

Integrating Archaeological Models: Management and Compliance on Military Installations

Legacy Resource Management Program, Project 06-167

David W. Cushman and Lynne Sebastian

Prepared with funding from the Legacy Program
for Air Force Air Materiel Command,
Martyn D. Tagg, Principal Investigator



Submitted to:

Paul R. Green, Ph.D.

Headquarters Air Combat Command

129 Andrews Street, Suite 102

Langley AFB, VA 23665-2769

and

D. Stephen Dibble

Ecosystem Planning Section

U.S. Army Corps of Engineers

Los Angeles District

915 Wilshire Boulevard

Los Angeles, CA 90017



Statistical Research Technical Report 08-64
SRI Foundation Preservation Research Series 7
November 2008



CONTENTS

Executive Summary.....	4
Acknowledgments.....	6

Chapter 1: INTRODUCTION

1.0. Background.....	7
1.1. Purpose of Project.....	8
1.2. Scope of Project.....	9
1.2.1. Expanding the Use of Locational Predictive Models.....	9
1.2.2. Development of a Pilot Archaeological Significance Model.....	10

Chapter 2: USING PREDICTIVE MODELS FOR PLANNING AND COMPLIANCE

2.0. Background: Locational Predictive Models and DoD Cultural Resources Management.....	11
2.1. Legal Mandates.....	12
2.1.1. National Historic Preservation Act: Sections 106 and 110.....	12
2.1.2. The National Environmental Policy Act.....	13
2.1.3. Executive Order 13007.....	13
2.1.4. Military Regulations.....	13
2.2. Using Locational Models to Meet Planning Needs and Compliance Requirements.....	14
2.2.1. Planning.....	14
2.2.2. NEPA Compliance.....	16
2.2.3. Compliance with Section 106 of NHPA.....	17
2.2.4. Other Applications.....	21
2.3. Study Methods.....	22
2.4. The Installations.....	23
2.4.1. Eglin Air Force Base.....	23
2.4.2. Fort Drum.....	25
2.5. Using the Models for CRM Compliance: Interviews with Installation CRM Staff.....	26
2.5.1. Eglin Air Force Base.....	27
2.5.2. Fort Drum.....	28
2.6. Planning for Preservation: Conceptual Outlines for Installation Programmatic Agreements.....	30
2.6.1. Eglin Air Force Base.....	31
2.6.2. Fort Drum.....	32
2.7. Conclusions.....	34

Chapter 3: MODELING SITE SIGNIFICANCE

3.0. Background: The Problem of Unevaluated Sites.....	35
3.1. Managing for “Significance” versus “Eligibility”.....	35
3.2. Evaluating Archaeological Sites: Eligibility and Historic Context versus Morphology and Site Setting.....	36
3.3. Archaeological Sites and Traditional Cultural Values.....	37
3.4. Developing a Significance Model.....	38
3.5. Using Significance Categories in Management Decisions.....	40
3.6. The Conceptual Draft Significance Model.....	41

3.7. Conclusions	42
Chapter 4: STUDY CONCLUSIONS	43
ACRONYMS	45
REFERENCES CITED	46
APPENDIXES	
A: Installation CRM Staff Interview Questionnaire.....	52
B: Conceptual Outline of a Programmatic Agreement for Eglin AFB	54
C: Conceptual Outline of a Programmatic Agreement for Fort Drum.....	66
D: Conceptual Draft Significance Model for Utah Test and Training Range	75

EXECUTIVE SUMMARY

Background, Objective, and Goals

In 2004, Statistical Research Inc. (SRI) and SRI Foundation received funding from the Legacy Resource Management Program (#03-167) to bring together Department of Defense (DoD) installation archaeologists and cultural resource managers, predictive modeling experts, private-sector cultural resource consultants, and representatives of state and tribal historic preservation programs for a workshop on more effective use of predictive modeling on military installations. The workshop participants produced a broad set of suggestions about ways that archaeological predictive modeling could be improved as a tool for cultural resource management on military installations and be more effectively integrated into installation management, stewardship, and compliance practices.

In 2006, SRI and SRI Foundation received funding from the Legacy Program (#06-167) for a pilot project to begin addressing the first two general recommendations of the workshop participants:

- DoD installations are under-utilizing their locational predictive models; these models could be used much more broadly and effectively for cultural resource management and compliance than they are at present
- DoD needs to shift its modeling effort away from the current exclusive focus on site location and begin examining issues of site significance

Results

In this pilot project we have worked with Eglin Air Force Base (AFB) in Florida and Fort Drum in New York to identify additional applications of their existing locational predictive models for planning and historic preservation compliance, assisted them in beginning a dialog with their stakeholders/consulting parties about these applications, and developed concept drafts for programmatic agreements (PAs) to implement these applications. Once executed, the PAs will be used by the installations to improve and streamline their historic preservation compliance activities, and lower the risk of mission delays due to cultural resource issues.

We have also worked with information from the Utah Test and Training Range (UTTR), administered by Hill AFB, to evaluate the feasibility of developing “significance models.” As proposed here, a significance model is a set of algorithms or rules for sorting archaeological sites within a database into provisional management categories based on their potential to yield particular types of information, their traditional cultural values, and other important characteristics as defined by an installation. The proposed significance models will serve as a tool that shifts archaeological predictive modeling efforts away from the current exclusive focus on site location, and eliminate case-by-case evaluations of site significance. The models provide a more programmatic approach to evaluating site significance and establish a more effective framework for installation resource management decision-making.

Follow Up

In 2007, United States Air Force (USAF) Air Combat Command, with URS Corporation, SRI, and SRI Foundation as partners, was awarded funding under the DoD's Environmental Security Technology Certification Program (ESTCP project number SI-200720) to upgrade the performance of the locational predictive models in use at Eglin AFB and Fort Drum, as well as two other installations—UTTR and Saylor Creek Range (administered by Mountain Home AFB in Idaho). As part of this project, SRI Foundation will assist Eglin AFB and Fort Drum in negotiating and finalizing the PAs developed during the pilot study reported here. The two additional installations will be assisted through a process similar to the one described in this report—identification of additional applications for their models, negotiation with stakeholders/consulting parties, and drafting of PAs. Further exploration of the “significance model” concept was not included in the initial scope of work for this ESTCP project.

ACKNOWLEDGMENTS

The DoD Legacy Resource Management Program provides a mechanism to develop creative and innovative approaches to the study and management of cultural and natural resources. This particular project was especially challenging, as it focused on developing programmatic approaches to cultural resource management, approaches that would be acceptable to both installation managers and their public stakeholders. We want to thank Hillori Schenker, Cultural Resources Management Specialist, Legacy Resources Management Program, for her oversight of this project, and her patience with the delays encountered during this project's execution. We also want to acknowledge Maureen Sullivan, Director, Environmental Management, Office of the Deputy Secretary of Defense for Installations and Environment, and Brian Lione, Deputy Federal Preservation Officer, for supporting this project at the DoD level. We also acknowledge Martyn Tagg who, at the time this project was initiated, was at Headquarters Air Force Materiel Command and served as the cultural resource manager for this effort. After he left the Air Force Materiel Command, responsibility for this project moved to Dr. Paul Green of Headquarters, Air Force Combat Command. Contractual support for this Legacy project was provided by D. Stephen Dibble, U.S. Army Corps of Engineers, Los Angeles District.

In addition, we would like to thank the following individuals: Dr. Laurie Rush, Cultural Resources Manager, Fort Drum, New York and Mark Stanley, Base Archaeologist, Eglin Air Force Base. Dr. Rush and Mr. Stanley were generous with their time and their knowledge about their respective cultural resources management programs. Both helped us understand the challenges and benefits of building and using archaeological predictive modeling that improve and enhance cultural resource management compliance within military installations.

Chapter 1: INTRODUCTION

1.0. Background

In 2001, Statistical Research, Inc. (SRI) and the SRI Foundation received funding from the Department of Defense (DoD) Legacy Resource Management Program (#01-167) to evaluate the use of archaeological predictive models by military installations. The project team surveyed 23 installations representing all branches of the service to determine whether the installations had developed such models and, if so, how they were being used for management and for compliance with Federal environmental and historic preservation laws. Thirteen installations agreed to participate in the study, and each model was examined to ascertain its age, structure, database size, and so forth.

The project team then selected four of the installations—Fort Drum, New York; Fort Stewart, Georgia; Eglin Air Force Base, Florida; and, Fort Bliss, Texas—for a more in-depth evaluation. The models were reviewed for technical quality, accuracy, and general utility. Specific recommendations were offered for improving the quality and usefulness of the models. Additionally, the project team designed a follow-up program that would contribute directly to more effective use of archaeological predictive modeling by DoD installations. The findings of this study were released in 2004 (Altschul et al. 2004).

In 2004, SRI and SRI Foundation received a second year of funding from the Legacy Resource Management Program (#03-167) to implement the follow-up program proposed in the initial study. In November of 2004, the project team brought together installation archaeologists and cultural resource managers, predictive modeling experts, private-sector cultural resource consultants, and representatives of state and tribal historic preservation programs for a workshop on more effective use of predictive modeling on military installations. The workshop participants produced a broad set of suggestions about ways that archaeological predictive modeling could be improved as a tool for cultural resource management on military installations and be more effectively integrated into installation management, stewardship, and environmental compliance practices.

The workshop resulted in general guidance on model development, improvement, and integration into installation operations and recommendations for creation and dissemination of specific additional guidance on best practices in model development and use. These results and recommendations were published by the SRI Foundation (Altschul et al. 2005) and are also available on the Foundation's website at <http://www.srifoundation.org/library.html>.

The three general recommendations of the 2004 workshop were:

- Installations are under-utilizing their locational predictive models; these models could be used much more broadly and effectively for management and compliance than they are at present
- DoD needs to shift its modeling effort away from the current exclusive focus on site location and begin examining issues of site significance
- There is a need for a centralized source of information for installations seeking to develop or improve existing archaeological models and to use them more effectively

1.1. Purpose of Project

The current Legacy Program-funded study (#06-167) is a pilot project to begin addressing the first two general recommendations outlined above: (1) broadening the use of locational predictive models for compliance with Federal laws, and (2) expanding archaeological modeling to include the significance of sites as well as their location.

As with all federal agencies, the DoD is required to comply with the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act (NHPA) when planning for actions that may adversely impact the human environment, including places that are listed in or eligible for listing in the National Register of Historic Places (NRHP). Additionally, under Section 110 of the NHPA, federal agencies have an affirmative responsibility to be good stewards of historic and prehistoric properties under their control.

Every year, DoD installations invest a significant amount of time and funding to comply with these mandates. Federal agencies across the board are under increasing pressure to reduce budgets, while at the same time, the demand on the DoD for military training and development has increased. With the convergence of these two forces, the issue of how to manage cultural resources, including archaeological sites and other kinds of historic properties, in such a way as to better facilitate mission objectives has become paramount. Archaeological predictive modeling is a tested means of providing objective data that can be used for compliance with the NHPA and the NEPA.

More than 80 percent of military installations have predictive models. Although most of those installations use information from their models to plan for military training exercises and infrastructure development, as well as to track and manage archaeological sites, few installations have integrated these models into the NHPA- and NEPA-compliance process. The first component of the present study, therefore, was designed to explore ways in which DoD installations can use predictive modeling to reduce the time and expense associated with compliance while enhancing overall cultural resources management (CRM) planning and stewardship capabilities.

The second component of the current study is an initial attempt to expand archaeological modeling to include the concept of site significance as well as location. Over the past several decades, military installations have identified tens of thousands of archaeological sites as part of general or project-specific planning. Many of these sites were simply avoided during construction or other activities and their eligibility to the NRHP was never determined. The presence of a large number of unevaluated sites has now begun to impose constraints on the military mission at some installations. This is especially true for installations where there have been changes in military training strategies and where Base Realignment and Closure (BRAC) actions and consolidation of missions will require evaluation and mitigation of effects to large numbers of archaeological sites. Case-by-case archaeological testing of many thousands of sites in order to determine their eligibility to the NRHP would be very expensive and very time-consuming. The 2004 workshop participants recommended that a method be developed for addressing the significance of archaeological sites on a programmatic, rather than a case-by-case basis to develop what is, in essence, a significance model.

1.2. Scope of Project

The objective of this project was to begin addressing the need for expanded integration of archaeological modeling into CRM activities on military installations. We have accomplished this objective by carrying out pilot projects at three installations. In two cases, we assisted the installations in planning for expanded use of their locational predictive models for both planning and compliance; in the third case, we developed a conceptual draft of a model for assigning unevaluated archaeological sites to site-significance categories that could potentially be used in management and compliance decisions.

1.2.1. Expanding the Use of Locational Predictive Models

We addressed this objective by selecting two military installations for pilot projects that would (1) identify opportunities to integrate existing locational models more fully into installation planning and compliance, and (2) secure support from reviewing agencies and stakeholders for these expanded applications of the models. The selection criteria for the pilot project installations included:

- Representation of multiple services and a variety of mission types (ground training, material management, intelligence gathering, and so forth)
- Representation of varied environmental settings
- Existing models that predict archaeological site densities with a relatively high level of accuracy
- Varying proportions of an installation that had previously been inventoried for archaeological resources

Based on these criteria, we selected Eglin Air Force Base (AFB) in Florida and U.S. Army Fort Drum in New York for the pilot studies. Once the two installations were selected, SRI Foundation staff worked with each installation to identify:

- Aspects of resource management and NHPA and NEPA compliance in which the installation's locational model(s) are currently being used effectively
- Additional areas in which their locational model(s), in their current state, could be integrated into management and compliance activities
- Needed planning or management tools for expanding the use of the model(s)
- Adaptations or refinements of the installation's current model(s) that could make them more effective for management and open new compliance uses; special emphasis was placed on the potential for adapting or upgrading current locational models to be useful for evaluating significance of archaeological sites and designing avoidance and mitigation measures

Once it was determined how each installation could effectively expand the use of locational archaeological models, SRI Foundation staff worked with installation personnel, review agencies, and stakeholders to develop approaches and procedures that would increase agency and stakeholder support for current and expanded use of the models.

1.2.2. Development of a Pilot Archaeological Significance Model

In order to address the need for a programmatic rather than case-by-case approach to evaluating the significance of archaeological sites, we selected an installation at which to develop a simplified example of a “significance model.” By significance model, we mean development of a set of rules or algorithms that would classify archaeological sites into management categories based on a projection of their potential to yield information about human behavior in the past and other, nonarchaeological values. The criteria for selecting the pilot installation were:

- Location in the western United States where arid conditions create good-to-excellent surface visibility
- Substantial amounts of well-reported archaeological excavation and archaeological synthesis in the region. These factors would provide information on the relationship between surface manifestations and likely subsurface data yield and enable us to identify basic archaeological research themes and the archaeological data needed to address those themes.

Based on these criteria, we selected the Utah Test and Training Range (UTTR), administered by Hill AFB, for the pilot modeling effort. SRI Foundation staff reviewed the archaeological literature of the eastern Great Basin to identify current research issues, excavation projects in the general vicinity of the study area, and environmental parameters that might condition site significance. A set of example significance categories was then proposed, basic rules for classifying unevaluated sites were developed, and suggestions were prepared as to how site significance could and could not be used in management and compliance.

Chapter 2: USING LOCATIONAL PREDICTIVE MODELS FOR PLANNING AND COMPLIANCE

2.0. Background: Locational Predictive Models and DOD Cultural Resources Management

Locational models are based on the premise that locations of human activities are non-random. People make decisions about where to carry out various activities based on both cultural and environmental factors. Because many environmental factors are relatively stable over time (e.g., slope, aspect, soils) and because many activities of past human societies were closely constrained by environmental factors, we can model the likely locations of archaeological sites—the physical remains of past human activities—based on locations of particular features or constellations of features of the modern environment.

There are two kinds of archaeological site locational models: correlation models and theory-based models. A correlation model examines the relationship between locations of known archaeological sites and various environmental variables. The model then examines the distribution of particular values of those environmental variables across the entire landscape being modeled. Based on positive and negative correlations between particular values and known site locations, the model classifies all locations within the landscape in terms of their probability of containing an archaeological site. The end result is a sensitivity map that attempts to correctly classify the largest number of “site positive” locations within the smallest possible proportion of the total landscape.

A theory-based locational model, on the other hand, begins with ethnographic information and archaeological inferences about how past human societies interacted with their environment. Hypotheses are then developed about what the relationship should exist between locations of past human activities and features of the current environment, which serve as proxies for the environment that existed in the past. These hypotheses are tested against the actual locations of known sites and the distribution of modern environmental features. Based on the results, the theoretical assumptions and the hypotheses are re-examined and refined, and the model may be run again many times. The goal is to achieve the best possible fit between where the model predicts sites will (and will not) be located and the actual locations of known sites. Once this best fit is achieved, the results can be projected onto the rest of the landscape to predict the probable locations of sites not yet recorded.

Both types of models can be implemented in ways ranging from non-statistical intuitive approaches to simple statistical manipulations to complex multivariate statistical analyses. Both types of models can yield sensitivity maps that predict the likelihood that a not-yet-discovered archaeological site will be found at the certain location. The major difference is that a correlation model can only offer a probability statement about *whether* sites will or will not be found in a particular location, while a theory-based model can provide both a probability statement and an explanation as to *why* sites are likely or not likely to be located in a particular location.

