressed processes and techniques to locate and identify cultural resources that may be adversely affected, directly or indirectly, by military activities. To locate and identify cultural resources, the geographic distribution of cultural resources and military activities must be specified. A predictive knowledge of the impact of various military activities on cultural sites, structures and artifacts is also required.

The "Find-It" Focus Area was charged with considering research activities that lead to locating and mapping cultural resources. Discussions in the Plenary Session suggested that the fourfold organization of the Workshop itself may have been incomplete: the "Find-It" activities are logically sandwiched between "Define-It" and "Extract-It" activities, virtual groups whose responsibilities must in part be absorbed by "Find-It." This is not altogether unreasonable: Most panelists in "Find-It" had a pretty good idea what "It" was (for example, sites, structures and artifacts) and validation efforts for "Find-It" methodologies naturally spill over into full-blown archaeological excavations. Consequently, discussion in the "Find-It" Breakout Session was focused in five areas or "sub-sessions": (1) Defining the object of search ("Define-It"); (2) Predictive modeling; (3) Remote sensing; (4) Geophysical prospecting; and (5) Archaeological sampling issues ("Extract-It").

### II. PROBLEM AREAS

Of concern to "Preserve-It" panelists was the entire issue of curational and archival activities. Specifically, the vast amount of cultural material collected, all of which requires space and money to store and access, appears to be excessive in terms of its actual use, once collected. "Preserve-It" panelists argue that a natural step to take is to collect less material, with a focus on samples that will actually be used. The "Find-It" group was therefore asked to consider sampling strategies that addressed the overabundance of extracted materials.



Vast amounts of cultural material, such as arrowheads shown here, are collected; all of which requires space and money to store and access.

The archaeological samples actually collected in "Find-It" validation efforts are a minuscule part of the total of archived material. Nevertheless, collection of non-archaeological materials - images, maps, and other data - could pose curational difficulties similar to but on much a smaller scale than the difficulties experienced by the Distributed Activities Archival Center (DAACS), and the Earth Resources Observation System (EROS) Data Center. Therefore, it makes sense to review the history of archival efforts at the Eros Data Center (EDC) to anticipate specific problem areas in archiving this type of material and to search for a model approach. This problem is discussed at length because it was not anticipated in the extended agenda circulated by the Chair of "Find-It" before the meeting.

## III. APPROACH

For each topic, the key issues and problems of each approach for DoD CRM were discussed; for example, what class of problems is predictive modeling good for, or not good for? Attempts were made to characterize the current state of the art of each research area as commonly or routinely practiced in the field, as well as new directions and hot topics – the cutting edge of science as opposed to current state of the art -- for future research. Finally, the group suggested likely solutions and recommended research efforts that are worth supporting now, to address and/or solve the issues and problems identified at the outset. In discussions, it immediately became clear that validation issues were central to all three of the main sub-session topics (modeling, remote sensing, and geophysical prospecting). Rather than introduce yet another sub-session ("Validate-It"), validation issues were treated as they arose; therefore, there is a degree of redundancy or cross-talk among the recommendations for the three sub-sessions.

## IV. DISCUSSIONS AND RECOMMENDATIONS IN THE CORE AREAS OF PREDICTIVE MODELING, REMOTE SENSING, AND GEOPHYSICAL PROSPECTING

The following table outlines the discussions of the group with respect to the three core areas under consideration: predictive modeling, remote sensing, and geophysical prospecting techniques. Discussion was broken into four major topics: (1) key issues and problems; (2) state of the art; (3) hot topics; and (4) solutions/recommendations.

| | Predictive Modeling | Remote Sensing | Geophysical Prospecting |
|---|---|---|---|
| **Key Issues/Needs/ Problems** | • Predicting the nature and extent of current and future military effects on archaeological resources<br>• Estimating location and abundance of buried cultural resources not detectable on the surface<br>• How effective are various model types for prediction?<br>• What kinds of information are needed to improve prediction? How to extend model utility and transferability?<br>• Distinction between management and research models<br>• Concern that predictive modeling could be used inappropriately or overextended<br>• Need to consider predictive modeling as an iterative process | • Need for an approach to remote sensing analysis based on understanding of physical processes<br>• Analysis and identification of anthropogenic phenomena from target signatures<br>• Develop elegant approaches to ground-truthing<br>• What kinds of data are best suited to different purposes?<br>• Appropriateness in different environments (e.g., forested *vs.* desert habitats)<br>• Evaluate tradeoffs between scale and spectral resolution *vs.* cost and identifiability<br>• Cost-effectiveness compared to traditional search methods<br>• Concern about educating decision-makers in what the technology can do and its strengths and limitations<br>• Remote sensing underutilized in archaeological study, and typically only photo-interpretation used; application lags that of other disciplines such as forestry, ecological mapping, and geology | • Interpretation of signals as anthropogenic phenomena<br>• Integration of aerial and ground-based geophysical prospecting methods (but aerial methods are viewed as problematic owing to scaling issues)<br>• Improved visualization tools<br>• Concerns about evolution of technology<br>• Major concerns about adoption of technology by managers and researchers: need to get the technology more into the mainstream, to educate the profession and decision-makers about the utility of these methods<br>• Important uses for interpretation and non-destructive visualization of buried gravesites and other culturally sensitive areas |

| | Predictive Modeling | Remote Sensing | Geophysical Prospecting |
|---|---|---|---|
| **State of the Art** | • Currently in vogue:<br>  • Habitat-based models<br>  • Existing-sample (empiric correlate) models<br>  • Informant-based models<br>  • Geomorphic process models (e.g., CHILD model)<br>  • Agent-based simulation modeling (e.g., SWARM model)<br>• GIS data management environment<br>Other potential model approaches:<br>  • Cellular automata<br>  • Non-linear (fractal) modeling<br>  • Neural network decision modeling<br>All model approaches may be useful for various purposes, but all have significant limitations, associated imprecision, and bias | • Variety of techniques used, including photo-interpretation, thermal imagery, spectral analysis, Digital Elevation Models (DEMs), Land Remote Sensing Satellite (Landsat), etc., but use in archaeology is sporadic<br>• Readily available images are typically retrieved from space-borne platforms, which are often at a coarser resolution than is desirable for many archaeological purposes; high-resolution data useful for archaeology is usually nonexistent and costly to obtain<br>• Remote sensing has moved from photo interpretation to spectral analysis throughout the electromagnetic spectrum | • Variety of existing technologies including Ground Penetrating Radar (GPR), magnetometry, conductivity, resistivity<br>• Used primarily to locate and to image potential buried archaeological features, allowing more informed excavation strategy<br>• Detailed interpretation and identification of anomalies as particular archaeological features is more difficult |

| | Predictive Modeling | Remote Sensing | Geophysical Prospecting |
|---|---|---|---|
| **Hot Topics** | • Explore use of more modeling approaches from geography and other disciplines<br>• Formal error analysis, propagation of uncertainty<br>• Precision of the confidence estimates<br>• Extendibility | • Integration of remote sensing data for predictive modeling<br>• Use of low-flying remotely powered vehicles for higher resolution images, especially over dangerous/-inaccessible terrain<br>• Use of thermal imaging, especially day/night contrasts<br>• New remote sensing technologies, including thermal imaging and sub-pixel spectral mixture modeling of artifact distributions<br>• Data access and security issues | • New technologies: interferometry, seismic tomography, high-resolution infrared thermal imaging<br>• Improved visualization tools<br>• Variety of technologies implemented in tandem<br>• Educational needs<br>• Data access/security issues |
| **Solutions/ Recommended R&D Topics** | • Sensitivity and/or error analysis of predictive modeling<br>• Integration of predictive modeling with other approaches such as remote sensing<br>• Identification and use of appropriate 'test sites' that can be used to compare the success of different predictive modeling approaches and their extendability across a range of environments<br>• Development of decision tool for assessing which model or set of models may be appropriate under certain circumstances | • Integration of remote sensing with other technologies and feeding the results into other approaches such as predictive modeling<br>• Research into well-known sites to test how different remote sensing technologies work under various conditions<br>• Communication of results to decision makers<br>• Continue to explore the use of cutting-edge methods, involving thermal data, radar, and Light Detecting and Ranging Instruments (LIDAR), for CRM applications | • Education/outreach programs<br>• Improvements to data visualization<br>• Demonstration of capabilities/reliability/extendibility of technology to solve important archaeological problems<br>• Evaluate how well anomalies can be distinguished as specific archaeological features with greater detail than an intriguing 'anomaly'; what are the limitations of the interpretation of anomalies<br>• Cost-benefit studies of using geophysical prospecting methods vs. traditional excavation-based prospecting methods<br>• Pre-survey protocols—information needed for effective geophysical interpretation |

## V. SAMPLING OR "EXTRACT-IT" ISSUES

Three linked issues are addressed.