The DoD controls huge tracts of land across the country, many of which contain tens of thousands of archaeological sites (Altschul 2006). It is estimated that each year the agency spends approximately \$15,000,000 on cultural resources compliance. Recent changes in the nature and intensity of military training means that cultural resources compliance under both NHPA and NEPA likely will involve not only more archaeological survey but also greater data recovery as

previously recorded archaeological sites are impacted by land use and development. As a matter of practice, federal agencies, including the DoD, often comply with federal environmental mandates one proposed action at a time. Although existing records on past investigations are reviewed, it is difficult to anticipate *what* kinds of archaeological sites will be found, *where* they will be found, or *how* they might be affected. As such, planners are confronted with making educated guesses about funding and time needs while coordinating environmental compliance with project budgets and schedules. Predictive site modeling can reduce these uncertainties and enhance both planning and stewardship capabilities as further discussed below.

Using predictive site modeling for CRM purposes is not new. During the 1970s and 1980s, federal land managing agencies, including the DoD, developed tools to predict the likely location of archaeological sites in areas that had not been inspected for them. They were used initially as substitutes for large-scale archaeological inventory (Altschul et al. 2004). The rationale at the time was that if sites could be predicted then actual inventory was not necessary. The consulting parties to the compliance process mandated under Section 106 of the NHPA objected to this approach. Federal agencies then, and now, are required to take into account the effects of their actions on historic properties. Predictive modeling alone did not satisfy this objective, and as a consequence, modeling lost its appeal. Some agencies discontinued the use of predictive models or no longer supported the maintenance and upkeep needed to keep them current. Other agencies continued to use them for basic planning but not for compliance purposes (Altschul et al. 2004).

Today, with advances in statistical modeling, as well as the advent of Geographical Information Systems (GIS) technology, it is possible to predict site location in probabilistic terms, as well as to characterize archaeological sensitivity on a landscape level. Data layers that contain the location of known and predicted archaeological sites can now be viewed in relation to other environmental variables, therefore providing a comprehensive view of potential land-use impacts. It has been argued that such tools can enhance CRM thereby saving time and money in compliance with federal environmental law (Altschul et al. 2004; Altschul et al. 2005).

2.1. Legal Mandates

Military installations, like other entities of the federal government, are required by federal law to appropriately manage historical and cultural resources, including archaeological sites, under their jurisdiction. There are several different statutes and other authorities that address this issue in different ways.

2.1.1. National Historic Preservation Act: Sections 106 and 110

Under Section 106 of the NHPA, federal agencies have to take into account the effects of their undertakings on historic properties—i.e., districts, sites, structures, buildings, or objects that are listed in or eligible for listing in the NRHP. They must also provide the Advisory Council on Historic Preservation (ACHP) with an opportunity to comment on those effects. To be listed or eligible for listing in the NRHP, historic properties must generally be at least 50 years old, meet one or more of four criteria of eligibility, and have “sufficient integrity” to convey their significance. The process for compliance with Section 106, as mandated by the ACHP’s regulation at 36 CFR (Code of Federal Regulations) Part 800, requires identification of historic places (including archaeological sites), evaluation of their eligibility to the NRHP, assessment of

the nature of the effects of the undertaking on the eligible or listed properties, and identification of measures to resolve any adverse effects.

Section 110 of the NHPA requires that federal agencies assume responsibility for the preservation of historic properties under their ownership or control and establish a program to identify, evaluate, and protect such properties. This section of law also requires that the agency's preservation program and planning activities be carried out in consultation with state agencies and Indian tribes, as well as the public. Like Section 106, Section 110 is specific to properties listed in or eligible for listing in the NRHP.

2.1.2. The National Environmental Policy Act

The NEPA of 1969 established as a policy of the federal government that all agencies should use all practicable means to improve and coordinate plans, functions, programs, and resources to achieve a series of goals relative to the human environment. One of these goals (Section 101(b) (4)) is to "preserve important historic, cultural, and natural aspects of our national heritage." NEPA does not define "important" or "historic" or "cultural." The Council on Environmental Quality's implementing regulation (40 CFR Parts 1500–1508), however, includes the following criterion in the list of factors to be considered in determining whether an action will significantly affect the quality of the human environment:

The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources (40 CFR 1508.27(b)(8)).

To be in compliance with NEPA, therefore, a federal agency must include in ongoing development programs, as well as future development projects, a consideration of the impacts not only to historic properties eligible to the NRHP, but also to "significant cultural and historical resources."

2.1.3. Executive Order 13007

In 1996, the president of the United States issued an executive order (EO) concerning Indian Sacred Sites. EO 13007 requires that federal agencies who manage lands "shall to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and (2) avoid adversely affecting the physical integrity of such sacred sites." Although many sacred sites do not have archaeological manifestations, some do, and more to the point, some Indian tribes ascribe religious and cultural significance to *all* precontact-period archaeological sites.

2.1.4. Military Regulations

DoD, as a federal agency, is required to comply with federal environmental laws, including the NHPA and the NEPA. DoD has developed policies and instructions that direct how DoD agencies, including the service branches, will manage cultural and environmental resources as listed below.

- DoD Directive of DoDD 4710.1 (21 June 1994): *Archaeological and Historic Resources Management*
- DoD Instruction DoDI 4715.3 (3 May 1996): *Environmental Conservation Program*
- DoDD 4715.1E (19 March 2005): *Environmental, Safety, and Occupation Health*

The service branches in turn, have developed their own policies and related instructions to implement DoD directives and instructions protecting cultural resources. The U.S. Air Force policies (AF) are:

- AF Policy Directive AFPD 32-70 (20 July 1994): *Environmental Quality*
- AF Instruction AFI 32-7065 (13 June 2004): *Cultural Resources Management Program*
- AFI 32-7061 (12 March 2003): *The Environmental Impact Analysis Process*
- 32 CFR 989: *Environmental Impact Analysis Process*
- AFI 32-7062 (1 October 1997): *Air Force Comprehensive Planning*

The U.S. Army has a similar list of directives including:

- Army Regulation 200-1 (23 May 1990): *Environmental Protection and Enhancement*
- Army Regulation 200-2 (23 January 1989): *Environmental Effects of U.S. Army Actions*
- Army Regulation 200-3 (28 February 1995): *Natural Resources, Land, Forest, and Wildlife Management*
- Army Regulation 200-4 (17 October 1997): *Cultural Resources Management*

These directives, policies, and instructions, demonstrate how the DoD and the military service branches have interpreted and implement federal laws on cultural and environmental resources protection and management as part of their defense responsibilities.

2.2. Using Locational Models to Meet Planning Needs and Compliance Requirements

Statistically based GIS models designed to predict the locations of archaeological sites have a number of potential uses in addressing the cultural resources planning and regulatory compliance needs of DoD installations.

Environmental planning is a basic function that is necessary for all land-disturbing activities that have the potential to adversely affect both cultural and natural resources. The greater the ability to reliably anticipate impacts, the more effective planning can be in managing resources. Predictive modeling can be employed to assist in navigating through the regulatory compliance process and, consequently, to reduce associated costs and time delays. Predictive modeling, however, has additional uses that can contribute to site preservation and the overall management of cultural resources on DoD installations. Each of these topics is discussed below.

2.2.1. Planning

Planning is needed in order for DoD installation managers to anticipate impacts/effects to archaeological sites, among other environmental resources, resulting from proposed land-disturbing actions. By definition, planning is carried out *before* an action takes place and is most effective when done early in the project design process. This is to ensure sufficient time needed

for analysis so that informed decisions can be made about project design and development prior to approval. Predictive site-location modeling can provide important insight into where archaeological sites may be found, which under various federal environmental laws, must be considered during the planning process for any action that may effect/impact the environment. Specifically, GIS-based predictive modeling can be used to:

- Manage effects to known archaeological sites
- Stratify impacts/effects on a landscape/installation basis
- Coordinate environmental planning

2.2.1.1. Manage Effects to known Archaeological Sites

A GIS database containing data layers on site location and survey coverage; although not a predictive device when used alone, is invaluable as a basic planning tool. Use of this tool can enable decisions about the potential environmental impacts/effects of different kinds of land uses to known archaeological sites in places that have already been inventoried. A GIS database on site and survey location can also be used to determine where significant gaps exist in survey coverage that may warrant further research. The more information that is gathered on the archaeological record, the greater the certainty there is in effectively managing the resources and the potential effects/impacts that may result from land uses in the future.

2.2.1.2. Stratify Impacts or Effects on a Landscape or Installation Basis

The purpose of predictive modeling is to develop rational expectations about where archaeological sites are likely to be found in areas that have not been inventoried. For DoD installation managers, however, site location is not the critical issue so much as the potential effects to archaeological sites that may occur through land use. Long-term planning is enhanced through the use of predictive modeling by being able to reliably anticipate impacts/effects in areas that have not yet been surveyed. By linking proposed land uses with predictive modeling, the installation may be able to partition or stratify the landscape according to probable impacts/effects on different types of sites resulting from different classes of actions. The most useful outcome of this analysis would be the newly gained ability to determine where on the landscape few or no impacts/effects to archaeological sites are likely to occur as a result of proposed ground-disturbing activities. Knowing where these areas are likely to be can provide installation managers with land-use options that limit adverse effects to archaeological sites—and the attendant regulatory liability—and enhance resource preservation.

2.2.1.3. Coordinate Environmental Planning

A predictive site location model can provide an added layer of information to overall environmental planning for DoD installations by showing where archaeological sites may be located in relation to other valued environmental resources, such as threatened and endangered species, both known and modeled in their distribution. This would allow installation managers to overlay GIS data layers to produce landscape maps describing and predicting environmental sensitivity. The advantage of this approach is that it provides a means of determining where on the landscape cultural and natural resources “stack up” in overlapping concentrations versus those areas where resources do not co-occur. Installation managers will be presented with different management challenges and opportunities depending on the outcome of this analysis. This will

enable informed, justifiable decisions about the costs of environmental impacts versus the benefits of any proposed land use within the installation.

2.2.2. NEPA Compliance

NEPA requires DoD installations to integrate environmental concerns into their project decision-making process. This is accomplished by considering the environmental impacts of proposed installation actions and identifying and analyzing reasonable alternatives to these actions. The consideration of environmental impacts includes assessing the impacts of actions on properties listed in or eligible for listing in the NRHP. Such properties include NRHP-eligible archaeological sites. DoD must also inform and involve the public in the agency's NEPA environmental review process.

The NEPA review process can follow three pathways, based on whether or not an action will have a significant impact on the environment. Categorical Exclusions (CEs) include those actions that, through experience, a federal agency has found will typically have little or no significant environmental impacts. Environmental Impact Statements (EISs) are developed for those actions that will have a significant impact. EISs are detailed and rigorous analyses and evaluations of the impacts of proposed actions and of all reasonable alternatives to these actions. The EIS process concludes with a decision-making document, the Record of Decision (ROD), which identifies the selected alternative and presents the basis for this selection. An Environmental Assessment (EA) is used to determine whether or not an action will have a significant impact on the environment, and thus requiring the preparation of an EIS. If the EA-level of analysis demonstrates that the proposed action will not have a significant impact on the environment, the agency documents this finding through a Finding of No Significant Impact (FONSI) (Bass et al. 2001).

Each level of NEPA analysis involves an assessment of how proposed action alternatives may impact NRHP-eligible or -listed properties, including significant archaeological sites. Predictive modeling is an important tool for streamlining the analysis of impacts to archaeological sites. In particular, modeling can reduce the time and cost for NEPA scoping and analysis of project alternatives. Modeling can be used in the NEPA analysis the following ways:

- Project scoping
- Alternative analyses
- Postponing identification and evaluation of significant archaeological sites

2.2.2.1. Project Scoping

Through the project scoping process, installations determine the range of environmental issues that must be addressed through a NEPA review. As part of the scoping process, a predictive model can be used to identify and assess the potential impacts of a proposed DoD action to archaeological sites. Information from modeling also can provide guidance on the level of effort and methodology appropriate for identifying archaeological sites within project alternatives retained for detailed study. Using modeling, objective decisions can be made about where and how to invest limited time and resources in collecting information on archaeological sites within project alternatives. In addition, predictive models can be used during the project scoping process as a way of communicating to the public and stakeholders the potential impact of the action on significant archaeological sites.

2.2.2.2. Alternative Analyses

Characterizing the probability of archaeological site locations early in the NEPA process enables installation managers to assess the relative impacts each alternative may have on significant archaeological sites. When used in conjunction with other environmental data, predictive modeling provides a comprehensive understanding of the environmental consequences of the alternatives, and the regulatory liabilities and related costs of each alternative. For example, areas with high potential for impacts to significant archaeological sites could be dropped from further consideration if the potential impacts would require cost-prohibitive mitigation. It is more efficient to identify (and eliminate) such problematic alternatives (or portions of alternatives) early in the NEPA review process, as opposed to dropping an alternative after conducting detailed environmental analyses within the study area associated with the alternative.

2.2.2.3. Postponing Identification and Evaluation of Significant Archaeological Sites

DoD installations may, if appropriate, postpone the identification and evaluation of significant archaeological sites until after the release of a FONSI or ROD. As discussed above, predictive modeling can be used as a means of characterizing the affected environment and the environmental consequences of the alternatives under consideration within the EA or EIS level of NEPA review. Information provided by the model would be used, in the context of NEPA, in lieu of conducting archaeological fieldwork within the alternatives. Further, the modeling would direct the completion of the archaeological identification and evaluation process after the FONSI or ROD, but prior to implementation of the selected action. The process for completing identification and evaluation would be stipulated in a NHPA Section 106 agreement executed by the time of the release of the FONSI or ROD.

2.2.3. Compliance with Section 106 of NHPA

Section 106 of the NHPA requires that installation managers take into account the effects of proposed undertakings on historic properties listed in or eligible for listing in the NRHP, and provide the ACHP an opportunity to comment prior to authorizing an undertaking (King 2004). Undertakings are agency actions that involve federal lands, funding, licenses, or other approvals.

Under 36 CFR Part 800, the regulations implementing Section 106, DoD installation managers must determine if a proposed action is an undertaking, and if so, identify the Area of Potential Effect (APE). The APE is that area in which an undertaking may alter the character or use of historic properties. Having established the APE, the regulations require that the DoD installation managers follow a four-step review process: (1) identify historic properties within the APE, (2) determine their NRHP eligibility, (3) assess the potential effects of the undertaking on historic properties, and, (4) resolve any adverse effects that may result from the undertaking. In this process, predictive modeling could be used to:

- Anticipate the kinds of historic properties likely to be encountered in an APE
- Anticipate the costs to conduct a historic property inventory/survey of an APE
- Plan for phased inventory/identification
- Design sample surveys
- Evaluate the integrity of archaeological sites and thus their National Register eligibility
- Develop research designs and field methods

- Redesign undertakings to avoid/minimize adverse effects
- Anticipate mitigation costs
- Assist with tribal consultation
- Facilitate the development of Programmatic Agreements

2.2.3.1. Anticipate the Kinds of Historic Properties

Predictive models can be designed to treat all sites equally regardless of temporal or functional differences; however, it may also be possible to build the model to discriminate among certain site types (e.g., prehistoric habitation sites versus those used for limited activities), thus predicting where each site type may be encountered on the landscape. This refinement on the predictive capability could provide installation managers with a better understanding of the potential for places with religious or cultural sensitivity to Native Americans, for example, that might require special management consideration.

2.2.3.2. Anticipate the Costs of Inventory

Being able to anticipate the number of sites in an APE could help CRM staff assess the potential cost-per-acre of inventories conducted either in-house or out-sourced to contractors. With growing pressure on all federal agencies to streamline operations and reduce costs, wise use of limited funds for NHPA Section 106 compliance has become a priority. Predictive modeling could help installation CRM staff to be cost effective in budgeting for and contracting out inventory services.

2.2.3.3. Plan for Phased Identification

Predictive modeling could be used for undertakings that require phased identification over time in order to anticipate future survey needs and levels of effort. There are circumstances when it is not possible or appropriate to identify all the historic properties that may be affected by a proposed undertaking. For example, the undertaking may require phased development such that what may be affected and how in future phases cannot be known until the first phase is constructed. In situations like this, where it is reasonable to expect that further identification will be needed, predictive modeling can be used to inform decision makers about what will be needed as future development phases are planned.

2.2.3.4. Design Sample Survey

To be effective, sampling in archaeology must be based on some expectation of the archaeological record in a given area. Predictive modeling is ideally suited to provide a sound basis for those expectations and could be used to guide the development of the sample design. In the absence of a predictive model, decisions on what, where, and how to survey must be made judgmentally by installation CRM staff, by designing a sample survey for each undertaking, or by some combination of both techniques. The problem with these alternatives is that judgmental survey can only confirm or deny subjectively held assumptions about archaeological site location, whereas sample surveys, even those using a systematic random approach, can produce spurious results. Predictive modeling also uses statistically probabilities but has the advantage of demonstrating within defined confidence levels the relationship between site location and certain

environmental variables on a landscape level. Testing and re-evaluating the model will improve its predictive efficacy over the long term, producing ever increasing dividends.

2.2.3.5. Evaluate the Integrity of Archaeological Sites and their NRHP Eligibility

This subject will be further developed elsewhere; however, lack of information on subsurface context may be the single greatest weakness of predictive modeling on DoD installations, especially in the eastern United States. With information on geomorphology, it may be possible to determine which types of landforms have the highest potential for containing intact archaeological deposits and which have lower potential. Archaeological sites located in those places that have been disturbed greatly through natural geomorphic processes are less likely to retain their integrity of materials and location and will thus be less likely to be NRHP eligible. Conversely, there may be landforms that have been stable for long periods of time that have a higher likelihood of containing intact archaeological deposits that meet the NRHP-eligibility criteria. Being able to distinguish between the two kinds of environmental settings would greatly enhance the ability of installation CRM staff to determine site eligibility programmatically. As a consequence, management practices could be changed. For example, in consultation with the Section 106 consulting parties, it might be that those areas identified by the model as having low potential for eligible sites could be eliminated from all future inventory.

2.2.3.6. Develop Research Designs and Field Methods

Research designs developed for undertakings within DoD installations would benefit from the insights gained from a predictive model as well. In conjunction with information on known archaeological sites within the region, an installation-wide predictive model could be used to formulate research questions and identify the field methods needed to address those questions. This would be particularly useful in guiding future CRM-driven research through survey, testing, and data recovery. The results of that effort could then be worked back into the model through periodic evaluations and thus contribute to the model's overall performance. Without the benefit of a predictive model, research questions and designs must be developed using existing information on the installation and the surrounding area; these may be overly broad or out of date, limiting their utility.

2.2.3.7. Redesign Undertakings to Avoid or Minimize Adverse Effects

If through predictive modeling it is possible to identify where ground-disturbing activities will likely have adverse effects to archaeological sites, then it may be possible to redesign those activities to avoid those areas. Avoidance and preservation in-place is the cheapest, quickest way of meeting the Section 106 requirements, but it is also the best way of ensuring site protection, provided that there are measures put in place to ensure avoidance during the undertaking. The model may indicate that certain areas can be expected to have high site densities or contain particular kinds of sites that might be especially sensitive to tribes and public stakeholders. Installation managers could use this information to avoid effects by locating the undertaking elsewhere. Without this foreknowledge, time and funding may need to be committed in identifying these resources before managers are in a position to recognize the nature and scale of potential effects. Predictive models can enhance site preservation and reduce costs.

2.2.3.8. Anticipate Mitigation Costs

As a consequence of being able to predict site location in relation to a planned ground-disturbing activity, installation managers could anticipate where those activities may result in the greatest mitigation costs. Mitigation, which for archaeological sites often entails data recovery through testing and or excavation, involves an intensive examination of the by-products of past human behavior in their temporal and spatial contexts. It can be expensive and time consuming. Predictive modeling could be very useful in developing reasoned expectations of where sites are located, how they may be affected, and what it may cost to conduct testing and data recovery. If the costs are too great, then it may be possible to avoid the expense by redesigning the project. Again, predictive modeling could help facilitate site avoidance and thus reduce costs.

2.2.3.9. Assist with Tribal Consultation

Predictive modeling could be useful as a means of conveying to Native American tribes what the installation CRM staff believes is the nature and distribution of archaeological sites within the installation boundaries. This capability might be especially useful in identifying areas with a high probability of containing particular types or densities of sites that may be especially sensitive, for example, where habitation sites with higher probability of containing burials may be located. Under the Section 106 regulations, installation managers are required to make a reasonable and good faith effort to identify places of religious and cultural importance to tribes and to consult with the tribes about these places as part of the compliance process. Tribal consultation can be challenging and time consuming. As such, it is advantageous for DoD installations to develop good working relations with tribes that claim a traditional use of the land contained within their installations. A predictive model could help in conveying to the tribes where sites may be located in an effort to discuss with the tribes the general location of sensitive places that should be considered in the planning process. Inventory would be required to confirm these locations, but modeling would allow a means of focusing this effort and facilitating consultation with the tribes about these areas.

2.2.3.10. Facilitate the Development of Programmatic Agreements

PAs are planning tools that allow federal agencies to demonstrate compliance with the provisions of 36 CFR 800 in situations where the effects of an undertaking, or a series of related undertakings, cannot be known. They typically establish protocols for how the agency will meet its obligations, when and in consultation with whom, after the agreement is executed. A predictive model could become a part of the agreement in a number of scenarios, some of which have been discussed above, such as in cases where the undertaking must be phased over time. The results of predictive models could also be used generally to establish survey methods used for identification, determine site eligibility, determine how sites may be affected and the research questions needed to guide data recovery, all informed by and incorporating the results of predictive modeling. For example, the Minnesota State Historic Preservation Officer (SHPO) entered into a Programmatic Agreement (PA) with the Minnesota Army National Guard at Fort Ripley that uses a predictive model to decide programmatically that any undertakings that are located in areas of low archaeological sensitivity do not require prior consultation with the SHPO (Altschul et al. 2005).

2.2.4. Other Applications

Predictive modeling could have other uses that contribute to cultural resources management on DoD installations. Too often cultural resources management is something that happens in reaction to a proposed land development or undertaking in compliance with NEPA and NHPA. It is also the installation's responsibility, however, to proactively manage their cultural resources as stipulated in Section 110 of the NHPA. As such, predictive modeling could be used to:

- Identify potential high value resources for management under Section 110
- Develop historic contexts
- Develop future research and management objectives
- Internal communication

2.2.4.1. Identify Potential High Value Resources for Management under Section 110

Predictive modeling could be used to identify the potential location of high value cultural resources warranting special management consideration and help DoD installations in meeting their Section 110 responsibilities. The information could be used to develop strategies for targeted survey or defining special management areas, for example, the location of certain kinds of prehistoric sites (e.g., habitation sites) or sites from particular time periods (e.g., Paleoindian sites). It is necessary for installation managers to know what is on the DoD property and why it may be important in order to fulfill their responsibility to protect the nation's cultural heritage. Places such as these deserve the kind of advance planning that predictive modeling can facilitate so that they can be preserved for future generations. Predictive modeling could contribute to Section 110 planning.

2.2.4.2. Develop Historic Contexts

Predictive modeling could contribute to developing historic contexts for installations based on what is known, and can be expected to be discovered, about the archaeology of the area in terms of time, space, and thematic considerations. Historic context studies are a key element in establishing NRHP eligibility, which is the standard used to determine whether a cultural resource is significant in American architecture, archaeology, history, engineering, or culture. They are typically designed to organize information about the past into meaningful units for a particular time, place, or theme in history or prehistory and establish the attributes that historic properties must exhibit in order to be determined NRHP eligible in relation to those contextual units. In this way, historic contexts can become invaluable tools for defining what is important about an area, such as a DoD installation, and how to evaluate the significance of any particular cultural resource within it. Context studies provide a tailored means of determining what requires management consideration and why. Models that predict the nature and location of archaeological sites within DoD installations could be used to establish those organizational units that are the backbone of historic context studies.

2.2.4.3. Develop Future Research and Management Objectives

Predictive modeling could be a very useful tool in developing future research questions and management objectives. Having a sound basis for knowing what to expect and where to expect it would give installation CRM staff the ability to define priorities for future research. Effective resource management is dependant upon a growing knowledge base about the resource, and as

such, collecting and synthesizing information through research activities is a critical part of management. But that effort must be channeled into areas that will most effectively fill gaps in the knowledge base. Predictive modeling could be used as heuristic device in developing research guidelines and objectives. This would enable DoD installation managers to focus limited dollars into research on sites that have the maximum preservation payoff or the greatest potential for information return.

2.2.4.4. Internal Communication

Installation managers must be provided with information that gives them an understanding of the nature and distribution of the resources for which they have management responsibilities under various federal preservation laws (e.g., NEPA, NHPA Section 106, NHPA Section 110, Archaeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act). Effective communication is the key. It is important for installation managers to understand what the CRM staff do and why, especially in terms of the regulatory compliance, because this has management implications. Predictive modeling used in conjunction with GIS technology would give CRM staff a useful planning tool but also an effective means of communicating with management, military planners, and other environmental staff about the potential challenges and opportunities in managing the archaeological record. Being able to convey the likely distribution of archaeological sites across a landscape in relation to proposed land uses—all at the same scale and spatial reference—is a highly effective as a means of communication.

As federal agencies are confronted with reduced budgets combined with pressure to accelerate project delivery, it is appropriate to re-examine the potential uses of predictive models in the current political and regulatory environment. This brief overview suggests that predictive modeling can be used to solve a number of problems related to compliance with environmental law and regulations.

2.3. Study Methods

To address the potential use of site prediction models for enhanced CRM planning and environmental compliance, SRI Foundation staff identified three candidate installations that met the selection criteria in the Scope of Work presented above in Section 1.2. Fort Drum, New York and Eglin AFB, Florida participated in the first Legacy grant project that evaluated the strengths and weaknesses of their respective models (Altschul et al. 2004). Staff from both installations also participated in the follow-up workshop in Santa Fe, New Mexico (Altschul et al. 2005). Dr. Laurie Rush, Cultural Resources Manager for Fort Drum, and Mr. Mark Stanley, Base Archaeologist at Eglin AFB, were committed to following up on the ideas and recommendations that emerged from these earlier studies. They both agreed to participate in the present study. A third installation, the United States Army Yuma Proving Ground (YPG) in Arizona, was also contacted because it provided the opportunity to add a DoD installation in the western United States about which the archaeology was well known. The Base Archaeologist at the time, Dr. Brantley Jackson, also agreed to participate.

This component of the study was divided into two parts. Part One involved one or more telephone interviews with installation CRM staff to elicit information on (1) how the predictive models are currently being used for planning and compliance purposes, and (2) how they could be used in the future. A summary of the potential solutions to compliance-related problems in which predictive

models may be used was developed, and this was sent to the installation CRM staff for consideration prior to the interviews. To guide the interviews, a questionnaire was developed; this is presented in Appendix A. The results of the interviews are discussed below in Section 2.5.

In Part Two of the study, SRI Foundation staff, in close consultation with the installation CRM staff, developed a conceptual outline of a PA called a “concept draft.” A concept draft is a document that spells out in plain language what may be contained in an agreement document. It is intended to be used as a starting point in discussions over the basic structure and content of an agreement document. Once agreement is achieved at this conceptual level, the concept draft can then be written as a formal draft for subsequent review and discussion. The advantage of this approach, especially when dealing with large-scale, complex, or controversial situations, is that it allows for early “buy in” of the participants greatly accelerating the formal drafting process.

Critical to this second stage of the work, face-to-face discussions were held with staff from the SHPOs in Florida and New York on June 21, 2007 and June 27, 2007, respectively. Under the Section 106 regulations, federal agencies are required to consult with the SHPO and other parties in developing PAs. Thus, a meeting with the SHPO to discuss the framework of a PA in conceptual terms was warranted. The concept drafts were designed to achieve the management and compliance goals identified in Part One, but they were also designed to incorporate the predictive models of each installation. The PA concept drafts for Eglin AFB and Fort Drum are presented in Appendix B and C.

2.4. The Installations

As explained, three installations were approached for this study and invited to participate. Fort Drum and Eglin AFB both confirmed. YPG in Arizona also agreed to participate; however, during the preliminary interview with SRI Foundation’s Program Manager, David Cushman, the base archaeologist, Dr. Brantley Jackson, told Mr. Cushman that he had decided to take another job and that YPG was not likely to fill his position after he left. Given the loss of key personnel, we decided to drop YPG from the study. Eglin AFB and Fort Drum remained the subject of research.

2.4.1 Eglin Air Force Base

2.4.1.1. Base Description

Eglin AFB is the headquarters for the Air Armament Command, which is attached to the Air Force Materiel Command. The base occupies approximately 724 square miles (463,360 acres) located in the Florida panhandle. It also includes 97,963 square miles of open water ranges making it one of the largest training facilities of its kind. The land for the base was originally acquired by the War Department in 1940. During World War II, Eglin AFB played a critical role in the testing of new weapons and tactics. With the end of the war, Eglin assumed additional weapons research and development functions during subsequent conflicts, including the Cold War. Today, its mission continues to focus on testing and developing military hardware, tactical strategies, and missile research (Eglin Air Force Base 2005).

2.4.1.2. Cultural Resources Program Summary

Eglin AFB began its cultural resources management program in 1982 when the National Park Service (NPS) administered a multi-year contract to locate, identify, and evaluate cultural resources and to conduct follow-up interdisciplinary studies. CRM contractors were hired to continue the inventory process and to provide Eglin AFB with management recommendations. Thousands of acres were surveyed and hundreds of archaeological sites were recorded in the process. The program was overseen by the Base Environmental Division until 1992, but there were no qualified staff to provide in-house historic preservation expertise. In that year, however, the program was reorganized as a separate branch within the Division, the position of the Base Historic Preservation Officer was created, and qualified personnel were hired to manage the program. Since then, the program has evolved into an effective CRM organization (Eglin Air Force Base 2005).

As of March, 2005, 160,212 acres had been surveyed for cultural resources or approximately 35 percent of the total land within the installation. In summary,

- 2,037 archaeological sites from all time periods over the past 10,000 years are represented on the installation
- 654 buildings have been recorded, of which 37 are listed in the NRHP
- 3 NRHP-listed historic districts have been established (Camp Pinchot, Eglin Historic Field, and Cape San Las)

2.4.1.3. The Model

Eglin AFB has developed an inductive, site-sensitivity model that is based on the correlation between site location and critical environmental variables: proximity to potable water, elevation above the closest water supply, and proximity to coastlines and alluvial plains (Altschul et al. 2004). The model, called the “Site Probability Model,” was first developed using multivariate statistical modeling and discriminate analysis; however, the results were disappointing. A refined model was then developed that examined the predictive power of a discrete set of environmental variables. Proximity to water and elevation predicted 95 percent of prehistoric site location. The Florida SHPO requested that distance from water be expanded from 150 meters to 200 meters, which increased the predictive power of the model to 96 percent (Thomas 2005). With the buy-in of the SHPO, the model was developed on U.S. Geological Survey (USGS) 7.5-minute quadrangle maps to stratify the base into high probability areas (HPA) and low probability areas (LPA). Wetlands were defined as an intermediate zone because they contain isolated elevated landforms within them that contain archaeological deposits. Historical-period sites are managed in a different manner because archival records describe or suggest where specific properties are located. These locations are then examined during inventory. Recently, the USGS quadrangle maps predicting prehistoric site sensitivity and the results of the archival review of historic settlements have been digitized and stored as data layers in a GIS database, which enables multiple planning applications.

The predictive model is used as a management tool for Section 106 compliance, among other planning functions. On a daily basis, areas that will be impacted by military training or test missions or construction projects are reviewed. If the location of these projects falls within a HPA that has not been surveyed, a Section 106-required survey will be initiated prior to project authorization. The model is also used to support Forestry Management, by determining if HPAs are located within timber sales area prior to timbering activities. Any portion of a timber sale that falls within a HPA will be surveyed, and located sites will be protected prior to the timbering

activity. The model is also used to identify areas to be surveyed for Section 110 inventory completion. A number of acres are surveyed each year to meet the base's Section 110 mandate. These areas are selected within the HPAs identified by the predicative model (Mark Stanley, personal communication, 2006).

2.4.2 Fort Drum

2.4.2.1. Base Description

Fort Drum was originally established in 1908 as Pine Plain and renamed as Pine Camp. In 1941, 75,000 acres were added for training purposes. This expansion required the demolition of five villages and 350 farms. The base was renamed Camp Drum in 1951 and was given its current name, Fort Drum, in 1974. In 1984, Fort Drum became headquarters of the 10th Mountain Division, Light Infantry. Today, the 107, 265-acre installation is used primarily for military training (Wagner et al. 2005).

Approximately 30,000 acres of the installation are used as firing ranges and impact areas, while over 11,000 acres make up the administrative area or cantonment, including Wheeler-Sack Army Airfield. The remaining 66,000 acres are utilized for troop maneuver and training and are divided into 18 training areas and 70 sub-areas. Fort Drum has 37 developed ranges that support training in a wide variety of weapons systems, small arms, artillery, armor, and aviation (Wagner et al. 2005).

2.4.2.2. Cultural Resources Program Summary

Fort Drum started its CRM program in 1985. The U.S. Army, with the assistance of the NPS, contracted with Louis Berger and Associates (LBA) to provide CRM services. Between 1985 and 1991, LBA conducted inventory, evaluation, recording, documentation, and preservation planning for the base (McHargue 1998). During this period, LBA recorded 390 historical-period and prehistoric sites and five historic villages. It also prepared a number of historic context studies and recorded the LeRay Mansion.

At the time the Integrated Cultural Resources Management Plan (ICRMP) was prepared in 2005, Fort Drum had completed archeological inventory of approximately 87 percent of its surveyable territory, not including the permanent impact areas and the previously developed portion of the cantonment. In summary,

- 69,000 acres have been surveyed
- 891 archaeological sites have been recorded, representing all time periods from 9000 B.C. to A.D. 1940s
- 1 historic district with standing structures (LeRay Mansion Historic District) has been listed on the NRHP
- 5 archeological districts have been listed on the NRHP
- 13 historic cemeteries exist within the limits of the installation

2.4.2.3. The Models

Fort Drum uses an inductive site sensitivity model, called the “Glacial Landscape Model,” for both Section 106 compliance and Section 110 stewardship. The model characterizes the sensitivity of the landscape for archaeological sites by correlating site location with several key environmental variables: proximity to ravines/fossil waterways, elevation, and soils. It is considered an “informal” model in that the operative assumptions are not explicitly stated and its predictive statements are more intuitive than objective (Altschul et al. 2004). Its great advantage is that it is easy to use and understand, and it works (Dr. Laurie Rush, personal communication, 2006).

Fort Drum began developing the Glacial Landscape Model in 1999 after an earlier modeling effort proved unsatisfactory (Rush et al. 2003). In reviewing the location of previously recorded prehistoric archaeological sites against environmental data layers in a GIS database, the CRM staff noted a correlation between site location and ravines or fossil waterways. Using a digital elevation model (DEM) of Fort Drum’s topography, this correlation was further refined. This led to a field-testing program designed to assess the observed relationships. In the process, new sites were recorded in areas that clustered between certain elevations. Further analysis indicated that these elevations correlated with ancient shore lines associated with three stages of Glacial Lake Iroquois at the end of the last Ice age (ca. 11,000 years ago). Additional testing refined the correlation by identifying certain soil types in which archaeological sites are typically found. The model applies to two, large, physiographic zones that make up the majority of the installation: the Ontario-St. Lawrence Lowlands (Lake Plain) and the Pine Plains Sands (Delta). Predictive accuracy holds for all time periods during prehistory in that proximity to water and certain soils appears to be a critical factor in past settlement (Rush et al. 2003).