### A. Tools to Reduce Field Sampling

The "Find-It" investigative strategy itself is a way of scoping research activity to the scale of the problem under study, or minimizing sampling activities. Predictive modeling leads to maps that show the likelihood of finding cultural resources. These tend to be more stochastic than deterministic. Modeling may best be viewed, therefore, as a tool to focus more detailed investigations, which may include remote sensing. Remote sensing adds a new kind of information to the model, information about the specific components in the scene. Therefore, remote sensing can tell if appropriate targets are actually present, rather than just if they are likely to be in a certain type of landscape. However, remote sensing is insensitive to scene elements or targets that are not distinctive by shape or composition, or are too small or uncommon to register on the images; therefore, remote sensing does not give a complete picture of the scene, and needs to be augmented by geophysical surveys or other field studies. Specifically, remote sensing techniques show mainly surface phenomena, yet many buried cultural resources that cannot be seen in images are threatened by military activities and must be found. However, remote sensing in conjunction with modeling may limit the area that needs to be studied by expensive and time-consuming field techniques. Similarly, geophysical prospecting can further winnow the areas that are candidates for field studies. In this way, the "Find-It" research strategy is a way of reducing the amount of field sampling necessary to characterize an area's cultural resources, but this does not address the next two items.

### B. Data Archiving Challenges

The "Find-It" activities themselves have the potential to generate vast amounts of data. The data, as discussed above, are not archaeological but nevertheless require curation. The standout problem may be archiving aerial photographs, which can deteriorate over time. Scanning and digital storage are effective techniques for preservation, but digital storage may not be permanent because of changes in mass storage with time. For example, 30 years ago, 7-track, 2400-ft magnetic tapes were the best mass storage medium available. Today, these cannot be read. Archived material must be transferred at great expense from obsolete to modern media, and this process is likely to require repeating until the computer industry stabilizes. Access to archived data is likewise problematical.

### C. Guidelines for Archiving Data

"Find-It" activities lead to collection and storage of archaeological samples in two ways: (1) Validation activities may lead to the collection of artifacts or the discovery of structures; and (2) Discovery of archaeological evidence properly leads to its study, sampling, and curation.

Properly, discovery and excavation are quite different activities and should be treated separately. However, some guidelines seem obvious. As far as remotely sensed images are concerned, it is mainly necessary to archive only in "Level 1" data (NASA's terminology): data in physical units, but not subjected to higher-level algorithms that depend on uncertain estimates of atmospheric or other conditions. It is more economical to recreate higher-level products, especially as computing power increases, than it is to store them. However, it is useful to archive the Level-1 data because, in the

future, questions or techniques may arise which require a reinterpretation of the data. In contrast, it is probably necessary to preserve map products produced from modeling, and the data and interpretations from geophysical surveys.

Generally, relatively few samples acquired in validation activities need to be archived on purely scientific grounds: that is, their role in validation does not necessarily require that they be saved. However, they are likely to have archaeological significance that may require that they be stored for future reference. Therefore, the key factors in archiving samples are:

1. The laws and regulations concerning archiving of cultural samples discovered on federal lands (36 CFR, Part 79, 1990), *Curation of Federally-Owned and Administered Archaeological Collections.*

2. The preferences and habits of the scientific community.

It does seem that it should only be necessary to conserve entire populations of archaeological samples if the number of members is small. If the population is large, perhaps a representative sample (i.e., necessary to characterize the population statistically) would suffice.

In all cases, collections of various sorts of phenomena (artifacts, site maps, other data) serve knowledge needs of various constituencies and customers, including future needs and customers, potentially into the distant future. Data collection, sampling, and curation strategies and practices must take into consideration both current and future requirements of these customers.

## VI. "FIND-IT": CAVEATS

A. Search strategies will not replace field investigations, but should be used to help guide field investigations.

B. "Sites" cannot be predicted in models or identified in images without cultural information. All search strategies should begin with a thorough review of existing data. DoD currently holds a great amount of artifacts and documents. It is important to take full advance of these data and resources.

C. Models are probabilistic; remote sensing and geophysical surveys can't "see" everything of interest.

D. Success requires education and support of decision-makers and resource managers, and adequate training of practitioners. Use of any modeling technique should have a clear and easily understandable purpose that can be effectively explained to the decision makers. Additionally, consultation and education in concert with modeling techniques should be employed to help ascertain areas of emphasis within an installation.

## *"CONSERVE/PRESERVE- IT" FOCUS AREA*

### I. BACKGROUND

One of the nation's most important and seemingly intractable problems, in the effort to protect our national heritage, is the processing and curation of archaeological collections. Collections recovered from federal land are the property of the American public, whose tax dollars funded the recovery projects. In an earlier era, federal agencies gave little attention to how collections would be maintained once the salvage programs were completed. Most collections were stored gratis by universities and museums. However, inadequate funding and failing facilities now seriously impair the ability of these institutions to adequately care for these collections. These collections of documents and artifact material have been recovered and generated over the last century and are becoming increasingly vulnerable from neglect. The Federal government is legally required to manage and curate their cultural resource collections by standards outlined in 36 CFR Part 79, Curation of Federally-Owned and Administered Archaeological Collections. These collections constitute the raw data generated from archaeological projects and, as such, represent a non-renewable resource. They are the only record of our national heritage for the prehistoric and early historic areas. Within the last decade, an effort has been funded to identify these collections as well as their location, and their condition. With this information in hand, the "Preserve-It" focus group was tasked with formulating the issues surrounding the next phase of care for these collections.

### II. BENEFITS

The paybacks that will accrue are substantial and will be mutually beneficial to the installations, general public, educational institutions, federal agencies, and Native American groups. Most importantly, by bringing federal collections into compliance they will become accessible for education, exhibits, and research. Ultimately, cost savings for the continual care of properly processed and stored collections will be realized. Collections will be consolidated and organized to a level where the up-front costs will be outdistanced by the savings of minimal care needed once collections have been stabilized.

### III. FINAL RECOMMENDATIONS

The "Preserve-It" Team focused on two types of archaeological collections, those that presently exist and collections that will be generated in the future.

Currently, there are systemic problems with the care, management, and use of existing archaeological collections (artifacts and associated records) in the United States. Although significant strides have been made in compiling basic inventories, there are still an enormous number of issues that need to be addressed at the policy, practice, and standards levels. In addition, collecting and curating practices must be considered, which will significantly affect future curation needs.

The "Preserve-It" team identified three strategic areas that significantly benefit national preservation efforts: policy issues, physical preservation, and access/public education. By way of priority classification, those recommendations that require immediate attention are identified as "Urgent" and those issues which are extremely important as "Significant", but can be remedied at a later date. Again, the following recommendations apply to existing and future collections.

A. Policy Issues

Retention of all associated records is mandated by 36 CFR Part 79. This includes digital, photographic, and paper records, which document all aspects of a project. Without the associated records that provide contextual information, the research and educational value of the collection is severely compromised. Research is needed to determine the best practices for the retention of these indispensable records for the future. [*Urgent*]

A huge volume of under-documented, deteriorated and hazardous collections currently exists. The deaccessioning regulation proposed in 36 CFR Part 79 has not been finalized; therefore, there is no legal federal mandate for deaccessioning archaeological collections. Research is required to define meaningful policies for reconsidering the curation of certain existing collections/artifacts. [*Urgent*]

The issue of collecting and retaining artifacts arises during the standard phases of archaeological investigation: survey, field testing, excavation/mitigation, and laboratory analysis. Research is needed to establish ethical, scientifically based and culturally sensitive collecting practices, (e.g., sampling strategies, non-collection policy). [*Urgent*]

36 CFR Part 79 mandates certain responsibilities for the care and long-term management of federally associated archaeological collections. Absence of clear title to a number of these collections prevents federal agencies from fulfilling their obligations under the law. Research is required to help establish title and long-term responsibilities between federal agencies and non-federal agencies currently holding these collections. [*Significant*]

B. Physical Preservation

Currently, there are no national standards for repository accreditation to meet 36 CFR Part 79. Installations have no guidance for evaluation of repositories. Research is needed to define and establish repository standards at a national level. [*Urgent*]

Certain classes of archaeological and architectural artifacts are bulky and take up a large percentage of collection storage space, e.g., rust, debitage, broken glass, construction materials for historic structures and buildings, etc. Research is needed to determine the present and potential future scientific, cultural, and educational value of these types of artifacts. [*Urgent*]