In addition, Fort Drum has developed a number of “deductive” models that predict site location based on theoretically derived arguments on past human behavior. The “Prehistoric Pathways Model” predicts where sites associated with prehistoric trail systems that pass through Fort Drum can be expected. The Paleo-Maritime Model extrapolates the shore lines for Glacial Lake Iroquois and predicts where shore line settlements ought to be located. Lastly, Fort Drum uses a model that it recently developed and is testing that predicts where sites should be expected in the foothills of the Adirondack Mountains, which includes uplands areas of the base.

2.5. Using the Models for CRM Compliance: Interviews with the Installation CRM Staff

The questionnaire in Appendix A was used to guide interviews of the cultural resources management staff at both Eglin AFB and Fort Drum. The purpose of the interviews was to gather information on how each installation currently uses its model for planning and compliance and what could be done to improve their utility. Additional questions were asked about the views of base management, the SHPOs, Native American tribes, and other parties to the compliance process towards the CRM program, and particularly, the models. The results of these discussions are summarized in the following sections.

2.5.1. Eglin Air Force Base

Mr. Mark Stanley, Base Archaeologist, Eglin AFB, Florida, was interviewed on August 21, 2006, from 9:15 a.m. to 10:30 a.m. Mr. Stanley was joined for the interview by two other staff members, Ms. Lynn Shreve and Mr. Joe Meyer.

Eglin AFB uses its predictive model for CRM and achieving compliance on a regular basis. The model distinguishes between HPAs and LPAs (for prehistoric sites) as well as indeterminate areas (wetlands). The probability areas, as well as information on survey and site locations, are maintained as data layers in a GIS database. A modified version of the model that shows the HPAs in black and the LPAs in white, along with the buffered locations of known sites, is also available to planners base-wide. Mr. Stanley thought that the availability of this “black and white” data layer in the GIS system will have the effect of increasing visibility of cultural resources in the planning process.

The CRM program staff is concerned about deeply buried sites and the effects of development on these resources. Mr. Stanley said that ideally he would like to interface their model with data on the geomorphology of the installation to provide a three-dimensional predictive capability. He identified statistically validating the model as critical to improving its utility for compliance and planning purposes. Currently, the model is not viewed by the military and civilian planners as a reliable planning tool. The CRM program team knows a lot about the archaeological record on this base, but their knowledge resides in the memory of staff rather than in the database or in an explicit statement of the model. As a result, the staff is uncomfortable making arguments they know to be valid but cannot be supported in probabilistic terms.

A persistent problem at Eglin AFB is the military’s lack of knowledge about cultural resources and the Section 106 requirements. For the military, the model is a means to an end, which is not well understood. The military supports the model as long as it saves time and money and facilitates regulatory compliance. As such, in addition to improving the reliability of the model, there is a need for educating the base management about the compliance process.

Mr. Stanley also thought that broadening the installation inventory to include cultural resources from areas of the base that are under-represented, such as off-shore environments, was needed and can be justified as a Section 110 responsibility. He suggested that remote sensing in the wetlands areas would help determine where sites are typically located in those settings.

The CRM staff mentioned that the program lacks information on Traditional Cultural Properties (TCPs). Eglin AFB is in the process of establishing government-to-government relations with four federally recognized Native American tribes so there may be opportunities to learn more about places of religious and cultural significance to the tribes that may be located on base lands. The tribes generally have a good understanding of the Section 106 process, but Mr. Stanley was not sure if they know about the model or how it is used for compliance.

When asked to describe the relationship between the Eglin AFB CRM program and the Florida SHPO, Mr. Stanley said they had an excellent relationship with the SHPO and that the SHPO supports the CRM staff. He mentioned that there is an unwritten agreement with the SHPO that Eglin AFB does not have to consult in “no effect” situations and can make decisions in the absence of prior consultation with the SHPO. Although this arrangement needs to be formalized, it is a measure of the trust that exists between the two offices. The SHPO has also been very supportive of the predictive model, especially since the GIS database was updated by the addition of the historic homestead data. Mr. Stanley noted that the SHPO is concerned about the lack of statistical validation for the model. An improved model that demonstrates its validity would be supported by SHPO.

Other than the SHPO, there are few outside stakeholders with whom Eglin AFB consults. West Florida University has talked to the CRM staff in the past about underwater archaeology. The

tribes are consulted about archaeological issues, as well, but the U.S. Air Force generally does not seek out the views of other parties as part of the Section 106 consultation process.

Section 106 consultation is covered in part by an existing PA that primarily addresses effects to the historic “built environment” (i.e., the humanly modified environment, including all constructed buildings, structures, features, and associated infrastructure) and allows Eglin AFB to make decisions without prior SHPO consultation. The PA has one paragraph that addresses archaeology; unfortunately, it’s too broad to be useful. As mentioned, Eglin AFB does not consult with the SHPO on “no effect” situations, but this is based on an unwritten agreement. They do consult with SHPO on Section 110-inventory results. There is, however, a great need for a PA that addresses the potential effects of base undertakings on archaeological sites and that formalizes the existing consultation arrangements with the SHPO.

The CRM staff thought that a PA would be the best way of streamlining the Section 106 process. They approved of an agreement that is linked to the probability model. Writing such a PA would also offer an opportunity to add in a number of other stipulations such as an inventory exemption for certain areas of the base (e.g., hazardous impact zones and classified areas). Mr. Stanley thought the military would respond favorably. He ended the interview by emphasizing the importance of upgrading the statistical viability of the predictive model.

In sum, Eglin AFB has a fully functional, base-wide, predictive model that is used on a regular basis for planning and compliance purposes. The model’s biggest drawback is its lack of statistical rigor, which contributes to the perception by others that it has limited reliability as a management tool. Upgrading and statistically validating the model was the number one priority identified during the interview. While Eglin AFB has an existing PA, it does not apply to archaeological resources. The Eglin AFB CRM team is strongly in favor of a PA that incorporates the predictive model into the Section 106 compliance process. The SHPO is a strong supporter of the Eglin AFB CRM program and views the model favorably. Base CRM staff thought the SHPO would also approve of a PA that uses the predictive model as part of its operation. The conditions are favorable for developing a PA.

2.5.2. Fort Drum

Dr. Laurie Rush, Cultural Resources Manager, Fort Drum, New York, was interviewed on August 16, 2006, from 9:00 a.m. to 10:30 a.m.

Dr. Rush has been at Fort Drum for eight years. The program is heavily oriented towards prehistoric archaeological resources. LBA was hired to develop a number of historic contexts, which the CRM program uses to manage historic archaeological and architectural resources. Section 106 compliance on some historic resources (e.g., farmsteads) on the installation has essentially been completed according to informal agreements with the New York SHPO.

The CRM program manages known sites including the LeRay Mansion Historic District. Survey, however, is largely project-driven. Approximately 160,000 shovel-test pits have been dug within the Fort Drum boundaries. Eighty-seven percent of all lands that can be surveyed have been tested. Certain areas of the fort have been surveyed using projections based on the site sensitivity model.

Fort Drum uses its predictive model, the Glacial Landscape Model, for the management of its archaeological and historical-period resources as a regular part of its planning and compliance

activities. The model allows the CRM program to focus its resources in the high sensitivity areas. It also uses a model designed for the uplands of the Adirondack Mountains, portions of which extend into the base, to direct timber surveys. The Fort Drum CRM program employs multiple, overlapping models that are either landscape based (inductive) or contextual (deductive). Their goal is to cover the entire base with geo-spatial models that can be used to guide cultural resources management.

Dr. Rush would like to use the models in PAs for Section 106 compliance. She noted that the Glacial Landscape Model is already integral to how Fort Drum meets its survey responsibility for both project-related Section 106-compliance and their mandate to survey the entire installation under Section 110. She cited the Paleo-Maritime model as an example of context modeling that not only predicts where sites should be located in space but also the kinds of sites. Modeling the waterways used for fur trading to predict site location is another example of context-driven, proactive research that has Section 110 applications at Fort Drum.

The biggest problem in using the model for planning and compliance is the weakness identified in the model review conducted by the SRI Foundation—lack of quantification (Altschul et al. 2004). Dr. Rush agreed with the study's conclusion that the glacial landscape-based, site-sensitivity model is more intuitive than it is probabilistic. Its advantage, however, is that the model's expectations are easily communicated and visually apparent to both archaeological and non-archaeological audiences. Despite the lack of statistical rigor, Dr. Rush believes that the model is working.

Improving the Glacial Landscape Model would require quantifying its operative assumptions and statistically testing its performance in order to make the model less intuitive and more rigorous. Dr. Rush said that her program has done some investigation to this end, but validating the model would require a greater effort with more resources.

An improved model could be used to target future survey areas more effectively and provide a means of triaging new construction, especially in areas that have already been “cleared,” such as the base cantonment area. Overall, upgrading the existing model through statistical testing and validation of its findings would help the CRM staff feel more comfortable with the decisions that they make. In responding to a question about what the SHPO thinks of Fort Drum's modeling efforts, Dr. Rush said that the SHPO has a dim view of modeling in the state. She noted, however, that other parties are beginning to use the Adirondack Foothills model in their compliance. With an improved model, Dr. Rush believes the SHPO would be more open to its use for compliance purposes.

Fort Drum has an “excellent relationship” with the three Native American tribes with which it regularly consults: the Oneida Indian Nation, the Onondaga Nation, and the St. Regis Mohawk Tribe. The tribes, however, do not know much about the compliance process. The CRM staff has not talked to them about it specifically. The tribes do get a copy of the annual report that Fort Drum prepares for the SHPO. In Dr. Rush's opinion, trust is the key with the tribes. They feel comfortable with what the CRM program is doing. The St. Regis Mohawk Tribe has been most outspoken about their concern regarding archaeological site excavation, which they feel should be avoided or minimized. This is another area for which the model could be used: identifying highly sensitive places for avoidance.

As for other parties, stakeholders that are internal to Fort Drum do not worry how compliance happens. Dr. Rush said that the model actually helps her explain what she does and why. External

stakeholders, such as the state professional organization, are consulted when needed. Outreach and education is an important part of her job.

Currently, Fort Drum does not have a PA that guides how the installation complies with Section 106. As a result, the consultation process lacks the kind of streamlining provisions that Fort Drum wants and needs especially at a time of increased military training. Dr. Rush was strongly in favor of developing a PA for Fort Drum and thought that integrating the Glacial Landscape Model into the PA's operation was a good idea. She also suggested that the PA be used to formalize the annual reporting requirement that is currently in place with the SHPO and to exclude certain areas within the base that are too hazardous for future inventory.

What would be most beneficial to Fort Drum, however, would be a provision that allows the CRM program the authority to sign off on undertakings without prior SHPO consultation under certain circumstances. This might include "no historic properties affected," and possibly "no adverse effects" situations. Dr. Rush also thought the PA could help with site definitions, which are ambiguous, and also with survey procedures.

When asked what ideas she had on how to incorporate the current Glacial Landscape Model into a PA for the purposes of streamlining Section 106, Dr. Rush said there was a critical need for refined mapping. Fort Drum does not have good maps that can be used for planning and management purposes. Improved visuals would help considerably and should be undertaken as part of the model upgrade.

In sum, Fort Drum has both inductive and deductive models that are used as needed to help make management decisions. The Glacial Landscape Model, however, suffers from a lack of statistical rigor that is needed to make it less intuitive and more objective. The installation Cultural Resources Manager is in favor of an analysis to upgrade and validate the model. Fort Drum does not currently have a PA that governs how Section 106 consultation is conducted with the SHPO and other consulting parties. Such an agreement is strongly supported. The idea of incorporating the Glacial Landscape Model into the PA is also favored.

2.6. Planning for Preservation: Conceptual Outlines for Installation Programmatic Agreements

It was clear from the interviews conducted with the CRM staff at Eglin AFB and Fort Drum that the models used at each institution have become integral parts of their internal planning and compliance processes. It is also the clear that in each case the staff identified upgrading the models as their number one priority. Although the models work well, there is the perception that they lack statistical rigor and this detracts from their acceptance by non-CRM staff as being reliable planning tools. Lastly, the staff at both Eglin AFB and Fort Drum expressed an interest in the streamlining advantages afforded by a PA and approved of the idea of incorporating their respective models into a PA. With these conclusions in mind, the SRI Foundation carried out the following tasks in Part Two of this study:

- Developed a conceptual outline of a PA (i.e., the concept draft) that incorporates the model or models at each installation
- Consulted with the installation CRM staff regarding how the PA concept draft should be structured and what it should include

- Prepared a final concept draft for circulation to management within each installation and to the SHPOs in Florida and New York
- Met with the CRM staff at Eglin AFB and Fort Drum and toured the installations
- Met with the CRM staff and representatives of the Florida and New York SHPOs to discuss the PA concept draft

The results of these efforts are reported below and are intended to serve as the basis for future negotiations between the installations and their respective consulting parties on entering into a PA.

2.6.1. Eglin Air Force Base

The PA concept draft developed for Eglin AFB is included in Appendix B. Initially, a first draft was developed through extensive discussions between David Cushman of SRI Foundation and Mark Stanley, Base Archaeologist at Eglin AFB. Later, following a meeting among Mr. Cushman, Mr. Stanley, and Ms. Laura Kammerer, Deputy SHPO for Compliance and Review at the Florida SHPO, the draft was modified to reflect the points of agreement that emerged through this dialogue. Because there is an existing PA that addresses the built environment, this PA will apply specifically to historical-period and prehistoric archaeological sites, as well as, historic infrastructure associated with the development and use of testing ranges from World War II through the end of the Cold War (A.D. 1941–1991).

The Eglin AFB concept draft begins by explaining the problems that Eglin AFB faces in meeting its obligations under the Section 106 regulations; the purpose of programmatic agreements; and, why Eglin AFB is both qualified and capable of meeting its regulatory responsibilities under a PA. Following this are the stipulations that Eglin AFB proposes be included in the PA. Each is accompanied by an explanation of what the stipulation will do and how. At the end of this general review, there is a shorter bulleted summary of the points that have been agreed to between Eglin AFB and the Florida SHPO to date. Parts of the summary where further negotiations are needed are identified as “To Be Determined” as a place holder. The highlights of the PA concept draft for Eglin AFB are listed below.

- The Site Probability Model will be used to make decisions about where to conduct additional inventory for both Section 106 compliance and Section 110 planning.
- Certain areas within Eglin AFB that are too hazardous for future inventory will be exempted from consultation, as will certain kinds of activities.
- Site eligibility will be determined by Eglin AFB, in consultation with the SHPO. SHPO input on eligibility was specifically requested by the CRM staff. In some cases, where avoidance can be achieved, eligibility may be determined after the undertaking is completed.
- Effect determinations will also be made in consultation with SHPO; however, Eglin AFB will not be required to consult on “no historic properties affected” situations. This will codify an existing arrangement between SHPO and Eglin AFB. Eglin AFB will consult with SHPO in “no adverse effect” and “adverse effect” situations as well.

- Avoidance of historic properties and preservation in place will be the preferred management option at Eglin AFB. When avoidance is not possible, effects will be mitigated in all cases through the preparation of a treatment plan.
- Provisions will be made to suspend the terms of the agreement for declared emergencies for the duration of the emergency. After the emergency is over, the PA will go back into effect.
- Eglin will develop a protocol with each federally recognized tribe claiming ancestral affiliation to the lands within Eglin AFB today. The protocols will structure the manner and circumstances of future Section 106 consultations with the tribes. Until then, the tribes will be consulted when ever there may be an effect on a NRHP-eligible prehistoric site or site of historic Native American origin.

In further discussions about the PA, the Eglin AFB CRM staff identified the need to design the PA so that it will also address the potential effects of activities resulting from the BRAC Congressional mandate. This may include new construction, demolition of outdated facilities, and the operation of louder, high speed aircraft.

2.6.2. Fort Drum

The PA concept draft developed for Fort Drum is included in Appendix C. This document, like the concept draft prepared for Eglin AFB, was written after successive rounds of review and discussion with Dr. Laurie Rush, the Cultural Resources Manager at Fort Drum. The final version was sent to the New York SHPO, as well as the Oneida Indian Nation, the Onondaga Nation, and the St. Regis Mohawk Tribe for their review.

The Fort Drum concept draft begins by explaining the compliance problems that Fort Drum faces in meeting its obligations under 36 CFR Part 800, the Section 106 regulations. This is followed by an explanation what PAs do. Lastly, there is a summary of the reasons why Fort Drum is in a position to meet its regulatory responsibilities by means of a PA. Each of the proposed stipulations is then presented along with an explanation. A summary of the main points in the concept draft is then presented in bulleted form as the basic framework of an agreement.

The concept draft, as presented in Appendix C, proposes the following:

- The Glacial Landscape Model will be used to make decisions about where to conduct future survey for Section 106 compliance purposes as well as Section 110 planning. The other models will also be used for Section 110 planning.
- Fort Drum will make determinations of eligibility following standard NRHP criteria but will not be required to consult with the SHPO. Instead, Fort Drum will report to the SHPO on its eligibility determinations upon request.
- Fort Drum will make determinations of effect as well but will not be required to consult with SHPO unless a historic property will be adversely affected. All effect determinations will be submitted to the SHPO for review upon request.
- Existing documentation on the LeRay Mansion will be used to guide repairs and replacement that if conducted with in-kind materials will have “no adverse effect.”

- Adverse effects will require treatment in accordance with a treatment plan that will be sent to the SHPO and the consulting parties for review and comment. Buildings and structures previously recorded for the development of certain historic contexts, however, will not require additional recording as part of treatment. These buildings and structures will be listed in an appendix.
- Certain areas within Fort Drum that are too hazardous for future cultural resources inventory will be exempted from consultation, as will certain activities.
- Fort Drum will consult with the tribes whenever a proposed undertaking will adversely affect a prehistoric archaeological site. Two known prehistoric sites within the fort will be protected.

Unlike the meeting between Eglin AFB and the Florida SHPO, the staff at the New York SHPO did not make specific recommendations on how to improve the PA concept draft. As a result, the concept draft presented in Appendix C is the original document submitted to the SHPO for review. The SHPO staff was skeptical of the proposal but did not reject the idea of a PA. They recognized the opportunity to work with Fort Drum to do something innovative but admitted that there was no precedence in New York for what Fort Drum is proposing. They expressed their concerns on a number of issues. These can be summarized as follows:

- The reliability of the model, especially the Glacial Landscape Model
- The quality of the data collected and maintained by Fort Drum upon which the model is based. The SHPO does not have a complete set of records from Fort Drum
- The acceptability of the architectural plans developed for the LeRay Mansion
- The depth, range, and quality of the historic context studies
- The need for a comprehensive inventory of all potentially eligible buildings and structures at the Fort
- The possibility of indirect effects to properties outside the fort's boundaries resulting from military activities

It was clear from the discussions that the NY SHPO staff was not familiar with the cultural resources program at Fort Drum and, as such, did not understand the need to streamline the present consultation process—with or without a model. The staff had not reviewed much of the research conducted at Fort Drum, particularly the existing historic studies and the architectural plans for the LeRay Mansion. Nor did they know about Fort Drum's GIS database for cultural resources and how this is used to make planning and compliance decisions. Dr. Rush committed to sharing all of this information with the SHPO staff and to arrange for the SHPO staff to visit Fort Drum.

As mentioned, Fort Drum did send the concept PA to the three federally recognized tribes that have ancestral connections to the land within the installation. Comments from the Onondaga Nation were sent to Fort Drum. In short, the tribe recommended changes to the concept PA that clarify when and under what conditions the tribe wants to be consulted.

2.7. Conclusions

SRI Foundation staff has worked closely with the cultural resources staffs at Eglin AFB in Florida and Fort Drum in New York. The result of these efforts outlines what each installation proposes to do to meet its Section 106 responsibilities programmatically. In each case, the installation's site sensitivity model is incorporated into the agreement as a way of facilitating both planning and compliance functions.

Follow up discussion with the SHPOs in Florida and New York produced somewhat different results, which will affect future efforts to forge workable compromises into an acceptable agreement among the respective parties. In Florida, the SHPO and Eglin AFB have a close working relationship, and both parties are eager to change the nature of the relationship to achieve greater streamlining in the consultation process. In New York, the relationship is not as close, and as a result, there is a greater need for trust-building measures. Agreement will probably be achieved more quickly at Eglin AFB than at Fort Drum; however, when an agreement is achieved in New York, it will be precedent setting for the state and will provide a platform for continued growth in the relationship between Fort Drum and the New York SHPO.

Chapter 3: MODELING SITE SIGNIFICANCE

3.0. Background: The Problem of Unevaluated Sites

As noted earlier, for many years military installations have been carrying out surveys to identify archaeological sites within areas projected to be impacted by construction, training, and operations. Whenever possible, they have then redesigned or relocated the proposed activities to avoid impacts to all sites rather than spending the time and money to evaluate the sites to determine which ones warranted avoidance and which did not. This approach worked well in most cases, but it has left many installations with hundreds, even thousands of unevaluated sites which constrain the locations currently available for mission-related activities.

In order to plan for new and expanded uses as required by BRAC and other authorities, installations need to know not just where there are concentrations of archaeological sites and where sites are rare, but also which sites would require avoidance, which would require expensive mitigation, and which would be straight-forward to deal with in resolving adverse effects. Answering these questions on a site-by-site basis through testing and on-site evaluation would be both expensive and very time-consuming. In this project, we have explored an alternative rule-based approach based on existing site and environmental data, for assigning known sites to categories that would indicate their potential to yield different types of information about the past. Such an approach could permit installations to make many planning decisions and could support some types of compliance decisions as well.

3.1. Managing for “Significance” versus “Eligibility”

The purpose of the significance modeling component of this project is to enable installations to address programmatically the problem of unevaluated sites by focusing on the concept of site “significance.” As noted above, Sections 106 and 110 of the NHPA are specific to properties, including archaeological sites, that are listed in or eligible for listing in the NRHP, but eligibility to the NRHP is only one of the dimensions of significance for archaeological sites. Both for management and for many compliance issues, installation cultural resource managers should be focused on the more general issue of what kinds of information a site is likely to yield and what other qualities, beyond information potential, it has.

NRHP-eligibility for archaeological sites is most commonly evaluated under eligibility criterion D—places that “have yielded, or may be likely to yield, information important in prehistory or history.” *National Register Bulletin* 15 (National Park Service 1991), which describes how to apply the eligibility criteria, addresses the issue of “important” information by saying:

the information must be carefully evaluated within an appropriate context to determine its importance. Information is considered “important” when it is shown to have a significant bearing on a research design that addresses such areas as: 1) current data gaps or alternative theories that challenge existing ones or 2) priority areas identified under a State or Federal agency management plan [1991:21].

The problem inherent in operationalizing this concept of “important” information is that it is incompatible with both the nature of the archaeological record and the temporal dimension of archaeological research.

There is no *unimportant* or *important* information in archaeology; there is just information. Every isolated artifact and every site, whether tiny or enormous, contains pieces of the total record of the past. Some sites contain many pieces, some very few. But no pieces are intrinsically important while others are not; they are all pieces of the same thing. In addition, when the NRHP requires that the information available in a particular site must “have a significant bearing on...such areas as *current* data gaps or alternative theories that challenge *existing* ones” (National Park Service 1991:21, emphasis added), it ignores the constant improvements in archaeological methods and the frequent paradigm shifts in archaeological theory. The data gaps and theoretical issues of today are soon replaced as a result of the technological and methodological advances of tomorrow (Glassow 1977).

Some specific compliance decisions require that NRHP eligibility decisions be made about archaeological sites. But other compliance decisions and most management decisions can and should be made on a broader basis. If we judge the NRHP eligibility of archaeological sites—that is, the importance of the information that they contain—by today’s standards and interests, and if we rely entirely on NRHP-eligibility to make management decisions about archaeological sites, we are using short-term criteria to make long-term, indeed, often permanent decisions.

Sites that are classified as “not eligible” often are subsequently destroyed and lost forever. This is problematic because some or all sites so classified may contain information that we simply do not know how to access or interpret yet. Until archaeologists learned that the tree-ring patterns in wooden beams from pueblo sites in the American Southwest could be used to date construction episodes or that burned plant remains could be used to radiocarbon-date very ancient sites, no one would have classified intact beams or charcoal from ancient campfires as a source of “important” information in the National Register sense.

Another category of sites that might be classified as “not eligible” according to the strict NRHP definition would be sites of particular types from which we have learned a good deal in the past, but whose information potential is considered largely redundant today, given current questions and current techniques. Again, new techniques and new questions in the future might make sites of these types critically important. But if they have all been classified as ineligible and lost, it will be too late.

3.2. Evaluating Archaeological Sites: Eligibility and Historic Context versus Morphology and Site Setting

Because of the focus on current data gaps and theoretical perspectives, the NRHP and the Secretary of the Interior’s standards for archaeology and historic preservation require that eligibility to the NRHP be evaluated using developed “historic contexts,” that is, discussions of important research issues grouped by place, time, and theme. Historic contexts, it is argued, enable us to define important information and thus identify NRHP-eligible archaeological sites. Virtually every theoretical discussion on the topic of making better decisions about eligibility for archaeological site concludes that what is needed are more and better historic contexts.

In practice, however, very few people making decisions about eligibility of archaeological sites actually *use* the historic contexts we have *now* in any meaningful way to make those decisions.

What people actually do is to evaluate the physical characteristics (including setting) and the morphology (i.e., the form, content, and structure) of the site and make a decision based on those. Is the site largely intact or is it eroded or looted? Is it mostly buried or exposed on the surface? How many artifacts are visible? What kinds? Is there evidence of features or structures? Are there temporally diagnostic artifacts or features?

Other compliance decisions, such as planning for data recovery, do not rely on developed “historic contexts” either. Archaeologists gather a relatively fixed set of data from all archaeological sites: artifacts, features, structures, pollen samples, flotation samples, chronometric samples, ethnobotanical samples, perishables, faunal materials, human remains and associated grave goods, plus all of the provenience information for those things—maps, plans, notes, photographs, drawings, and so forth. Some sites have all of these categories of data, others only a few. But by looking at the physical characteristics and morphology of a site, archaeologists assess the site’s potential to yield many of these categories of archaeological data and use that assessment to design an excavation strategy and analytical approach. In a general sense, it does not matter whether the site’s historic context is “Pueblo II field houses of the San Juan Basin” or “Early Woodland camps in the Piedmont” or “Cahokia and the American Bottom during the Moorehead Phase.”

For both management and compliance decisions, what we want to know when assessing the significance of a site relative to its potential to yield information about the past are:

- What is the site’s potential to yield artifacts, features, structures, pollen samples, flotation samples, chronometric samples, ethnobotanical samples, perishables, faunal materials, or human remains and associated grave goods?
- Are the material remains recoverable from this site (whatever their nature) in their original context and spatial relationships (i.e., does the site have integrity of location and materials)?

These decisions do not require case-by-case evaluation of individual archaeological sites relative to developed historic contexts. They can be made by synthesizing existing survey and excavation data to understand the relationship among surface manifestations, geomorphic setting, and information potential, and then developing a set of algorithms or “rules” for predicting the information potential of a given site based on this past experience. Indeed, this is how much of the decision-making in cultural resource management is done now, despite widespread lip service to the concept of developed historic contexts. But such decisions are now made on an *ad hoc*, unsystematic basis, using an individual’s knowledge of the archaeological patterns of a given area and the results of previous archaeological investigations. The approach suggested here would systematize such decision-making and provide for consistent, replicable outcomes.

3.3. Archaeological Sites and Traditional Cultural Values

Although, as noted above, archaeological sites are most often evaluated under NRHP criterion D for their information potential, these sites have other values as well, especially for descendant communities. Many Native American groups ascribe religious and cultural significance to archaeological sites that they view as ancestral. In an attempt to reflect these “other than information potential” values, Native Americans often request that sites be considered eligible to the NRHP under criterion A—their association with important events in the history of the tribe—and/or under criterion B—their association with the ancestors of the modern tribal members.

NRHP criterion A requires that the “events” in question must be “important in a defined historic context” and that the association between the site and the event or events must be both important and specific (National Park Service 1991:12). General associations with events in the past are not sufficient for eligibility under criterion A. Likewise, criterion B requires that a site has a specific and important association with a specific individual and requires that this individual’s contribution to history be specific and appropriately documented (National Park Service 1991:14).

Unless there is recognizable physical evidence or specific oral traditions supporting the association of an archaeological site with specific events or individuals in the past, it is usually impossible to make a successful argument for eligibility under criterion A or B. If we were to shift our focus from eligibility to a broader category called “significance,” however, we might be able to find ways to reflect the traditional cultural values that tribes ascribe to some archaeological sites and features and consider those values under NEPA and EO 13007, as well as in a broad approach to NHPA Section 106 treatment and Section 110 management as discussed below.

3.4. Developing a Significance Model

Our challenge in this component of the project was to develop a “predictive model” for significance, one that would take into account both current research importance (eligibility), as required by NHPA Section 106, and the need to address the broader issue of “loss or destruction of significant scientific, cultural, or historical resources” under NEPA. We also needed to create a model that would allow installations to meet part of their Section 110 responsibilities through preservation of at least a representative sample of all archaeological information within the installation for future research needs. Finally, and ideally, the significance model that we develop would include a mechanism for addressing traditional cultural values ascribed by Native Americans to archaeological sites and features and, combined with existing locational models, should enable installations to meet a wide variety of management and compliance needs.

The premise of a significance model is that there are physical characteristics of an archaeological site that can be used to predict the nature of the archaeological data that could be gained through excavation and other forms of data recovery at the site. Some of these characteristics have to do with morphology of the site itself. Among these characteristics are: types, numbers, distributions, and densities of artifacts; overall site size; presence (though not absence) of temporal diagnostics; indications of structures or features; presence of ash, charcoal, or other evidence of burning; and indications of buried cultural materials. Other useful predictors of information potential are aspects of the site’s setting and environment. Among these are: the geomorphic age of the surface on which the site is located; whether the site is in an erosional, stable, or depositional setting; and whether the site has been disturbed by natural or cultural forces.

In addition to these predictors of information potential, a significance model could include measures for assessing *other* values associated with types of sites, types of features, and sensitive physiographic settings. These other values might be derived from published ethnographic studies and recorded oral traditions, as well as through interviews and consultation.

As with locational models, significance models could be developed using a correlation approach or a theory-based approach. The latter, for example, might be based on cognitive theory and human psychological principles.

The information used to develop a correlation based significance model would include:

- survey information about the archaeological characteristics of the site—artifacts, evidence of structures/features, and so forth
- information from available locational predictive models about the geomorphic setting of the sites—age of land surface, erosional versus depositional or stable, and so forth
- synthesized information from excavation projects on the installation and from adjacent lands concerning the relationship between surface archaeological manifestations and subsurface deposits; the preservation of pollen, macrobotanical materials, and other organic remains; and the state of research on current regional research questions and theoretical issues
- information and traditional knowledge communicated through ethnographic studies and community consultation about cultural values

The significance categories into which sites are to be sorted would be whatever is meaningful and useful for managers and cultural resource staff on the installation and for the local and regional community of archaeological researchers. The purpose of these categories is not to create immutable “significance” assignments, but rather to provide installation CRM personnel with a fairly straightforward set of management classes to guide everyday management and compliance decisions. Categories and assignments to categories may (and should) change through time as new information, new technologies, and new research and management needs arise.

A hypothetical set of significance categories into which sites could be classified might look something like this:

- Category 1: sites likely to contain “important” information in the NRHP sense—i.e., information that can contribute significantly to *current* research questions and theoretical issues
- Category 2: sites likely to contain substantial information about the past but whose current research potential has been largely exhausted by previous excavation—i.e., sites whose information would be viewed as “redundant” given current research questions and archaeological techniques
- Category 3: sites that may contain substantial information about the past, but whose information potential cannot be tapped with current research approaches and archaeological methods
- Category 4: sites with very high traditional cultural values

To continue with this hypothetical example, once a sensitivity model using these categories is developed for an installation and validated, it could be used to classify known sites into significance categories, and the results of such a classification effort could then be used to create a map layer within the installation’s locational model or other GIS-based representation of the installation’s resources. This map layer could then be used to display the geographic positions of sites of different significance categories within the installation. For installations with a locational predictive model, this information could be used to develop a predictive data layer for sites not yet identified. This component of the predictive model would yield the locational probability scores for sites of the different significance categories and create a significance-based sensitivity map or set of maps.

As future archaeological surveys on the installation are completed, the new sites would then be assigned to the sensitivity categories using the same criteria used in the initial assessment of the

site data, and the sensitivity maps would be updated. Future excavation data would be used to test and refine the rules for significance category assignments.

3.5. Using the Significance Categories in Management Decisions

By focusing on overall “significance” of archaeological sites rather than the narrower concept of “eligibility,” the approach advocated here would enable a military installation to:

- deal programmatically rather than case-by-case with the effects of its undertakings on historic properties as provided in Section 106 of NHPA
- do a more effective job of meeting its stewardship responsibilities under Section 110 of NHPA
- address tribal and descendant community concerns about values of archaeological sites that go beyond their “information potential”
- focus mitigation dollars on sites with the greatest research payoff
- address the concerns of review agencies and the archaeological community about the “fourth dimension” problem—i.e., sites currently judged to contain low or enigmatic information potential, but sites that could become essential for addressing some research problem in the future

To continue the example using the hypothetical categories proposed above, *treatment approaches* for these four hypothetical significance categories might be something like the following:

- Category 1 sites—i.e., those sites likely to contribute significantly to *current* research questions and theoretical issues—emphasize data recovery at these sites; reserve a representative sample of them for future research
- Category 2 sites—i.e., those sites whose current research potential has been largely exhausted by previous data recovery—reserve a representative sample for future research but forgo data recovery or only carry out very specific, tightly focused data recovery (e.g., collect obsidian hydration samples)
- Category 3 sites—i.e., those sites whose information potential cannot be tapped with current research approaches and archaeological methods—reserve a representative sample for future research
- Category 4 sites—i.e., those sites with very high traditional cultural values—preserve undisturbed wherever possible

If these were the agreed upon treatment strategies for the various significance categories, as part of mitigation for the effects of specific projects or for the effects of ongoing programs, the installation would establish a set of *reserves* within which sites would be set aside for future research and *preserves* that would allow sites with very high traditional values to be left undisturbed. There are at least two possible approaches to establishing these reserves and preserves. Research reserves could be established on an installation-wide basis as proactive, up-front, Section 110-activities and as part of mitigation for ongoing programs. Once these reserves are established, resolution of adverse effects for subsequent individual development projects would address only the Category 1 sites and the Category 4 sites—the former by conducting data recovery at some or all affected sites, the latter by establishing preserves around the site(s) if possible. If specific, tightly focused data recovery was proposed at particular kinds of Category 2 sites (e.g., collecting obsidian for hydration studies), those activities would be part of the mitigation efforts where appropriate.