The Team reemphasizes that "cultural resources" includes buildings, structures, and landscapes. Segregation of disciplines, e.g., historic archaeologists, historic architects, public works, engineers, etc., is a problem resulting in fragmentary, differential application of preservation policy. Research needs to be done to investigate the cost differential between maintaining, preserving, and adaptive reuse of historic buildings versus demolition and new construction. Additional research should also be conducted to identify best scientific practices and techniques for preservation, e.g., mortar, adobe, paints, windows, etc. [*Urgent*]

Soil samples make up a large percentage of collections. These samples take up valuable curation space, and often are presented for curation unprocessed in varying types of packaging. Research is required to determine the long-term viability of soil samples and development of the best packaging methods. [*Urgent*]

Certain health risks that may be associated with curated collections have not been adequately assessed. Research is required to determine if communicable diseases, such as *Hanta* virus and *Coccidioidomycosis*, can be acquired by handling collections under normal conditions. An additional concern is the presence on artifacts of toxic chemical residues used historically in museums, such as arsenic and pesticides. Research is required to determine the extent and severity of health risks and to explore the safest way to protect personnel. [*Significant*]

The analysis of archaeological collections is often a subjective endeavor. Research is required to determine if quantitative, qualitative, or investigational technologies used in other disciplines would be useful in the analysis of artifacts. [*Significant*]

Standards for collection packaging vary widely throughout the United States. Research is required to identify and test cost-effective, archival-quality packaging products that ensure the long-term and cost-effective preservation of archaeological artifacts. A specific research area may be anoxic microenvironments, currently an important technology in food preservation. [*Significant*]

As a matter of practice, museums have imposed strict environmental standards to the preservation of archaeological collections. These practices may be inappropriate and cost-prohibitive for archaeological collections. Research is required to determine the appropriate environmental standards for the entire range of archaeological artifact classes. [*Significant*]

Since the inception of the Antiquities Act of 1906, there has been a serious national problem with looting and vandalism of archaeological sites. R&D are needed to determine the best practices for providing security and monitoring access to the wide range of archaeological sites that exist nationally. This not only includes archaeological sites destroyed by vandalism, but also those destroyed by neglect of the collections already out of the ground.[*Significant*]

C. Public Access/Education

The DoD has an obligation to serve multiple customers. These customers include commands, installation personnel, taxpayers, local and regional community, culturally affiliated groups, educational institutions, and the nation at large. Archaeological collections and related documents offer an opportunity to teach critical thinking skills, science, mathematics and cultural sharing. Methods for profitably and efficiently interpreting these cultural resources for the full range of customers should be pursued through R&D of Web access, electronic information, digitization, printed material, educational and interpretive programs, etc. [*Urgent*]

Research is required to determine the public's desire to access information about archaeological sites and collections. This research could be carried out with reference to the Society for American Archaeology Harris Report on public attitude about archaeology and the National Park Service's Messaging Project. [*Urgent*]

Presently, among archaeologists and curators, there is no systematic national inventory of which archaeological periods are represented in existing collections, e.g., Early Woodland, Middle Woodland, Late Woodland, etc. Research is required to determine which cultural periods might be over/under-represented in the collections and to develop a strategy to outline future collecting practices. [*Urgent*]

Non-standard nomenclature/typology and incompatible collection databases, which currently exist throughout the nation, prohibit exchange of information for research, education, and interpretation. In addition, individual artifacts are often impossible to locate within a collection. Research is required to establish a minimal set of standardized database fields, nomenclature, and aids for the identification of artifacts and their ownership. [*Significant*]

## *"MANAGE-IT" FOCUS AREA*

### I. GENERAL PROCESS ISSUES

The issues identified here and the tasks recommended are those R&D activities that the "Manage-It" workshop team believed were central to the overall process of CRM activities at military installations. The Workshop view of this process is that it encompasses the full range of activities that are applied to cultural resources within the operational context of an installation. The central goal of these recommendations is to present a process that should be seen as: (1) predictable; (2) consistent; (3) efficient with respect to time and resources; and (4) objective. Within this larger goal, it was the team viewpoint that the arenas of information systems, generally, and data recording and data management, specifically, provided a venue where R&D investments would provide substantial and rapid results.

### II. KEY APPLICATION AREAS IDENTIFIED

Three key application areas were identified: a) Data integration; b) Dynamic operational modeling; and c) Regularization of the assessment processes. Data integration is the term used here to characterize the various tasks needed to develop data recording/management systems that allow lateral/vertical integration for management and decision support. Dynamic operational modeling is the term used to define integration of "traditional" predictive modeling, with ongoing information systems (both cultural resources and others) and property condition data to create dynamic decision support systems providing constant input to operational decision making. Regularization of assessment refers to the development of a formal process and evaluation structure that would allow consistent assessments to be applied to different historic properties. Similar structures have been developed for resources such as wetlands (e.g., the "New Hampshire wetland ranking system") and the group believes that effective R&D can lead to a similar system for cultural resources, though the effort will be challenging.

### III. DATA INTEGRATION

The aims of CRM in the DoD environment are, most directly put, the proper treatment of cultural resources with favorable long-term cost/benefit ratios. That means that the assets are properly respected, evaluated, examined, recorded, and so on, as appropriate for each; at the same time, it means that the processes required intrude as little as possible into the mission of the DoD. The key to proper treatment at minimal costs is information. The more information available to all involved, including the command structure, all those responsible for CRM, the public sector outside the DoD, and the general public, the less likely it is that unexpected costs or undesirable results will be encountered.

If we are to bring information to bear on the issue, there are several important requirements. First, access to and recording of information must be easy, quick, and reliable. Confidence in the accuracy and currency of the information must be high. Second, access to information must be appropriate, in terms of data complexity and completeness, for the persons seeking information. Third, information from various installations should be available to other installations and others in the chain of command so that all may benefit from what has been learned throughout the system.

Fourth, users must be able to integrate CRM information with other appropriate information, e.g., environmental assets, facilities management, and training.

Effective use of such systems will require new operating procedures in many cases. Information must be adequately advertised and made available so that the value it provides is fully realized. Information should not be seen as or treated as proprietary, and personnel must be persuaded that free access to information is valued up and down the chain of command. Personnel must be evaluated for their ability to perform with the aid of this information, not by trying to ignore it. People should be empowered by the information, not intimidated by it, meaning that using the information properly must be expected and rewarded and should lead to success, not frustration.

Decisions on what format to choose or what process to advocate should include input from as many cultural resource partners as possible. DoD should strive to examine agencies to assist them in creating not only a user-friendly system, but also one that limits the amount of reinventing and that can easily be transmitted into other existing databases.

A. Data Integration Tasks

Some specific steps should be taken to create a robust, useful, broad CRM information system.

(1) First, there should be two parallel information-gathering processes.

(a) The first track would be intended to gather comprehensive information about data requirements for management of cultural resources throughout the DoD. Information requirements within DoD installations as well as outside would be involved. Information would be needed from State Historic Preservation Officers (SHPOs), the National Park Service National Register (NPSNR), the Historic American Building Survey (HABS), and the Historic American Engineering Record (HAER), as well as contractors working closely with DoD and universities. Information requirements from these external sources are needed to ensure that any DoD program is interoperable and to ensure that all DoD efforts are focused on effective information systems development. The final result would be a complete inventory of the information requirements regarding CRM in the DoD. A common list of data items would be collected for each data set and a standardized nomenclature and definition of terms would be developed. Assessment, and where appropriate, integration of existing standards that would be applicable, e.g. TriServices Computer Assisted Drafting (CAD), the Federal Geographic Data Committee (FGDC) metadata etc., should be included as part of this task.

(b) The second track would gather information about the various computer and manual (paper) databases in use in the DoD and in the collateral programs. Here the goals would be to identify best-of-breed systems and processes that could be adopted for DoD efforts and define technical requirements for interoperability. Here it should be noted that these databases are seen to include "traditional" site files, artifact inventories, site surveys, structures/buildings, photographic and other collateral data, and geospatial

data systems. A key aspect of this track would be to determine data interoperability requirements so that DoD systems would be entirely compatible with systems from the SHPOs and others. Developing enterprise-to-enterprise (E2E) standards based on extended markup language (XML) would be part of this effort. In addition, the value, cost, and importance of digital versions of any data sets that are not now currently in digital form should be considered.

(2) The result of both these efforts will be a comprehensive inventory of both data requirements and operational systems, with information about the range of items included, management possibilities, and the like. The inventory should also identify any data sets that are at risk due to storage problems. These two inventories would provide information about cultural resources and about effective data management in this arena. With that information in hand, two continuing tracks should be pursued.