The other approach to developing the reserves and preserves would be carried out case-by-case for each development project. For each individual undertaking, the installation would:

- preserve affected Category 4 sites within a project's APE where possible
- set aside for future research a sample of Category 2 and 3 sites, either within the APE or elsewhere on the installation
- carry out data recovery at a sample of the affected Category 1 sites, and set aside for future research a sample of these sites either within the APE or elsewhere on the installation
- complete targeted, narrowly focused data recovery at affected Category 2 sites, if appropriate

Clearly, an essential component of this approach would be a commitment on the part of the installation to periodic synthesis of new excavation data and consideration of theoretical and methodological advances in archaeology. After each review, the significance category assignment criteria would be re-evaluated and potentially adjusted, the representativeness of the sets of reserved sites would be evaluated, and the significance sensitivity maps would be redone.

3.6. The Conceptual Draft Significance Model

As part of this Legacy project, we have developed a simplified example (Appendix D) of how a significance model might be created, using site, survey, and geoarchaeological information for UTTR, administered by Hill AFB. We began the process by reviewing the extensive archaeological literature from the eastern Great Basin with a special emphasis on (a) current research issues, (b) research issues that have been extensively addressed in the past, (c) results of previous excavations, and (d) environmental variables that appear to have conditioned the location, function, content, and condition of archaeological sites (Adovasio 1986; Aikens and Witherspoon 1986; Beck 1999a, 1999b; Bettinger 1998, 1999a, 1999b; Cannon et al. 1990; Coltrain et al. 1999; Currey 1990; Fowler 1990; Grayson 1993; Hemphill and Larson 1999; Holmer 1986; Janetski 1986, 1990; Kelly 1999; Larson and Hutchinson 1999; Madsen 1986, 1988, 1993, 1999; Madsen and Janetski 1990; O'Connell 1995; O'Connell and Elston 1999; Rhode 1999; Rhode and Madsen 1998, 1995; Schoeninger 1999; Simms 1985, 1999; Simms and Raymond 1999; Thomas 1986). We also reviewed the 2006 ICRMP for Hill AFB (Air Force Materiel Command 2006), a synthesis of archaeological studies at UTTR (Ezzo 1999a, 1999b), a research design for the northeastern Great Basin prepared for Hill AFB (Bischoff et al. 2000), and the geoarchaeological sensitivity model recently developed for UTTR by Young (2008).

Based on the materials reviewed, we have developed an example set of rules or algorithms for classifying known sites into significance categories, based on their surface signature and geomorphic setting (Appendix D). This is a very simplified, illustrative example of how the process for actually classifying sites might work. The variables examined in classifying the sites included: site type, time period, geoarchaeological probability category from Young (2008), elevation, site condition, impact agents, slope, aspect, distance to permanent water, topographic location, depositional context, vegetation, site dimensions, estimated depth of cultural fill, lithic tools, lithic debitage (estimated quantity), number of ceramic artifacts, number of non-architectural features, and number of architectural features from the Intermountain Antiquities Computer System (IMACS). The significance categories developed in Appendix D are a variant of the categories discussed above in Section 3.5.

3.7. Conclusions

The discussion of issues above and the brief exercise provided in Appendix D indicate how a significance model might be developed and make it clear why such models might be very useful for installations that have large numbers of recorded but unevaluated archaeological sites. Even for installations such as UTTR, where the majority of the currently recorded archaeological sites have eligibility determinations recorded, however, the development of a detailed, full-scale significance model could have great utility. There are several reasons for this: the current determinations are based on surface manifestations and do not take into account the geomorphic setting of the sites, these determinations do not take into account other values beyond current information potential, and they are treated as “fixed” information and cannot be easily reviewed and re-evaluated as can significance category assignments of the type proposed here.

In discussing the eligibility status of sites at UTTR, Young notes:

Recent inventories have found that many sites previously determined to be eligible can be re-evaluated in light of growing knowledge regarding the preservation characteristics and data potential of specific environments at UTTR. However, until re-evaluations are complete, all eligible sites must be managed and protected as eligible properties [2008:44].

In fact, however, there is no reason why this needs to be true. The only determinations of eligibility that must be considered “permanent” until a demonstrated change in significance or condition make it imperative to re-visit the property’s NRHP status are those formal determinations made by the Keeper of the National Register. The consensus determinations of eligibility made through consultations between the installation and the SHPO are for the purposes of a single Section 106 undertaking; they are not and should not be permanent decisions. By using a significance modeling approach, installations could update and revise their significance assessments routinely and easily as new survey and excavation data become available, as archaeological methods and research emphases change, and as information from other disciplines and from descendant communities is collected and synthesized.

Chapter 4: STUDY CONCLUSIONS

In 2004, SRI and SRI Foundation received funding from the Legacy Resource Management Program (#03-167) to bring together installation archaeologists and cultural resource managers, predictive modeling experts, private-sector cultural resource consultants, and representatives of state and tribal historic preservation programs for a workshop on more effective uses of predictive modeling on military installations. The two key recommendations of the 2004 workshop were:

- Installations are under-utilizing their locational predictive models; these models could be used much more broadly and effectively for management and compliance than they are at present
- DoD needs to shift its modeling effort away from the current exclusive focus on site location and begin examining issues of site significance

The current Legacy Program pilot project (#06-167) is the first step toward addressing these two important recommendations.

The first component of the pilot project explored ways in which DoD installations can use predictive modeling to reduce the time and expense associated with historic preservation compliance (i.e., Sections 106 and 110 of the NHPA) and compliance with the NEPA, while enhancing overall cultural resources management planning and stewardship capabilities. Eglin AFB and Fort Drum participated in the first component of the pilot study.

One of the most important issues facing both Eglin AFB and Fort Drum is the need to improve their existing locational predictive models. In 2007, USAF Air Combat Command, with URS Corporation, SRI, and SRI Foundation as partners, was awarded funding under the DoD's Environmental Security Technology Certification Program (ESTCP Project number SI-200720) to upgrade the performance of these models. Research and analysis on the existing installation models are underway. As part of the ESTCP-funded project, SRI Foundation will assist Eglin AFB and Fort Drum in negotiating and finalizing the concept draft PAs developed under the current Legacy Program pilot project. The objective is to complete the model upgrades by the time the PAs are ready for signature. Two additional installations, UTTR and Saylor Creek Range (administered by Mountain Home AFB in Idaho) will be assisted through the process described in this pilot study for Eglin AFB and Fort Drum—identification of additional applications for their models, negotiation with stakeholders/consulting parties, and preparation of draft PAs.

The second component of this pilot project was to expand archaeological modeling to include the concept of site significance as well as location. Chapter 3 and Appendix D present a conceptual draft of a “significance model” that will allow installations to move away from costly and time consuming case-by-case approaches to archaeological site evaluation, replacing these approaches with a pro-active, efficient, and programmatic evaluation process.

The current pilot project did not involve a real-world test of the proposed significance model. The most effective means to test this approach is through a demonstration project, involving a diverse sample of military installations across the country. It is recommended that the installations involved in the demonstration project meet the same selection criteria as used in the current Legacy pilot project (see Section 1.2.1). Fort Drum and Eglin AFB, in addition to UTTR, would serve as good candidates for this demonstration project. An important component of this demonstration project is to integrate the significance model(s) with an installation's validated

archaeological predictive model. The resulting data layer within the predictive model would yield the locational probability scores for sites of the different significance categories and create a significance-based sensitivity map or set of maps.

ACRONYMS

A.D.	Anno Domini, “in the year of the Lord;” convention used to indicate a time division of the Christian calendar after the birth of Christ
ACHP	Advisory Council on Historic Preservation
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
APE	Area of Potential Effect
B.C.	Before Christ; convention used to indicate a time division of the Christian calendar
BP	Before Present; calibrated calendar years prior to A.D. 1950
BRAC	Base Realignment and Closure
CE	Categorical Exclusion
CFR	Code of Federal Regulations
CRM	Cultural Resource Management
DEM	Digital Elevation Model
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESTCP	Environmental Security Technology Certification Program
EO	Executive Order
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
HPA	High Probability Area
ICRMP	Integrated Cultural Resource Management Plan
IMACS	Intermountain Antiquities Computer System
LBA	Louis Berger and Associates
LPA	Low Probability Area
NEPA	National Environmental Protection Act of 1969
NHPA	National Historic Preservation Act of 1966
NPS	National Park Service
NRHP	National Register of Historic Places
PA	Programmatic Agreement
ROD	Record of Decision
SHPO	State Historic Preservation Office
SRI	Statistical Research, Incorporated
TCP	Traditional Cultural Property
USAF	United States Air Force
USGS	United States Geological Survey
UTTR	Utah Test and Training Range
YPG	Yuma Proving Grounds

REFERENCES CITED

- Adovasio, James M.
1986 Artifacts and Ethnicity: Basketry as an Indicator of Territoriality and Population Movements in the Prehistoric Great Basin. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 43–88. University of Utah Anthropological Papers No. 110. University of Utah Press, Salt Lake City.
- Aikens, C. Melvin, and Younger T. Witherspoon
1986 Great Basin Numic Prehistory: Linguistics, Archeology, and Environment. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 6–20. University of Utah Anthropological Papers No. 110. University of Utah Press, Salt Lake City.
- Air Force Materiel Command
2006 *Hill Air Force Integrated Cultural Resource Management Plan, Vols. 1 and 2*. U.S. Air Force, Hill Air Force Base, Ogden, Utah.
- Altschul, Jeffrey H.
2006 Integrating Predictive Modeling in DoD Cultural Resources Compliance. Grant proposal submitted to the Environmental Security Technology Certification Program, Department of Defense. Manuscript on file, SRI Foundation, Rio Rancho, New Mexico.
- Altschul, Jeffery H., Terry H. Klein, and Lynne Sebastian
2005 *A Workshop on Predictive Modeling and Cultural Resource Management on Military Installations, Santa Fe, New Mexico, November 15–18, 2004*. Preservation Research Series 4. SRI Foundation, Rio Rancho, New Mexico.
- Altschul, Jeffery H., Lynne Sebastian, and Kurt Heidelberg
2004 *Predictive Modeling in the Military, Similar Goals, Divergent Paths*. Preservation Research Series 1. SRI Foundation, Rio Rancho, New Mexico.
- Amick, Daniel S.
1999 Using Lithic Artifacts to Explain Past Behavior. In *Models for the Millennium: Great Basin Anthropology Today*, edited by Charlotte Beck, pp. 161–170. University of Utah Press, Salt Lake City.
- Bass, Ronald E., Albert I. Herson, and Kenneth M. Bogdan
2001 *The NEPA Book: A Step by Step Guide on How to Comply With the National Environmental Policy Act*. 2nd ed. Solano Press Books, Point Arena, California.
- Beck, Charlotte (editor)
1999 *Models for the Millennium: Great Basin Anthropology Today*. University of Utah Press, Salt Lake City.

- Beck, Charlotte
 1999 Where We've Been, Where We Are, and Where We're Going. In *Models for the Millennium: Great Basin Anthropology Today*, edited by Charlotte Beck, pp. 3–12. University of Utah Press, Salt Lake City.
- Bettinger, Robert L.
 1998 Cultural, Human, and Historical Ecology in the Great Basin: Fifty Years of Ideas about Ten Thousand Years of Prehistory. In *Advances in Historical Ecology*, edited by W. Balée, pp. 169–189. Columbia University Press, New York.
- 1999a Faces in Prehistory: Great Basin Wetlands Skeletal Populations. In *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*, edited by Brian E. Hemphill and Clark Spencer Larsen, pp. 321–332. University of Utah Press, Salt Lake City.
- 1999b What Happened in the Medithermal. In *Models for the Millennium: Great Basin Anthropology Today*, edited by Charlotte Beck, pp. 62–74. University of Utah Press, Salt Lake City.
- Bischoff, Matt C., Joseph A. Ezzo, Teresita Majewski, Robert M. Wegener, and Stephanie M. Whittlesey
 2000 Appendix P of the Hill Air Force Base Cultural Resource Management Plan. In *Archaeological Research Design for the Northeastern Great Basin*. Technical Report 99–29. Statistical Research, Tucson.
- Cannon, William J., C. Cliff Creger, Don D. Fowler, Eugene M. Hattori, and Mary F. Ricks
 1990 A Wetlands and Uplands Settlement-Subsistence Model for Warner Valley, Oregon. In *Wetland Adaptations in the Great Basin*, edited by Joel C. Janetski and David B. Madsen, pp. 173–182. Occasional Papers No. 1. Museum of Peoples and Cultures, Provo, Utah.
- Coltrain, Joan Brenner, and Thomas W. Stafford, Jr.
 1999 Stable Carbon Isotopes and Great Salt Lake Wetlands Diet: Toward an Understanding of the Great Basin Formative. In *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*, edited by Brian E. Hemphill and Clark Spencer Larsen, pp. 55–83. University of Utah Press, Salt Lake City.
- Currey, Donald R.
 1990 Quaternary Palaeolakes in the Evolution of Semidesert Basins, with Special Emphasis on Lake Bonneville and the Great Basin, U.S.A. *Palaeogeography, Palaeoclimatology, Palaeoecology* 76:189–214.
- Currey, D. R., G. Atwood, and D. R. Mabey
 1984 *Major Levels of Great Salt Lake and Lake Bonneville*. Utah Geological and Mineral Survey Map 73. Utah Geological Survey, Salt Lake City.
- Eglin Air Force Base
 2005 *Eglin Air Force Base Integrated Cultural Resources Management Plan Implementation, Okaloosa, Santa Rosa, and Walton Counties, Florida*. Prentice Thomas & Associates, Fort Walton Beach, Florida.

- Ezzo, Joseph A.
 1999a *Explorers of the Desert Great Basin: The Archaeology of the Utah Test and Training Range*, Technical Report 98-31. Statistical Research, Tucson.
- 1999b *A Synthesis of Archaeological Studies on the Utah Test and Training Range*. Technical Report 98-32. Statistical Research, Tucson.
- Fowler, Catherine S.
 1990 Ethnographic Perspectives on Marsh-Based Cultures in Western Nevada. In *Wetland Adaptations in the Great Basin*, edited by Joel C. Janetski and David B. Madsen, pp. 17–31. Occasional Papers No. 1. Museum of Peoples and Cultures, Provo, Utah.
- Glassow, Michael
 1977 Issues in Evaluating the Significance of Archaeological Resources. *American Antiquity* 42:413–420.
- Grayson, Donald K.
 1993 *The Desert's Past: A Natural Prehistory of the Great Basin*. Smithsonian Institution Press, Washington, D.C.
- Hemphill, Brian E., and Clark Spencer Larsen (editors)
 1999 *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*. University of Utah Press, Salt Lake City.
- Holmer, Richard N.
 1986 Common Projectile Points of the Intermountain West. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 88–115. University of Utah Anthropological Papers No. 110. University of Utah Press, Salt Lake City.
- Janetski, Joel C.
 1986 The Great Basin Lacustrine Subsistence Pattern: Insights from Utah Valley. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 145–167. University of Utah Anthropological Papers No. 110. University of Utah Press, Salt Lake City.
- 1990 Wetlands in Utah Valley Prehistory. In *Wetland Adaptations in the Great Basin*, edited by Joel C. Janetski and David B. Madsen, pp. 233–257. Occasional Papers No. 1. Museum of Peoples and Cultures. Provo, Utah.
- Kelly, Robert L.
 1999 Theoretical and Archaeological Insights into Foraging Strategies among the Prehistoric Inhabitants of the Stillwater Wetlands. In *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*, edited by Brian E. Hemphill and Clark Spencer Larsen, pp. 117–150. University of Utah Press, Salt Lake City.
- King, Thomas F.
 2004 *Cultural Resource Laws & Practice: An Introductory Guide*. 2nd edition. AltaMira Press, Walnut Creek, California.

- Larson, Clark Spencer, and Dale L. Hutchinson
 1999 Osteopathology of Carson Desert Foragers: Reconstructing Prehistoric Lifeways in the Western Great Basin. In *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*, edited by Brian E. Hemphill and Clark Spencer Larsen, pp. 184–202. University of Utah Press, Salt Lake City.
- Madsen, David B.
 1986 Great Basin Nuts: A Short Treatise on the Distribution, Productivity, and Prehistoric Use of Pinyon. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 21–41. University of Utah Anthropological Papers No. 110. University of Utah Press, Salt Lake City.
 1988 Hunting Hoppers. *American Antiquity* 53:593–604.
 1993 Testing Diet Breadth Models: Examining Adaptive Change in the Late Prehistoric Great Basin. *Journal of Archaeological Science* 20:321–329.
 1999 Environmental Change during the Pleistocene-Holocene Transition and Its Possible Impact on Human Populations. In *Models for the Millennium: Great Basin Anthropology Today*, edited by Charlotte Beck, pp. 75–82. University of Utah Press, Salt Lake City.
- Madsen, David B., and Joel C. Janetski
 1990 Introduction. In *Wetland Adaptations in the Great Basin*, edited by Joel C. Janetski and David B. Madsen, pp. 1–4. Occasional Papers No. 1. Museum of Peoples and Cultures, Provo, Utah.
- McHargue, Georgess
 1998 *In the North Country: The Archaeology and History of Twelve Thousand Years at Fort Drum*. Timelines, Littleton, Massachusetts.
- National Park Service
 1991 *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. Interagency Resources Division, National Park Service, U.S. Department of the Interior, U.S. Government Printing Office, Washington, D. C.
- O’Connell, James F.
 1995 Ethnoarchaeology Needs a General Theory of Behavior. *Journal of Archaeological Research* 3:205–255.
- O’Connell, James F., and Robert G. Elston
 1999 History, Theory, Archaeology, and the Management of Cultural Resources: Commentary. In *Models for the Millennium: Great Basin Anthropology Today*, edited by Charlotte Beck, pp. 261–265. University of Utah Press, Salt Lake City.
- Rhode, David
 1999 The Role of Paleoecology in the Development of Great Basin Archaeology, and Vice-Versa. In *Models for the Millennium: Great Basin Anthropology Today*, edited by Charlotte Beck, pp. 29–49. University of Utah Press, Salt Lake City.

- Rhode, David, and David B. Madsen
 1998 Pine Nut Use in the Early Holocene and Beyond: the Danger Cave Archaeobotanical Record. *Journal of Archaeological Science* 25:1199–1210.
- 1995 Late Wisconsin/Early Holocene Vegetation in the Bonneville Basin. *Quaternary Research* 44:246–256.
- Rush, Laurie W., Randy Amici, James Rapant, Carol Cady, and Steve Ahr
 2003 Glacial Geology and Prehistoric Sensitivity Modeling, Fort Drum, New York. In *Geoarchaeology in the Glaciated Northeast*, edited by David L. Cremeens and John P. Hart, pp. 91–101. New York State Museum Bulletin 497. State Education Department, University of the State of New York, Albany.
- Schoeninger, Margaret J.
 1999 Prehistoric Subsistence Strategies in the Stillwater Marsh Region of the Carson Desert. In *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*, edited by Brian E. Hemphill and Clark Spencer Larsen, pp. 151–166. University of Utah Press, Salt Lake City.
- Simms, Steven R.
 1985 Acquisition Cost and Nutritional Data on Great Basin Resources. *Journal of California and Great Basin Anthropology* 7:117–125.
- 1999 Farmers, Foragers, and Adaptive Diversity: The Great Salt Lake Wetlands Project. In *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*, edited by Brian E. Hemphill and Clark Spencer Larsen, pp. 21–54. University of Utah Press, Salt Lake City.
- Simms, Steven R., and Anan W. Raymond
 1999 No One Owns the Deceased! The Treatment of Human Remains from Three Great Basin Cases. In *Prehistoric Lifeways in the Great Basin Wetlands: Bioarchaeological Reconstruction and Interpretation*, edited by Brian E. Hemphill and Clark Spencer Larsen, pp. 8–20. University of Utah Press, Salt Lake City.
- Thomas, David Hurst
 1986 Contemporary Hunter-Gatherer Archaeology in America. In *American Archaeology Past and Future: A Celebration of the Society for American Archaeology 1935-1985*, edited by David J. Meltzer, Don D. Fowler, and Jeremy A. Sabloff, pp. 237–276. Smithsonian Institution Press, Washington, D.C.
- Thomas, Prentice M., Jr.
 2005 Eglin Air Force Base Predictive Model. Internal review document prepared by Prentice Thomas & Associates, Inc. Manuscript on file, Eglin Air Force Base, Florida.
- Wagner, Heather, Margaret Schulz, and Laurie Rush
 2005 *Integrated Cultural Resources Management Plan (ICRMP), 2006–2010*. Center for Environmental Management of Military Lands, Colorado State University, Fort Collins.

Young, D. Craig

2008 *The Archaeology of Shifting Environments in the Great Salt Lake Desert: A Geoarchaeological Sensitivity Model and Relative Chronology for the Cultural Resources of the US Air Force Utah Test and Training Range*. Far West Anthropological Research Group, Davis, California.

APPENDIX A

INSTALLATION CRM STAFF INTERVIEW QUESTIONNAIRE

1. Do you use your installation's predictive model for cultural resources management and compliance related applications? If so, how?
2. What other management and compliance related needs could be, or should be, addressed using the model in its current form?
3. What are the biggest problems with, or limitations to, using the predictive model in its current form for CRM and environmental compliance at your installation?
4. What would be needed in order to improve the existing model as a planning tool for CRM and environmental compliance?
5. What potential management and compliance related applications of an improved model would your installation find useful?
6. What are the views of your base management towards predictive models and their use for CRM and environmental compliance?
7. How would you describe the relationship between the CRM program and the SHPO? Good, fair, poor?
8. What does the SHPO think of the current model and its use, especially for Section 106 compliance? How might they view future application of an improved model?
9. Describe the relationship between your installation's CRM program and any tribes that are consulting parties for Section 106 compliance? Good, fair, poor?
10. What are the views of the tribes regarding the compliance process and the use of your predictive model in the compliance process?
11. What about other stakeholders? How do they view the model and its use?
12. Does your CRM program currently have a PA covering the Section 106 process? If so, please describe what it does.
13. What ideas do you have on how to incorporate the current model into a PA for the purposes of streamlining the Section 106 compliance process?

APPENDIX B

CONCEPTUAL OUTLINE OF A PROGRAMMATIC AGREEMENT FOR EGLIN AFB

David W. Cushman

Eglin Air Force Base (Eglin AFB) intends to develop a Programmatic Agreement (PA) that will guide how it meets its responsibilities under Sections 106 of the National Historic Preservation Act (NHPA) and its implementing regulations 36 CFR (Code of Federal Regulations) Part 800.

In recent years, Eglin AFB has experienced a significant increase in military training activities that have the potential to affect historic properties listed in or eligible for listing in the National Register of Historic Places. The National Register of Historic Places (NRHP) is the nation's honor role of places significant to American history, architecture, archaeology, engineering and culture. As these training activities have increased in frequency and complexity, Eglin AFB finds that it needs to be able to meet its Section 106 obligation in a more timely fashion and with greater flexibility than is possible under the standard regulations.

Under the standard Section 106 consultation process, federal agencies must consult with the State Historic Preservation Officer (SHPO), and other consulting parties, each time an undertaking is proposed that may affect a historic property before the action is authorized. A historic property is any district, site, building, structure or object that is included in, or eligible for inclusion in, the NRHP. The purpose of consultation is to solicit input from the parties on what the agency proposes to do to take into account the effect of its actions on historic properties. The Section 106 regulations, however, provide federal agencies with the option of meeting their responsibilities programmatically through a PA. As such, Eglin AFB proposes to consult with all parties that are concerned about how it meets its obligations under the NHPA and will invite them to participate in the process of developing a PA.

PAs allow federal agencies to customize the Section 106 process to fit the agency's needs. They are ideally suited for large scale, complex situations, involving multiple undertakings when the effects of each action on historic properties cannot be known in advance. While the basic requirements in the regulatory process must be met, how this is to be achieved is negotiated among the agency and the consulting parties and then codified in a PA. Typically, a PA contains a series of stipulations that guides what will be done, when and by who as individual undertakings are proposed. When the agreement is signed, the agency demonstrates its Section 106 compliance for all future undertakings. By entering into a PA, Eglin AFB believes it can better balance its military training objectives with its commitment to manage its historic properties in compliance with the NHPA.

The PA will apply to all undertakings that have the potential to affect historic and prehistoric archaeological sites, as well as, historic infrastructure associated with the development and use of testing ranges from World War II through the end of the Cold War (A.D. 1941–1991). An existing PA, implemented in 2003, covers potential effects to historic buildings and archaeological sites at Eglin AFB. The proposed agreement will expand upon the provisions protecting archaeological sites and add provisions requiring the consideration of effects to historic test ranges and related infrastructure.

Presented below is a list of ideas on what could be included in the PA. These ideas are presented as points of discussion to be considered by the consulting parties when the formal negotiation on drafting the PA begins. The objective is to get feed back at an early stage during the agreement's conceptual development so that when the drafting process begins the parties have a common understanding of the basic concepts that will form the "backbone" of the PA. It is anticipated that the parties to the agreement will include Eglin AFB, the Advisory Council on Historic Preservation (Advisory Council), the Florida SHPO, the Miccosukee Tribe of Indian of Florida, the Seminole Tribe of Florida, the Poarch Band of Creek Indians of Alabama, the Muskogee (Creek) Nation of Oklahoma, and the Muskogee Nation of Florida. Other consulting parties are likely to be added as the drafting process moves forward.

All parties to the agreement will be asked to sign it once the drafting is complete; however, Eglin AFB, the Advisory Council, if participating, and the SHPO are required to sign as signatory parties. All other parties will be invited to sign the agreement as concurring parties to give them the opportunity to acknowledge that they have been invited to participate in consultation process and to demonstrate their support for the PA, if they so choose. Note: Under the Section 106 regulations, if a signatory party will not sign, the PA cannot go into effect. If a concurring party will not sign, the PA can be implemented without that party's signature.

Eglin AFB is in an excellent position to meet its regulatory responsibilities in a programmatic fashion for the following reasons.

- It has an experienced, qualified cultural resources staff.
- It has a history of effective cultural resources management that began in 1982.
- It has developed a five-year Integrated Cultural Resources Management Plan (ICRMP) for the Base, which establishes goals and procedures for meeting its historic preservation responsibilities.
- It has conducted extensive inventory for archaeological sites and historic buildings and structures.
- It has developed a comprehensive historic context study of historic ranges, test sites and instrumentation areas that were used from 1941 to 1991.
- It has developed and maintains an electronic database on all known cultural resources within the base that is used in conjunction with a base-wide Geographic Information System (GIS). The GIS database displays the spatial location of cultural resources in relation to other data layers thereby enhancing Eglin AFB's capabilities for environmental planning and compliance with federal environmental mandates including the NHPA.
- It has developed and maintains a GIS-based model that characterizes the probability of locating prehistoric archaeological sites anywhere within the base. The model is based upon the environmental signature of known prehistoric archaeological sites. It correlates site location, landform, and proximity to potable water to predict the expected location of sites in areas that have not yet been inventoried. This gives Eglin AFB an effective tool for both Section 106 compliance and Section 110 planning.

The following ideas are presented in the order in which they will appear in the PA. Proposed language for each stipulation is presented in summary form at the end of this proposal.

Identification: The Site Predictive Model will be incorporated into the PA under the stipulation for identification. The model was developed in 1982 and since then has been expanded and refined. It is actively used by the cultural resources staff as an effective planning and compliance tool.

The model will be used as a means of limiting future identification to the high probability areas (HPA) for prehistoric archaeological sites. Using the model to predict the expected location of prehistoric sites will promote greater efficiency by directing future identification efforts to those areas where it is most justified. Eglin AFB has also identified the probable locations of historic homesteads by researching archival records on homestead claims. These results, plus the predicted location of prehistoric archaeological sites, are used to define HPAs for the base. There are three HPA zones: prehistoric, homestead/historic, and wetland. Survey standards for all three HPA zones will be attached as an appendix to the PA.

In addition to modeling the location of prehistoric archaeological sites for Section 106 compliance, Eglin AFB uses the site predictive model to aid in identifying properties that may be NRHP eligible in compliance with Section 110 of the NHPA. Eglin AFB proposes adding language to the PA that formalizes the use of the model for this purpose.

Lastly, the range historic context study will be consulted to locate any known historic structures or related features that may be affected by an undertaking. Additional archaeological survey or architectural inventory will be conducted following the recommendations contained in the context study.

Eligibility: Eglin AFB proposes to add language to the PA that establishes the process by which NRHP eligibility determinations are made. National Register eligibility is critical to the Section 106 process. Only those cultural resources found to meet the criteria of eligibility established under regulation will require additional consideration in the planning process.

Eglin AFB, in consultation with SHPO, will determine the National Register eligibility of all cultural resources on the base that may be affected by a proposed undertaking. If Eglin AFB determines that an archaeological site is potentially eligible for listing in the NRHP, but would require further archaeological testing to make this evaluation, the PA will enable the undertaking to go forward provided that the site is avoided and preserved in place. Under these circumstances, Eglin AFB may test the site after the undertaking is completed and consult with SHPO on its eligibility status.

Eglin AFB will follow the eligibility recommendations contained in the range historic context study. No additional consultation with SHPO will be required in cases where the context study has made an eligibility recommendation. All structures and features that have not been evaluated for National Register eligibility will require SHPO consultation.

The PA will define “eligible” and “potentially eligible.”

Effect: Under the Section 106 regulations, an effect is any action that may alter the characteristics that qualifies a historic property for listing in the NRHP. Like eligibility, the standard process requires that Eglin AFB determine effects in consultation with the SHPO.

In the PA, Eglin AFB proposes that it be authorized to make determinations of effect, without prior SHPO consultation, when no cultural resources are found during inventory, when cultural resources are found but have been determined not to be eligible through prior consultation with SHPO, or when historic properties are found but will not be affected because they will be avoided.

Avoidance: Eglin AFB will add language to the PA that establishes avoidance and preservation in place as the preferred means of protecting historic properties during the planning for all undertakings. Avoidance is preferred because it is a faster and cheaper alternative to treatment and results in a better preservation outcome.

To ensure avoidance, Eglin AFB will review project plans and recommend avoidance procedures for each undertaking. The PA will include a list of standard avoidance procedures, to be defined, for this purpose. It will also include the option for Eglin AFB to require that proposed undertakings be monitored by a qualified cultural resources professional to ensure avoidance.

Eglin AFB proposes that it not be required to consult with SHPO regarding avoidance, but be given the option to consult if needed.

The PA will define “avoidance.”

Treatment of Effect: Treatment is the means by which federal agencies determine, in consultation with the consulting parties, what will be done to mitigate the effects of its actions on historic properties before the undertaking is approved.

When avoidance is not possible, Eglin AFB will mitigate the effects of the undertaking by means of a treatment plan. The PA will stipulate what must be included in a treatment plan. The treatment plan will be sent to the SHPO and other consulting parties for review within a standard 30-day review period. Eglin AFB will consider all the comments and responses and make changes as needed to improve the plan. Once completed, Eglin AFB will ensure the treatment plan is implemented and will provide copies of reports and other documentation to the consulting parties for their information.

The PA will define “treatment plan”

Qualifications: To ensure that all work performed under the terms of the PA is conducted by qualified individuals, Eglin AFB will commit to hiring personnel on staff, and contracting with individuals who meet the Secretary of the Interior’s professional qualifications.

Exemptions: There are parts of Eglin AFB that contain hazardous materials, e.g., unexploded ordinance resulting from past military activities that make these areas too dangerous to access for cultural resources investigations. Eglin AFB proposes to exclude these areas from future survey. These areas will be indicated on a map attached to the PA as an appendix.

In addition, Eglin AFB believes that certain kinds of undertakings can be excluded from review under the terms of the agreement because they have little or no potential to affect historic properties. A list of the exempted actions, to be developed by Eglin AFB in consultation with the consulting parties, will be added as an appendix to the PA. Any activities not on that list will be subject to review. The list of exempted activities will be developed and circulated for comment as part of the drafting process for the PA.

Unanticipated Discoveries: As a contingency, Eglin AFB will include in the PA a provision that would apply if and when there is an accidental discovery of cultural resources that occurs during project construction. These instances will include any undertaking, exempted or otherwise, in which a historic or prehistoric archaeological site is found, or a known historic structure or feature associated with the historic testing ranges is affected in a way that was not anticipated. Under these circumstances, Eglin AFB will ensure that the construction is halted and through a series of expedited steps, including SHPO consultation, resolve the situation so that construction can continue

Human Burials: If human graves and grave goods are found, either as an unanticipated discovery, or during archaeological data recovery, Eglin AFB will follow a special contingency plan. Because the installation is federal land, any Native American graves found on base will fall under the provisions of the Native American Graves Protection and Repatriation Act. Eglin AFB will follow these requirements. If Eglin AFB determines that the grave is either not Native American or cannot be identified as to origin, then Eglin AFB will follow the requirements of Florida's Unmarked Burial Law and consult with the SHPO and the State Archaeologist to resolve the situation.

Tribal Consultation: Under the Section 106 regulations, federal agencies are required to consult with Native Americans whenever a federal undertaking may affect places of cultural and religious significance to tribes. Eglin AFB has identified four federally recognized tribes as having ancestral ties to the land contained within its limits. These are the Miccosukee Tribe of Indians of Florida, the Seminole Tribe of Florida, the Poarch Band of Creek Indians of Alabama, the Muskogee (Creek) Nation of Oklahoma. These tribes, and any other tribes that so requests, will be consulted about possible effects to places of cultural and religious significance under the PA.

Emergency Situations: In the event that Eglin AFB is struck by a hurricane or other natural disaster, there needs to be a stipulation that explains what the U.S. Air Force will do. In order to protect health and safety, Eglin AFB should be able to do what is needed without having to abide by the PA. As such, this stipulation will waive the PA in response to emergencies that are declared by the Governor or the President. Once the emergency situation has passed, which will be defined in the PA, the PA will go into effect once again. Eglin AFB will then inspect those areas of the base in which damage is likely to have affected historic or prehistoric archaeological sites, or historic structures and features related to the development and use of the test ranges. Eglin will record and evaluate any damage done to these historic properties, and preserve and protect historic properties where possible.

Failure to Comply: If Eglin AFB inadvertently authorizes an action that should have been reviewed under the terms of the PA, then there needs to be some means of documenting this lapse, assessing damage to historic properties, if any, and notifying the SHPO and the appropriate authorities. This will have the effect of encouraging compliance with the PA over the long run.

Amendments, Termination and Dispute Resolution: Standard provisions for changing the agreement, ending the agreement and resolving any disputes that arise in the course of the agreement will be included.