(a) First, a simple database analogous to a library card file should be produced to provide information easily accessible throughout the DoD on the sources of CRM information available, where they may be found, how they may be accessed, and so on. The reports and this index should be placed on the World Wide Web, with both public and DoD-restricted aspects. This system could be seen as a cultural resource information system portal that provides readily accessible content for installation users as well as those outside DoD (e.g., SHPOs) who are required to inter-operate with installations.

(b) Second, a comprehensive report should be prepared that assesses the best of the data management applications found in the survey. Within this context, the report would define what the best current operating practices are, what significant improvements are needed, and so on. This report would provide a detailed road map for installation information systems development.

Some key factors that should be considered in this study would be the creation of a seamless structure that would integrate all phases of installation CRM within the larger context of installation operations. It should also be structured to be interoperable with external units that interact with the installation, with the various levels of command (permitting easy data roll up) and with the goals of enhanced public interpretation including seamless linkages to curation systems.

## IV. DYNAMIC OPERATIONAL MODELING

Over the last 20 years, many DoD installations funded the implementation of what were then referred to as "predictive models" for historic properties. There were many stated purposes for these models but the most common was to determine where historic properties were unlikely to occur and reduce the need for further identification efforts in these areas. This approach came under considerable question and predictive modeling has not been used extensively in recent years at DoD installations. Modern systems, however, are now available that build upon the foundation of these earlier models but are more comprehensive and, most importantly, are dynamic. Results of previous modeling efforts were static and reflected neither the changing situations on the installation nor the dynamic

nature of the prehistoric and historic properties and our changing knowledge about them. In the approach envisioned here, a structure very much like earlier predictive models would be dynamically coupled with a comprehensive installation operational and regional historic properties database that would provide the installation manager with a current "status" system for the installation lands and resources. Consider the following example, where extensive construction at an installation, if it led to the loss of a number of properties, could dynamically alter the value of other properties, even though the physical characteristics of the properties did not change. Alternatively, changes in the condition of resources outside the installation could lead to changes in the value of on-installation properties. With such a system in place it would be possible to envision a process where historic properties within the installation's boundaries as well as those outside are simultaneously considered as a single population.

The outputs of the proposed modeling system would be a constantly updated status map. The map provides information on the potential "information value" of resources predicted to lie in unexamined locations as well as a similar status for all known properties. This value could be expressed in projected costs for preservation, rehabilitation, and/or mitigation or other similar indices rather than just the presence/absence of a property. If, for example, properties of similar characteristics are destroyed, then the information value of existing properties would increase. Conversely, if steps were taken to preserve a particular property, then others of similar characters would, potentially, be reduced in their preservation priority. In viewing the range of properties in the region it would be necessary to define the geographic extent and determine the range of property types. This task could be facilitated by integration of cultural/historical/ethnographic analyses into ongoing ecosystem studies such as research needed for "biological" region definition as well as ongoing research required for compliance with the Native American Graves Protection and Repatriation Act. The range of properties defined should NOT be based on static "traditional" site typologies (e.g. village, hunting camp, etc.) but should attempt to consider the range of behavioral processes/activities and the ways in which they are distributed in both time and across the landscape.

The overall perspective in a dynamic operational model is to view all the properties (known and predicted) within the installation as part of a larger "population," which includes the full range of past activities that are manifest. The goal in this approach is to preserve the resources and/or information about this full range. This is in marked contrast to the traditional, conventional approach, which tends to use static individual, idiosyncratic property-by-property assessments. Not only does this new approach mean that a fuller record of the past will be known/preserved, but it has the important collateral benefit of providing the installation manager with a much more flexible management environment with a greater number of possible options to choose from.

## A. Operating Outside the Fence

The key element in developing a dynamic operations model is recognizing that assessments of historic properties frequently cannot be conducted "within the fence." Like ecological processes, historic properties must be considered within the context of the populations of which they are a part. In almost all cases, this would be a geographic area larger than any single installation. Consideration of properties in this larger context can have substantial positive implications for DoD management. In the current management approach, properties are normally only evaluated based on comparisons to properties on a base. As time passes and as properties outside an installation's boundaries are destroyed (e.g., through regional development), the properties on the installation will increase in

value and will present additional constraints to installation operation. If the properties on the installation are considered in a larger geographic context, it would be quite straightforward for installation managers to enter into conservation easements or other similar agreements with farmers or other landholders in the area. This in turn could potentially lead to the preservation of non-installation properties. The permanent preservation of these non-installation properties would reduce the pressure on similar installation properties. Evaluation and analysis of historic assets within this extra-installation, regional context would also have the significant advantage of placing the installation in a positive relationship within the larger community. Working with and considering its resources in a larger context would build important and useful linkages outside the installation. Finally, the outside-the-fence assessment would provide the installation with considerably more flexibility within the fence.

B. Dynamic Operational Modeling Tasks

The "Manage-It" work group anticipates that the following three tasks will be encompassed in this arena:

1. Assess previous predictive modeling work.

2. Review implementations of comparable systems that might be adopted.

3. Identify and synthesize approaches/systems/methodologies that would allow fielding of systems.

C. Assessment of Previous Predictive Models

For more than 20 years, DoD has funded research into predictive models of site location. Although a variety of such models exist, none has been adequately tested. As such, no model has met the promise of increasing resource management capabilities or decreasing costs associated with legal compliance. The proposed task would involve evaluation of predictive models from installations across DoD with the firm objective of determining which ones work and how to ensure that they met their management promise.

Predictive models of archaeological site locations have a long history in DoD CRM. Beginning in the late 1970s, many installations developed models to provide managers with a tool for assessing probable impacts of DoD undertakings on archaeological sites. Generally, these models were based on probabilistic surveys of relatively small sampling fractions (between 5 and 10 percent of an installation). Multivariate statistical techniques, such as logistic regression, multivariate regression, and discriminant function analysis, were then used to predict the probability of site occurrence from a series of independent, environmental features. Commonly, predictive models were either not tested or tested with subsets of the data that created them. Their accuracy, therefore, has always been suspect, and DoD managers and SHPO have been reluctant to use them in lieu of on-the-ground, complete surveys. Consequently, all installations with predictive models have sponsored many archaeological surveys to comply with Section 106 of the National Historic Preservation Act. To our knowledge, these data have never been used to test or refine the models. This task would do just that, with the objective of answering the following three specific questions:

1. Do the models work?

2. Can they be refined to work better?

3. Can they be proven to be of sufficient accuracy that land managers and SHPOs can use them to manage installation resources?

It is proposed that a set of installations (three to five) be chosen to represent a diversity of environments and cultures, and an array of differing types of predictive models. For each installation, the study should assemble the areas surveyed and the locations of archaeological sites recorded (broken down by site type). Next, statistical tests should be performed to assess whether the models accurately predicted where sites would and would not be located. Patterned errors should be sought (e.g., are locations for certain site types predicted better than others). Improving measurements to environmental variables included in the models and adding new environmental variables that have emerged as strong predictors in subsequent surveys can then refine each of the models. Finally, because most of these models were developed prior to the advent of GIS, the study should determine the best means of incorporating these models into the installation planning process, and most particularly, integrating the model into the installation GIS.

It must be stressed that the outputs of assessing past predictive models and future alternatives will be findings of major importance to the national and global archaeological and historic communities. Studies in each of these areas would be the first reasonably substantive attempt made on the issues. In addition to the value to the DoD conservation program, the findings should be communicated to the larger communities in a timely and accessible manner.

D. Assess Alternative Implementations and Develop an Implementation Plan

Under this task, the R&D effort would focus on review and assessment of possible alternatives that could serve as a structure for implementation of an installation dynamic operational model and identify the key aspects that are required by such an approach. The most successful approach may follow from that used in the Integrated Training Area Management (ITAM) System. Key questions to be addressed are:

1. How will the limits of the regional scope be defined?

2. How will technical methodologies be developed?

3. How will interoperability of installation and collateral systems (e.g., SHPO systems) be assured?

## V. REGULARIZING "ASSESSMENT"

The development of rigorous "structure" for cultural resource assessment is a key aspect in improving management practices at installations. There is the perception that survey areas or mitigation/preservation properties may be selected idiosyncratically and that the determination of levels of effort may be driven more by external resource levels than by any absolute value in the impacted property. The "Manage-It" work group believes that it is possible to develop formal

decision support systems that would make historic property assessments explicit, reproducible, non-capricious, and not personality-based.

Implementation of such an approach would require the application of methodologies such as critical path or multiple objective methodologies and a detailed evaluation of current approaches. This should be conducted in partnership with stakeholders such as SHPOs, consultants, and other interested parties. While the specifics would need to be determined as part of the R&D effort, we would suggest that key elements could be modeled similar to approaches used in wetlands assessment.

A. Inventory Assessment

In many instances a particular area of an installation has been inventoried ("surveyed") for archaeological resources repeatedly, with the statement made "previous surveys were inadequate or not sufficiently intensive." The "Manage-It" work group believes that survey adequacy/intensity can be assessed in a structured and rigorous manner and that such method can be applied on a national scale, if the indices are properly designed and applied. Assessing survey adequacy will require developing indices that are context-dependent. Different indices would apply, for example, if large dense occupations were expected compared to situations associated with limited activity occupations. Inventory intensity should be defined in more absolute terms; for example, "overall likelihood, with confidence intervals, that culture-bearing surfaces or deposits of specified types and densities were missed."

Assessments should have initial emphasis on the representatives of each relevant type of survey coverage across tracts of distinct cultural relevance, distinct historic context, distinct detect ability, and distinct disturbance. The overall survey assessment approach should be as follows:

1. Formulated independently for each type of cultural resource with distinct survey methodologies. The most obvious surveys with distinct methodologies are those for archaeological sites as opposed to historical buildings.

2. Considered separately for each distinct spatial and temporal subdivision of the state's past (historical context).

3. Consistent with accepted generalizations about history and prehistory.

4. Easily, if not automatically, updated in light of constantly improving knowledge.

5. Objective and statistically defensible wherever appropriate.

B. Survey Assessment Structure

The structure of the assessment should take three principal inputs:

1. Existing general and regional GIS databases of the region relating to past survey projects, especially location, resource type/time period focus (if any), and intensity.

2. Other georegistered data reflecting relevant environmental variability.

3. Other relevant spatial models, including for example, likelihood of future development.

Relevant variables for archaeological sites might include horticultural suitability/ecological zonation in plants and animals reflected in soils, and detect ability of sites reflected in interpreted ground cover. For historical settlements, examples might include soils, proximity to marine and freshwater staples, proximity to navigable water, historical settlements, historical roads, and later, railroads.

C. Individual Property Assessment

Another area that requires R&D attention is formulating an assessment methodology for individual properties. In this approach various aspects of the historic property would be defined and assessed using multiple index values. Such aspects or values might include a variety of characteristics about the property such as the presence of various artifact types or features, architectural components, and age. Other important considerations should include the relationship of the property to various existing research questions or contexts and a measure of the degree to which the site may address these questions. Additional indices could be developed for the site's uniqueness or similarity to others and the physical condition of similar properties. If, for example, all other similar sites are destroyed, then this index value would logically be very high. When all index values are computed, then a combined or weighted score could be produced.

This approach applies to a population of properties. A more holistic assessment approach is consistent with the "big picture" concept of operating "outside the fence." Consideration of a population of sites using such a formal methodology would define clear priorities and would link the status of properties outside the installation to those inside. The indices and assessment would be dynamic. As knowledge about the region changed or as property conditions changed as a function of ongoing preservation efforts or destructive processes, then the index values on all other sites could potentially change.

## *"APPLY-IT" FOCUS AREA*

### I. GENERAL PROCESS ISSUES

The "Apply-It" group was composed of people primarily from the Army and the Army Corps of Engineers Civil Works. Army representatives were from policy offices and installations. One person represented private industry and one, the Department of Energy. Almost every person had experience with communication and consultation with Native American's interests and their specific issues with DoD.

The first order of business for this group was to define "IT." Several definitions were given by synonyms such as: requirement, research, survey, dig, artifact, storage, return, reporting, and products.

Early on, the group, focusing on "Applying" CRM, realized that they would not be making recommendations of a scientific/technology nature. Their discussions kept coming back to process not products. They could identify no new product that could be hatched in a lab. "Apply-It" for the group kept coming back to the process of communication.

As a means to focus the group's exploration of communication issues, a tool kit was used that was developed for DoD's American Indian / Alaska Native Policy Training Initiative. Two groups were formed to review two scenarios that involved natural and cultural resource dilemmas with Indian tribes. The scenarios were the perfect icebreakers to get the group to discuss communication challenges as they address cultural resource challenges.

> *Case #1 – Briefing for New Commander*
> In this situation, four Indian tribes had traditional ceremonial and religious sites within the boundary of an installation. The installation had hundreds of artifacts stored, many of which belonged to these tribes. One tribe knew of their existence and wanted them returned. The others suspected the artifacts existed, but no concrete information to craft a plan. Two tribes requested a meeting. Another threatened to sue.

These generated the kind of information that CRM would need when preparing their leadership for sensitive cultural issues.

> *Case #2 – Briefing on a Consultation Plan*
> An Alaskan installation purchased an island that had been used for World War II bombing practice with continued use until 1989. A minimal amount of surface cleanup was completed in 1990. The installation agreed to an arrangement with the US Fish and Wildlife Service to restrict use of part of the island, reserving it as a wildlife refuge. Down stream, an Indian tribe wanted to open a fish hatchery but was concerned that the water was polluted from previous military activities. The tribe reminded the military that they have a trust responsibility to ensure that its activities did not contaminate or degrade water quality as a result of its activities.

Both situations reflect "a day in the life" of cultural resources managers. They are plausible. They provided the context in which the group considered the questions "What science do we have? Where are the gaps? What are the priorities?

## II. THE PARTICIPANTS IN THE "APPLYING IT" PROCESS

The longer the groups analyzed the circumstances, the more convinced they were that they could not "create" an R&D agenda. What was seen was that the solutions were tied up with "process", with communication. The discussions focused on "Who do we communicate with?"; "Who was empowered to communicate?"; "When was it appropriate to communicate?"; and "What did people need to know to communicate effectively?"

Step one became "Who cares about this problem?" These stakeholders were identified by categories of their relationship to the issues. One group was considered to be "interested" in the outcomes, but not necessarily empowered to do anything about it. For example, NGOs, like the Sierra Club or Greenpeace or the National Congress of American Indians, might be interested in a cleaned up site but have little to do with the process of bringing that about.

A second group, identified as "concurring" parties are people (agencies, offices) who were a part of the situation, either willingly or unwillingly. These include individuals or teams that play a direct role as to whether a site or other CRM entity is properly identified, preserved and protected, and/or otherwise available to "interested parties." These may include public works officials and workers, and personnel from public affairs, finance, and security. For example, security people might have to allow access to some part of the site but aren't aware that the Indians had the legal right to enter. They're a part of the problem / solution, whether or not they have been trained to allow such entry.

A third group, identified as "consulting" parties are people who must be consulted with as required by laws and regulations. For example, these may include American Indian tribes, federal, state, and/or agencies, general counsels, and SHPOs.

The last groups, identified as "approving" parties are people who must sign off on the solution. These may be as diverse as Congress, regulatory authorities such as U.S. EPA and the State environmental protection agencies or departments of natural resources, the general public through the process of public hearings or written comment periods to legal notices, or as specific as the installation commander. The judicial system may also be involved to provide guidance, that is interpreting the governing statutes and regulations, and settle disputes.

These could be defined as being "interested parties" to the CRM process but may also include other groups or individuals who may play a role in the process. The team identified people from the community at large, tribes that may or may not have a direct interest in a particular site or process, business and other commercial groups impacted by the decisions, Congressional delegates, other alliances that have an interest in local, State and even foreign governments.

Any communication should not overlook those persons within the agency that are critical points of contact, especially those persons at the command level. Adequate communication at this level will allow commanders to be well informed about what their cultural resource obligations are and how their cultural resource mangers are using their time to meet these obligations. Other important

persons to be considered include branch heads, office of counsel, contracting, operations, project managers, and contractors. The key is to ensure that the cultural resource need is met and that the archaeologist or cultural resource manager is not working in a vacuum but is instead part of an integrated team speaking with one voice to any other consulting parties.

The challenge is how to identify these diverse parties and then where, when, and how to involve them in the definition of the problem and the crafting of the solutions.

In answer to the questions posed at the beginning of this conference, the scenarios and the group's description of the dilemmas faced by cultural resource managers reflect "where we are" in our areas. They don't reflect science. They do reflect process issues, particularly communication.

## III. GAPS IN THE PROCESS

Three gaps related to process issues were identified: a) the need for communication, b) the need for training, and c) translation of technical information.

A. Recognition of the need for communication

While seemingly obvious, the group felt that it needed to be explicitly stated. The group noted that "You can't 'find' it, 'conserve' it or 'manage' it without 'talking.'" All the stakeholders identified above need to be appropriately involved in each step of the process for a successful resolution. Communication is at the root of each of these steps. It is the thread that weaves throughout each of the processes.

"FIND-IT:" The elements of the process for the cultural resources managers include: (1) defining requirements as to why these artifacts or sites need to be identified and possibly extracted; (2) research into the possible location; (3) surveying the site(s); and (4) digging and possibly extracting the cultural resource entities that are of interest or concern.

To define requirements, you have to be able to see the whole process. The discussion of the requirement has to include the discussion of the end product:

Who's going to use it?
How are they going to use it?
Why do it?

These questions are best answered by the stakeholders.

"PRESERVE-IT:" Upon extracting or exposing the artifacts and sites, the CRM manager is faced with the need to preserve the artifacts and store them properly. On occasion the artifact is returned to the site for display or even burial. Reports must be generated about the site(s) and artifacts or other findings. None of these can or should be done in isolation. The managers at the various levels of command or authority need to communication with "owners" (possibly ancestors are Indians and want remains returned) or users (museums who will display and manage).

"MANAGE-IT:" The items that are found and removed, and even those that are left at the site(s), must be managed in a manner that will allow proper tracking of the items. This includes cataloguing

and possibly sharing various items with the broader public. This step requires communication with ultimate users to determine what happens beyond "collecting."

The group believed that the "state of the art" for stakeholder involvement, whether inside or outside DoD, lags behind the expectations of the American taxpayers. Not only does DoD have difficulty communicating with external stakeholders, it has difficulty with internal communications as well.

B. The need for training on how to communicate

Communication training is not traditional training. This training has to teach DoD personnel not just how to communicate clearly, but how to listen, how to dialogue, how to build consensus, how to mediate competing interests, how to share technical information, how to bring the stakeholders into the decision-making process, and how to recognize cultural differences that have different standards for communication.

C. Technology Translation

Often one of the most difficult processes is the translation of technical information for use by those "outside of the discipline." The public and other stakeholders demand involvement and require information for effective involvement. The scientific concepts behind many solutions are not readily understood by the lay public. Without this kind of basic information, it is possible for good solutions to be rejected. It is the responsibility of CRM manager and others in the cultural resources community to provide the general information/education that helps groups be effective. Two points were made by the team to underscore this technology translation need:

- There are no standards for measuring how successfully we communicate (consult) internally (within the installation).

- There are no standards for measuring how successfully we communicate (consult) externally with regulators, tribes, and the public.

If we want to get performance improvements, we have to measure outcomes and behaviors.

## IV. RECOMMENDATIONS

Several recommendations were derived by this focus area team.

A. Redefine roles/mission/goals of cultural resource managers to meet communication needs.
- What should be the job of the cultural resource managers?
- How should they be trained to do the job?
- How should they be evaluated?

B. Establish standards for accountability
- Determine cost benefit analysis in building in stakeholder /tribal involvement early and throughout the process, rather than pulling in stakeholders for briefings and one-way communication;

- Improve quality of data and reporting; and
- Include in in-progress reports how your work with stakeholders is progressing.

C. Revise the DoD instruction on CRM to:
- Integrate plans for stakeholder involvement into CRM plans;
- Integrate stakeholder considerations into existing technology (software); and
- Build education and outreach into project budgets.

## V. PARADIGM SHIFT TO A "GRAVE-TO-CRADLE" APPROACH

Move to a life cycle communication with life cycle costing. This would provide budget savings, increased effectiveness, optimal decision-making, and compatibility with DoD systems development. Without the effective communication and interaction with the parties that are impacted by the cultural resources issues, the mission of training military personnel on the military installations where cultural resource sites will be greatly curtailed.

# APPENDIX A

## *COMMENTS AND CRITIQUE ON CRM*

To attempt to summarize what has already been summarized in each focus area would not only seem presumptuous and redundant, but also involves the risk of losing much of the meaning of the original concepts. It will be more useful to retain the original contexts and explanatory frameworks and avoid trying to extract bullet-like summary statements that do not do justice to the subtlety and complexity of the thoughts of their respective authors. Having had the opportunity to "float" in and out of the discussions and assemble the separate focus area summaries, we would prefer to offer some closing observations on issues that cross-cut the focus areas. In addition, we offer comments and additional recommendations about the perceived gaps and omissions that were inevitable because of the broad and ambitious agenda of the Workshop. CRM is a very complex subject, and it is easy for some important issues to fall through the cracks despite everyone's best efforts.

### I. CROSS-CUTTING ISSUES

Speaking metaphorically, CRM is a huge beast that is best consumed one digestible bite at a time. Any R&D to improve any complex activity, be it new product research or improved business practices in the private sector or a multifaceted CRM mission in the DoD, is going to be expensive. Some very difficult decisions must be made about research needs and reasonable priorities for solving priority problems a bite at a time. Identifying some cross-cutting issues may be helpful in defining some sense of priority or urgency or, at the very least, establishing some consensus in thinking.

Perhaps the most obvious general conclusion in all focus areas is the perceived legitimate need for an R&D effort. No one in the Workshop argued that there are no requirements for R&D support for CRM in the DoD. Sources of innovation are clearly needed to improve the state of the art. The seeds of innovation are unlikely to come from CRM contractors or traditional academia.

#### A. Sources of Innovation

Contract projects are designed by agency personnel with little or no research experience who have little incentive to design or to do research. Nor is there any institutional expectation that they perform research in these organizations. The objectives of CRM contract projects are to generate products to meet legal requirements for specific compliance events. Research with broad applications is rarely successfully incorporated in CRM contract projects. Contractors are not expected or paid to produce research results with value that transcends the specific legal requirements of the particular compliance event. The notion still exists that the federal government does not do research, that research is something done in academia.

Yet academic archaeologists and historians march to an entirely different drummer. They are not particularly committed to, or especially well qualified to be, agents of change in applied or basic research for CRM, because CRM has specific unique needs and problems that are uninteresting and unimportant to academic archaeologists. In fact, CRM is a discipline that is still largely regarded as second-rate and particularistic compared to real archaeology and anthropology, which deal with

important nomothetic issues and universal anthropological processes. The lock-step procedures of the compliance agencies have also not been particularly conducive to planting the seeds of needed innovation to reduce costs and improve efficiency. Of all the potential agents of change, the SERDP and Legacy programs are best situated to provide the needed leadership in promoting R&D in support of CRM.

B. Cross-Cutting Sampling Problems

When assembling this report, one area stuck out prominently as a research issue recognized in three of the four focus areas. The innovative use of remote sensing, near- ground geophysical prospecting, and predictive modeling necessitates a formal consideration of sampling strategies. To meet legal requirements, how much do we really need to survey? Where can predictive modeling complement or minimize the need for labor-intensive ground surveys? How can these promising technologies reduce the need for intensive testing and conventional, expensive, controversial, and destructive excavation? The utility of a predictive model, geophysical investigation, or geomorphological classification is going to be directly related to the statistical validity of the sampling design.

Questions of sample adequacy are no less critical issues in the archiving of artifacts, associated CRM records, and digital remote sensing products or GIS analytical output. A crucial concern expressed repeatedly in the Workshop was just how much do we really need to excavate, curate, conserve, and preserve? The concern with representative samples is not at all unrelated to the demanding requirements to evaluate for purposes of National Register eligibility the huge backlog of sites that have been recorded in the last quarter of a century. The development of dynamic operational or evaluation models could lead to a profound change in current CRM practice. Fresh thoughts on how to manage statistically representative samples could incorporate regional concepts from geography or ecosystemic approaches from ecology. More responsible, objective, and cost-effective alternatives should be considered for defining rarity and redundancy and grappling with the difficult problems of avoiding under-representation and over-representation.

C. CRM: An Iterative and Open Process

In discussing the importance of consultation, public education and outreach, predictive models, inventory, site management, and evaluation modeling or curation or GIS data base development needs, the point was repeatedly made about the iterative nature of these efforts. There is, unfortunately, a historic precedent for CRM to be seen as a series of discreet compliance events. The dissatisfaction with the history and failure of predictive modeling is a classic example of a compliance event orientation where the failure to test and upgrade the model has led to its abuse, rapid obsolescence, and rejection. All four focus areas seem to be in clear agreement that quantitative and qualitative or investigative technologies used in other disciplines need to be closely examined before being applied to CRM. The Workshop emphasis on integration of approaches stressed that no techniques stand alone; combined approaches optimize cost-effectiveness and search success. An obvious example is the use of complementary perspectives including oral history informants, historic and archaeological information, aerial photography, and geophysical instruments to inventory historic burial sites.

D. Standardization and Interoperability

All focus groups touched upon the failures to translate the importance of various CRM activities to the public in general and specific interest groups. The importance of preserving sites, artifacts, and information about our heritage is of great interest to the American public. Yet one of the principal stumbling blocks in communicating these ideas to the public is the inability of professionals to effectively translate their thoughts into terms that can be readily understood by laymen. CRM practitioners may be able to benefit from advances in communication theory that will aid them in translating their discoveries in to discourse for public consumption. The implication of this consensus is that research to improve CRM must include a realistic technology transfer consideration to assure that research results are effectively disseminated to the public, broadly defined, in readily understandable language, and not just passed back and forth between professionals.

Equally serious stumbling blocks exist to professional communication within CRM. Each region and each sub-discipline seems to have its own unique and inimitable nomenclature and specialized terminology that defy all attempts at standardization and more effective information sharing (interoperability of information systems). It was suggested by more than one focus group that CRM could benefit from advances in biological science where biologists, for example, have simply been forced to adopt standard classifications for the phenomena that they deal with. Very large and significant efficiencies and cost savings could be achieved in CRM simply by standardizing terminology.

Related to information sharing was a concern expressed in two focus areas about access and security problems. Interpretations and data can be misused in the wrong hands. Some reasonable controls on data accessibility and appropriate use need not detract from the obvious benefits of shared corporate data investments.

## II. GAPS AND OMISSIONS

The four focus areas of the Workshop represented an honest attempt to cover the whole broad range of CRM activities. Unfortunately the organization of the participants had the undesired effect of building boxes around each of the four focus areas. To the credit of every focus group, a valiant attempt was made to break out of these boxes and alter their approaches to cover obvious omissions and necessary overlap in recognition of the constraints imposed by the Workshop organization. Nevertheless, with some groups spread too thick and some spread too thin, it should not be too surprising that major gaps and omissions would occur. In retrospect, it is probably impossible to divide the whole spectrum of CRM tasks among only three, four or five small groups of people and achieve fair and exhaustive coverage of the subject: the topics are just too broad and the experts too specialized.

Several of the most important tasks performed in CRM are not included in the focus area reports. These tasks are at the very heart of CRM, they are where much time and money are spent, and they would obviously benefit from investments in serious research. A lot of money could be saved by investigating how to become more efficient in these tasks, some of which appear to be more important than many of the topics covered in the focus area reports.

## A. Methods and Techniques for Archaeological Excavation

The profession of North American archaeology is still essentially dependent upon 19th century technology. Excavators are still basically using shovels, trowels, line levels, and hand-written field notes. Even though the "Find-It" group touched upon important geophysical applications, the issue of excavation efficiency and unnecessary costs was still given short shrift. A whole suite of noninvasive, geophysical technologies has been demonstrated to be highly complementary to traditional excavation, yet it is not being used as resourcefully as it could be.

Even more immediate savings could be realized by reducing the time and effort it takes for other labor-intensive traditional archaeological tasks such as copious note taking, accurate point plotting of artifacts, feature drawings, level sheet descriptions, line level measurements, all of which are slow and not necessarily very accurate. Technologies for doing these traditional tasks more rapidly and efficiently have been demonstrated, but as with geophysics, they are not necessarily being fully employed. Total station electronic distance measuring (EDM), laser ranging instruments, digital and infrared cameras, automated field notebooks, etc., are just a few of the obvious but still under-utilized technologies. The significant question is "What else is out there to make expensive archaeological excavation more cost-effective and efficient?" It is not just a matter of more resourcefully using new gadgets. There is a certain amount of applied research and convincing demonstration involved that tailors the use of the technology specifically to archaeological excavation.

## B. Sampling in Excavation

Despite the cross-cutting discussions about the importance of sampling, the role of sampling specific to excavation was not discussed. In retrospect it would have been nice to have a field archaeologist or archaeologists specifically interested and well-qualified in quantitative sampling methods participating in the Workshop to help address this expensive issue. There are cases where archaeologists excavate far too much during Phase II investigations and a scientific basis is needed for eliminating this problem. A much more common problem is to dig too little. Perhaps this is a function of the low-bid phenomenon in contract archaeology. When too little is excavated to make a reasonable assessment, many archaeologists tend to err on the side of caution and say that ambiguous sites are eligible. This practice causes enormous problems and expense for the DoD by creating huge inventories of putatively eligible sites that inhibit our use and management of installation lands. We also do unnecessary and very expensive data recovery. There is wild variation in how archaeologists do data recovery excavation. These are issues that would benefit immensely from hard, dispassionate, scientific examination.

## C. Improved Survey Methods

Improvements in survey techniques to find sites in different regions, geomorphic contexts, and cultural settings have great potential for significant savings, mainly because of the amount of money that is spent by DoD on surveys and inventories. Research focusing on specific regions and cultures is needed. For example there is a need to develop some reasonable guidance on what shovel test interval is appropriate for finding small sites in a region like the southeastern coastal plain. In the arid southwest where DoD has huge landholdings, research that demonstrates strong

geomorphological and archaeological patterning may have broad regional application with management utility that transcends any one military installation.

D. Laboratory Analysis of Archaeological Artifacts

Laboratory work associated with CRM projects is very expensive and is a place where innovations could result in great cost reduction. Many of the tasks are repetitive and could be made much more efficient with a judicious use and understanding of new and improved technologies for mass analysis and especially responsible sampling.

E. Site Preservation and Protection Research

The option to protect and preserve cultural resources in place instead of mitigation through expensive and destructive excavation is usually stated as the preferred alternative. However, preservation in place is not an answer, it is an open question. Is there a demonstrable research basis for thinking that a particular protection strategy will work? One typical protection strategy involves burial. Under what specific conditions do we have a reasonable assurance that a particular burial plan will in fact protect and not result in further damage and impact? These are research issues for which some data are available but not nearly enough to even consider as a quick fix. Basic research to better understand some important biological processes of destruction of common building material, such as fungal and microbial corrosion of concrete, brick, and wood, is another needed investment to deal more effectively with these ubiquitous and super-expensive problems.

F. Historic Buildings and Underwater Resources

It is regrettable that there were no underwater archaeologists or historic building specialists in attendance at the Workshop. The identification, recordation, conservation, and preservation of historic buildings and underwater resources are problems for which a consideration of needed research would have been appropriate. These are very specialized sub-disciplines within CRM that deserve no less attention than other expensive responsibilities. Advancements in the methods and techniques of recording and evaluating vast numbers of buildings are bound to potentially save money. Streamlining HABS/HAER recording procedures alone could be a significant savings. New techniques to improve efficiency in underwater archaeology are needed. For example, use of the sand bypassing system developed for specialized small-scale dredging applications has potential as an improved underwater excavation method.

G. mtDNA Identification and CRM

A highly specialized kind of problem exists in CRM that happens to currently be very controversial and expensive. Ancient human remains must be returned to Native Americans who may opt to make a formal claim under provisions of the NAGPRA (1990). The older the remains, the more problematic will be the task of making agency decisions about their cultural affiliation. There is a need to evaluate the potential of using mtDNA as biological evidence to consider when faced with tough decisions about cultural affiliation that can lead to unnecessary administrative burdens and expensive litigation.

## III. CLOSING RECOMMENDATIONS

The CRM mission in DoD is complex and expensive. Separation of policy and R&D issues is critical. It might be very helpful if the CRM mission could be analyzed by reference to the elements spelled out in Integrated Cultural Resources Management Plans. These required documents comprehensively list exactly what is required to comply with the law. Reference to these plans may assist in the separation of policy issues driving requirements that each Installation and activity must expect to fund through the normal budgetary process from those R&D issues where prudent investments by direct allotted research programs result in benefits applicable to many or all installations.

Another extremely useful exercise would be to identify exactly where funds are being spent in the DoD on CRM. To better identify policy and R&D requirements, it would be valuable to know what is being funded and what is not. Much of this kind of information is probably already available to some extent. An outline or summary of Legacy resource management projects and a review of the National Park Service Annual reports on Federal Archaeology are existing sources of information that would be very helpful in better understanding R&D needs.

None of the Services maintains an accounting of the costs associated with cultural resources compliance. Determining the costs of compliance is a nearly intractable problem. Consider, for example, that the cost of replacing a window in a historic building. The maintenance people will probably have to use a special kind of frame or glazing to help maintain the historic character of the building. Perhaps a specially built wooden frame will be required instead of whatever can be bought cheaply at the local hardware store. However, the cost of that frame is not wholly attributable to historic preservation compliance. Only the difference between the historic window frame and commercial-off-the-shelf frame that would have been otherwise used is a historic preservation cost. To accurately consider the true cost of historic preservation, that difference in cost must be considered in light of the true use life of the repair. If one installs a slate roof that costs twice as much as a common roof, but lasts three times as long, considered over the true use life of the building, the slate roof is cheaper. When one considers that the Services may not keep maintenance accounting records on a building-by-building basis, the magnitude of the accounting problem should become apparent. Yet, how can one make a rational assessment of how to save money without first knowing how the money is spent? Thus, this is a vital problem, but one whose solution is not trivial.

It is recommended that the SERDP scientific advisory board consider recruiting an archaeologist with the appropriate professional credentials in an advisory capacity to provide professional archaeological input to their proceedings.

In the interim, it is recommended that SERDP and Legacy management teams consider the creation of a formal CRM advisory committee. Such a committee might be composed of leading archaeologists and cultural resource managers representing all branches of service in the DoD. Again the objective would be to provide these programs with professional experience and advice.

This recommendation is consistent with DoD Directive 5105.4 of Sept. 89 Ref: Public Law 92-463 Federal Advisory Committee Act of 6 Oct 72 Title 5, USC Annotated Appendix 2, which establishes the policy, procedures, and responsibilities of Federal Advisory Committees.

# APPENDIX B

Removed for Security

# APPENDIX C

Department of Defense
Strategic Environmental Research and Development Program (SERDP)
and the LEGACY Program

## CULTURAL RESOURCES MANAGEMENT WORKSHOP

JUNE 13 –16, 2000

AGENDA

Purpose Statement: to identify how research and development can support, along with other associated methodologies, processes and tools, cultural resource management requirements on military installations.

### Pre-Workshop Tour - Tuesday, June 13, 2000

**1315-1700** Private Tour of Historic St. Mary's City with Dr. Henry Miller

This tour will begin at the Visitor Center auditorium with an overview given by Dr. Miller on the ongoing archaeological and environmental research at St. Mary's City, the 17th-century capital. Various artifacts including the lead coffins discovered through archaeological investigations at the site will be presented. The historic St. John's site, the remains of a 1638 house, will be explored. The field trip will conclude with a presentation from Dr. Robert Paul, Chair of St. Mary's College Biology Department, who will address his ongoing study of the St. Mary's River basin.

**Dinner Break** See registration packet for options.

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### Workshop Tuesday PM, June 13, 2000

**1700 - 2100** Registration begins at the Hampton Inn, Lexington Park, MD

**1830-1930** Plenary Session

DoD's Conservation Perspective:
Mr. Bruce C. deGrazia, the Assistant Deputy Under Secretary of Defense, Environmental Quality
SERDP and Legacy Program Perspectives:
Mr. Brad Smith, Executive Director of SERDP
Mr. L. Peter Boice, Director of Legacy Program

**1930-2000** The Research Community's Perspective - Dr. Frederick L. Briuer, U.S. Army Engineer Research and Development Center

**2000-2030** The Installation's Perspective - Dr. Doug Lister, Natural Resources Branch, NAS Patuxent River

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## Workshop Day Two - Wednesday, June 14, 2000

Naval Air Station (NAS) Patuxent River, MD; Employee Developmental Center, Building 2189

**0800-0815** Message from NAS's Commanding Officer - Captain Paul Roberts

**0815-0830** A Roadmap of the Day's Activities and Expected Outcomes - Dr. Frederick L. Briuer, U.S. Army Engineer Research and Development Center

**0830-0915** Overview of Find It Focus Area – Dr. Alan Gillespie, Desert Research Institute

**0915-1000** Overview of Conserve It Focus Area - Dr. Michael Trimble, U.S. Army Corps of Engineers, St Louis District

**1000-1030** Break

**1030-1115** Overview of Manage It Focus Area - Dr. Fred Limp, University of Arkansas, Center for Advanced Spatial Technologies

**1115-1200** Overview of Apply It Focus Area – Mr. Len Richeson, Office of the Under Secretary of Defense (Environmental Security), Mrs. Bonnie Paquin, Native American Technologies, Inc.

**1200-1330** Lunch - Provided on Base at the O'Club. **($7.00 for the buffet. Collected at Registration.)** Buses will be provided to take participants to and from lunch.

**1330-1700** Focus Area Breakout Sessions - Room assignments will be posted.

Find It: Dr. Alan Gillespie, Chair, Desert Research Institute
Case studies and presentations on modeling, remote sensing, and geophysical methods

Conserve It: Dr. Michael Trimble, Chair, US Army Corps of Engineers,
St. Louis District
Presentations and discussions on topics such as: Strategy for Curation, Operational Tactics for Curation, Tenets of Curation and Conservation, and Developing Issues Affecting Curation

Manage It: Dr. Fred Limp, Chair, University of Arkansas,
Center for Advanced Spatial Technologies
Addressing the institutional and technological challenges associated with documentation and data management.

Apply It: Mr. Len Richeson, Chair, Department of Defense
Office of the Under Secretary of Defense (Environmental Security)
Exploring communication issues relevant to stakeholders such as: Native American Tribes, public groups, and regulatory bodies.

**Dinner Break** See registration packet for options.

**1930-2130** Behind-the-scenes tour of Jefferson Patterson Park and Museum, 10115 Mackall Road, St. Leonard, Maryland (directions will be provided; approximately 25 miles from the base) - Hosted by Julie King, Chief, Maryland Archaeological Conservation Laboratory.
Small tour groups will be served Wine, Sodas, and Desserts.

Tour Maryland's brand new state-of-the-art archaeological collection management facility. This 38,000 sq. foot, state-funded facility curates more than 4.5 million artifacts from Maryland's archaeological collection including 10% from Federal military installations.

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## Workshop Day Three - Thursday, June 15, 2000

**0830-1200** Breakout Sessions Continued – Room assignments will be posted.

**1230-1530** Box lunch and Driving Tour of Base **($2.50 for lunch. Collected at Registration)**

Observe NAS's award-winning cultural resource endeavors addressing the management and protection of archaeological and architectural properties. Enjoy Patuxent River's abundant wildlife and their most valuable resource, the Chesapeake Bay.

**1530-1700** Optional Breakout Sessions – for focus area groups that need additional time.

**1815-2130** Field Trip to American Indian Cultural Center - Piscataway Indian Museum
**Meet at 1815 at the Hampton Inn Lobby to form car pools.**
16816 Country Lane, Waldorf, MD, approximately 42 miles from the base, **($3.00 admission charge)**

Refreshments (beverages and Indian tacos) will be provided.

Meet in the auditorium at 1930 for refreshments and a presentation on the Piscataway and the life of Maryland's indigenous people given by Natalie Proctor, member of the Piscataway tribe. Two exhibits will be set up in the auditorium, "Birds Flew Off," a pictorial history of the Piscataway, and another exhibit on indigenous peoples of Maryland done in honor of the Tricentennial of Prince Georges County, Maryland. This will be followed by self-guided tours of the exhibit hall and a full-scale reconstructed longhouse. Members of the Piscataway tribe will be on hand to answer your questions.

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## Workshop Day Four - Friday, June 16, 2000

NAS Patuxent River, MD; Employee Developmental Center, Building 2189

**Continental breakfast available at meeting location.**

**0800-1000** Breakout Sessions report back to entire Group

**1000-1100** Concluding Remarks

# APPENDIX D

## LIST OF ACRONYMS

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|---|---|
| CAD | Computer Assisted Drafting |
| CRM | Cultural Resource Management |
| CSRM | Cultural Site Research and Management |
| DAACS | Distributed Activities Archival Center |
| DEM | Digital Elevation Model |
| DoD | Department of Defense |
| DOE | Department of Energy |
| E2E | Enterprise-to-Enterprise |
| EDC | Eros Data Center |
| EDM | Electronic Distance Measuring |
| EROS | Earth Resources Observation System |
| FGDC | Federal Geographic Data Committee |
| GIS | Geographic Information System |
| GPR | Ground Penetrating Radar |
| HABS | Historic American Building Survey |
| HAER | Historic American Engineering Record |
| ITAM | Integrated Training Area Management |
| Landsat | Land Remote Sensing Satellite |
| Legacy | Legacy Resource Management Program |
| LIDAR | Light Detecting and Ranging Instruments |
| NAGPRA | Native American Graves Protection and Repatriation Act |
| NAS | Naval Air Station |
| NPSNR | National Park Service National Register |
| R&D | Research and Development |
| SERDP | Strategic Environmental Research and Development Program |
| SHPO | State Historic Preservation Officer |
| XML | Extended Markup Language |