Annual Report: The idea behind an annual report is that it commits Eglin AFB to an accounting of its actions for which prior SHPO consultation is not required. This includes situations in which Eglin AFB determines that no historic properties will be affected by a proposed undertaking and when avoidance measures are used to ensure no historic properties will be affected.

Triennial Review: A requirement that all parties to the PA have a face-to-face meeting every three years, or as requested by a signatory to the PA, is recommended because it builds in accountability and gives all the consulting parties an opportunity to talk about how the PA is working. If there are problems with its performance, then this meeting becomes an opportunity for addressing those problems and making any amendments if needed.

Sunset Provisions: The agreement will include a provision that automatically terminates that agreement after a set period of time, ten (10) years for example, unless the parties agree to extend the agreement for another term.

In conclusion, the proposed stipulations presented here are all subject to negotiations but indicate what Eglin AFB wants to achieve in developing a PA. In short, Eglin AFB is looking for greater authority and flexibility in meeting its Section 106 responsibilities. With the proper safeguards and accountability measures included in the PA, Eglin AFB believes that it can achieve more effective planning and compliance outcomes and be more responsive to the mission needs of the US Air Force.

Summary of Proposed Stipulations

Identification

- Eglin AFB will utilize the site predictive model in determining where to conduct archaeological survey to meet its obligations under Section 106 and Section 110 of the NHPA.
- Those undertakings located in areas identified as low probability areas for prehistoric archaeological sites will not require archaeological survey.
- Those undertakings located in areas identified as high probability areas (HPA) for prehistoric and historic archaeological sites will require archaeological survey.
- Survey of the HPA areas will follow existing survey standards for each of the three HPA categories: prehistoric, homestead/historic, and wetland. The survey standards will be attached as an appendix to the PA.
- Eglin AFB will consult the range historic context study to locate any known historic structures or related features that may be affected by an undertaking. If there may be an effect, then additional archaeological survey or architectural inventory will be conducted where recommended by the context study.

Eligibility

- Eglin AFB shall determine, in consultation with SHPO, the eligibility of all cultural resources within the APE that may be affected by a proposed undertaking.
- If Eglin AFB determines, in consultation with SHPO, that a historic or prehistoric archaeological site is potentially eligible for listing in the NRHP, but further archaeological testing is needed to make this evaluation, then provided that the site is avoided and protected in place in accordance with the Avoidance Stipulation, the

undertaking may go forward. Under these circumstances, Eglin AFB may test the site after the undertaking is completed and consult with SHPO to determine its eligibility.

- Eglin AFB shall follow the eligibility recommendations contained in the range historic context for all ranges, test sites, and instrumentation areas. No additional consultation with SHPO will be required in cases where the context study has made an eligibility recommendation. All structures and features associated with ranges, test sites and instrumentation areas that have not been evaluated for National Register eligibility will require SHPO consultation.

Effect

- Eglin AFB will determine the effects of each undertaking on historic properties.
- Eglin AFB will consult with the SHPO whenever an undertaking may have an adverse effect or no adverse effect to historic properties.
- Eglin AFB will not be required to consult on effect with SHPO or the other consulting parties in the following circumstances:
 - Where no cultural resources are found within the APE
 - Where cultural resources are found but have been determined not to be eligible through prior consultation with SHPO
 - Where historic properties, previously determined to be eligible through consultation with SHPO, are found but will be avoided in accordance with the Avoidance Stipulation.
- Documentation supporting these “no effect” determinations will be provided to the SHPO in an annual report.

Avoidance

- Eglin AFB will avoid all historic properties whenever possible.
- Avoidance will require utilizing various avoidance measures including, but not limited to, one or more of the following as appropriate:
 - Flagging
 - Signage
 - Temporary fencing
 - Other removable barriers
 - Gating and other permanent barriers
- Eglin AFB may also require on-site monitoring by a qualified cultural resource professional to ensure avoidance during the undertaking.
- Eglin AFB will not be required to consult with the SHPO or other consulting parties when avoidance as stipulated can be achieved, but may seek their advice, as needed.

Treatment of Adverse Effect

- If Eglin AFB determines, in consultation with SHPO, that avoidance is not possible, and there will be an adverse effect to a historic property, then Eglin AFB will mitigate the effects of the undertaking in accordance with a treatment plan.
- At a minimum, a treatment plan will include:
 - A description of the proposed undertaking
 - A description of each historic property and how each may be affected by the proposed undertaking
 - A set of research questions and objectives
 - A description of methods to be used in collecting data needed to achieve the research questions
 - A description of analytical techniques to be used in addressing the research questions
 - A description of how and where artifactual materials will be curated
- Treatment will be conducted in the following manner:
 - Eglin AFB will ensure that a treatment plan is prepared by a qualified cultural resource professional.
 - The treatment plan will be submitted to SHPO and the other consulting parties for 30-day review.
 - Eglin will take into consideration any comments submitted by the SHPO and other consulting parties and make any changes needed to improve the treatment plan.
- The treatment recommendations contained in the range historic context study will be followed whenever structures or features associated with ranges, test sites or instrumentation areas identified in the context study may be affected. These recommendations will be addressed in the treatment plan.
- Eglin AFB may monitor an undertaking as part of treatment. Monitoring as part of treatment will be described in the treatment plan. Any such monitoring will be conducted by a qualified cultural resource professional.
- Eglin AFB will ensure that treatment of adverse effects is conducted in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation or the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings, as applicable.
- Copies of all reports and other treatment related documentation will be provided to the SHPO. Eglin AFB will send copies to all other consulting parties upon request.

Qualifications

- Eglin AFB commits to hiring personnel on staff and, as needed, contracting with individuals who meet the Secretary of the Interior's Professional Qualifications. All, monitoring, testing, excavation, treatment, research, analysis, curation, and report preparation carried out in compliance with the terms of this PA will be conducted by, or under the supervision of, a cultural resources professional who meet the Secretary of the Interior's Professional Qualifications (To Be Determined).

Exemptions

- The following areas shall be exempted from the identification requirements of this PA (To Be Determined—map to be attached as an appendix). These areas contain hazardous materials and are too dangerous to access for cultural resources investigations.
- The following undertakings shall be exempted from Section 106 compliance on Eglin AFB (To Be Determined—list to be attached as an appendix). These undertakings are determined to have little or no potential to affect National Register eligible history properties.
- If during implementation or construction of any of these exempted undertakings, an unanticipated discovery is made, Eglin AFB shall follow the provisions for unanticipated discoveries below.

Unanticipated Discoveries

- If during construction a previously unknown archaeological site is encountered or a known historic structure or feature is affected in an unanticipated manner, Eglin AFB shall ensure that:
 - Construction at the discovery is halted.
 - The discovery is protected from further harm, as needed.
 - An assessment of eligibility and effect is conducted by a qualified cultural resources professional.
 - The SHPO is consulted.
 - The tribes are consulted if prehistoric archaeological sites or historic Native American archaeological sites are found.
 - Treatment, if warranted, is conducted in accordance with the provisions for treating adverse effect.

Human Burials

- Eglin AFB shall ensure that if human graves, marked or unmarked, are encountered anywhere on the base during treatment or in unanticipated discovery, all work ceases at the grave location, the grave and its contents are protected from further harm, and a qualified cultural resources professional examines the grave.
- If Eglin AFB determines the grave is Native American, it will notify the State Archaeologist, and consult with the appropriate tribe or tribes pursuant to the Native American Graves Protection and Repatriation Act.
- If Eglin AFB determines the grave is not Native American, or the identity of the grave is undetermined, Eglin AFB will consult with SHPO and the Florida State Archaeologist pursuant to either 36 CFR Part 800 or the Florida Unmarked Burial Law FS 872, as applicable.

Tribal Consultation

- Eglin AFB will develop and enter into a protocol with each federally recognized tribe with cultural and historical affiliations to lands within Eglin AFB establishing appropriate means for consultation on Section 106 undertakings.
- Eglin AFB will conduct ethnographic studies in consultation with the tribes to identify places that may have religious and cultural significance.
- Until the Native American consultation protocols are in place, Eglin AFB shall consult with the tribes whenever a proposed undertaking will adversely affect a prehistoric or historic Native American archaeological site. The purpose of these consultations will be to consider the views of the tribes on places of religious and cultural significance in the planning process.

Declared Emergencies

- Natural disasters such as hurricanes, tornados, tidal surges, etc. may occur requiring an immediate response by Eglin AFB in order to protect health, safety and property. If the president or the governor of the state of Florida declares such an emergency, then the requirements of this PA are automatically waived.
- Once the emergency is declared over, (To Be Determined) the PA will go back into effect. Eglin AFB will then conduct an inspection of all National Register eligible or potentially eligible historic properties that are located in the areas of the base where Eglin AFB has reason to believe the integrity of historic properties may have been compromised during the emergency. Eglin AFB will record the condition of the properties, evaluate their eligibility to the National Register, and recommend any actions needed to protect, stabilize and preserve the properties. This report will be sent to SHPO for review and comment.
- Should Eglin AFB propose follow-up repairs to any historic properties at the conclusion of the emergency, and those repairs may cause additional effects; Eglin AFB shall consult with SHPO to develop a treatment strategy for those properties.
- In all those cases in which Eglin AFB concludes that damage to historic properties is so severe that their integrity has been compromised, then, with SHPO concurrence, these properties will no longer be considered eligible to the National Register.

Failure to Comply

- If and when Eglin AFB is responsible for authorizing an action that would otherwise have been reviewed as an undertaking in accordance with this PA prior to such authorization, Eglin AFB shall, upon learning of the incident, immediately take the following steps.
- Eglin AFB will report the incident to the SHPO and will ensure that a qualified cultural resources professional inspects the location and prepares a damage assessment report within 30 days.
- The report will, at a minimum, include:
 - A description of the incident
 - A description of any historic properties that may have been affected by the incident
 - A description of the effects of the action on historic properties, in any.

- A description of the steps that will be taken to protect, stabilize and preserve any affected historic properties
- Eglin AFB will send the damage assessment report to the SHPO and to appropriate agencies, departments and clients within the base along with an explanation of what steps Eglin AFB will take to ensure that similar failures to comply will not happen again in the future.

Amendment, Termination, and Dispute Resolution

- Any signatory to this PA may request that it be amended, whereupon the parties will consult on the proposed amendment.
- Any signatory to this PA may terminate it by providing thirty (30) days notice to the other parties, provided that the signatories and concurring parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, Eglin AFB shall comply with 36 CFR Part 800 with regard to individual undertakings covered by this PA or with regard to all remaining actions under this PA.
- Should any party to this PA object in writing to Eglin AFB regarding any action carried out or proposed with respect to the undertaking or implementation of this agreement, the agency shall consult with the objecting party to resolve the objection. If Eglin AFB determines that the objection cannot be resolved, it shall consult with Advisory Council on Historic Preservation and request Council comments.

Annual Report

- Every year, within 30 days of the anniversary of the signing of this agreement, Eglin AFB shall submit a report to the SHPO on activities under the Avoidance and the Effect Stipulations in which prior SHPO consultation was not required.

Triennial Review

- Every three years Eglin AFB shall meet with the SHPO and the other consulting parties to review the performance of this agreement and determine if amendments are needed to improve its effectiveness.

Sunset Provisions

- This PA shall become effective on the date it is signed and shall remain in effect for a period of twelve (12) years unless extended by unanimous approval of the signatories or terminated.

APPENDIX C

CONCEPTUAL OUTLINE OF A PROGRAMMATIC AGREEMENT FOR FORT DRUM

David W. Cushman

Fort Drum intends to develop a Programmatic Agreement (PA) that will guide how it meets its responsibilities under Sections 106 of the National Historic Preservation Act (NHPA) and its implementing regulations 36 CFR (Code of Federal Regulations) Part 800. In recent years, Fort Drum has experienced a significant increase in military training and construction activities with the potential to affect historic properties listed in or eligible for listing in the National Register of Historic Places. Under the standard Section 106 consultation process, Fort Drum must consult with the New York State Historic Preservation Office (SHPO), and other consulting parties, every time an undertaking is proposed that may affect a historic property before the action is authorized. The purpose of consultation is to solicit input from the parties on what Fort Drum proposes to do to take into account the effect of its actions on any historic properties that may be affected. Now, however, with the growing demand for training, Fort Drum needs to be able to meet its Section 106 obligation in a more timely fashion and with greater flexibility than is possible under the standard regulations.

Programmatic Agreements, as provided for under 36 CFR Part 800.14, allow federal agencies to customize the Section 106 process to fit the agency's needs. They are ideally suited for large scale, complex situations, involving multiple undertakings where the effects of each action on historic properties cannot be known. While the basic requirements in the regulatory process must be met, how this is to be achieved is negotiated among the consulting parties and then codified in a PA. Typically, a PA contains a series of stipulations that anticipate what will be done, when and by who as individual undertakings are proposed. When the agreement is signed, the agency demonstrates its compliance for all future undertakings covered by the PA. By entering into a PA, Fort Drum believes it can better balance its military training objectives with its commitment to manage its cultural resources in compliance with the NHPA.

The following is a list of ideas on what Fort Drum proposes to be included in the PA. They are presented as points of discussion to be considered by the consulting parties when the formal negotiation on drafting the PA begins. The objective is to get feed back at an early stage during conceptual development so that when the drafting process begins the parties have a common understanding of the basic concepts that will form the "backbone" of the agreement. It is anticipated that the parties to the agreement will include Fort Drum, the Advisory Council on Historic Preservation (Advisory Council), the New York SHPO, the Oneida Indian Nation, the Onondaga Nation, and the St. Regis Mohawk Tribe. Other consulting parties are likely to be added as the drafting process moves forward.

Fort Drum is in an excellent position to meet its regulatory responsibilities in a programmatic fashion for the following reasons.

- It has an experienced, qualified cultural resources staff.
- It has a history of effective cultural resources management that began in 1985.

- It has developed a five-year Integrated Cultural Resources Management Plan (ICRMP) for the installation, which establishes goals and procedures for meeting its historic preservation responsibilities.
- It has conducted extensive inventory for prehistoric sites and historic buildings and structures creating four National Register districts for archaeological sites and one for historic buildings and structures.
- It has developed and maintains an electronic database on cultural resources within the base that is used in conjunction with a base-wide Geographic Information System (GIS). The GIS database displays the spatial location of cultural resources in relation to other data layers thereby enhancing Fort Drum's capabilities for environmental planning and compliance with federal environmental mandates including the NHPA.
- It has developed and maintains a GIS-based model that characterizes the sensitivity of the base for the presence of prehistoric archaeological sites. Called the "Glacial Landscape Model," it stratifies the landscape into different sensitivity zones based on an understanding of the relationship among known prehistoric site locations, glacial hydrology and landforms. This gives Fort Drum an effective tool for both Section 106 compliance and Section 110 planning. Additional cultural resources models have also been developed enhancing Fort Drum's planning capability.

The following concepts and ideas are presented along with an explanation for each.

Identification: Fort Drum intends to utilize the Glacial Landscape Model for Section 106 compliance by incorporating the model into the PA under the stipulation for identification. The model was developed in 1999 and since then has been tested, refined, and expanded. It is actively used by the CRM Staff as an effective planning and compliance tool. As presented below, the model will be used as a means of limiting future identification to those areas that are indicated as high sensitivity zones for prehistoric archaeological sites. Only in certain circumstances, where an undertaking is in proximity to a navigable river or stream, will survey be conducted in low sensitivity areas. Using the model in this manner will promote greater efficiency by directing future identification efforts to those areas where it is most justified.

Fort Drum also wants to use several additional modeling tools, in conjunction with the Glacial Landscape Model, to meet its obligations under Section 110 to identify and manage NRHP-eligible properties. These additional models include two developed by Fort Drum that are based on deductions about human behavior in the past. The Prehistoric Pathways model predicts where sites associated with prehistoric trail systems that pass through Fort Drum can be expected. The Paleo-Maritime Model extrapolates the shore lines for glacial Lake Iroquois and predicts where shore line settlements ought to be located. Lastly, Fort Drum uses a model that it recently developed and is testing that predicts where sites should be expected in the Adirondack foothills. Together these modeling tools contribute to Fort Drum's capability for planning and resource identification.

There is a need to more clearly define the types of archaeological sites encountered at Fort Drum to enhance resource classification, analysis and communication. Site definitions will be added to the PA in the form of an appendix.

Lastly, the Cantonment Area on Fort Drum has been excluded from survey in the past under the assumption that an earlier historic building inventory was sufficient; however, in some areas,

additional survey is needed. Fort Drum proposes to add language to the PA to ensure that these areas are subject to inventory in the future.

Evaluation: Fort Drum needs to be able to make timely decisions about National Register eligibility. When cultural resources are found during inventory for an undertaking, following the standard regulatory requirements, Fort Drum makes a determination of eligibility and then requests concurrence from the SHPO. The process can take many weeks to complete, however, delaying critical mission needs. Fort Drum proposes that the PA include authorization to make eligibility determinations without prior SHPO consultation, with the understanding that the SHPO can request an accounting of these decisions by Fort Drum at any time.

Effect: Fort Drum also proposes that it be authorized to make determinations of effect without prior SHPO consultation in certain situations. This will apply to cases where no historic properties will be affected by the undertaking (“no historic properties affected”), or where there will be an effect but the effect will not alter the qualities that make a historic property eligible by diminishing its integrity (“no adverse effect”). In the case of the LeRay Mansion Historic District, Fort Drum has a full set of architectural plans and specifications that were prepared and agreed upon in close coordination with the SHPO. It will use these specifications in all cases where maintenance, repair or restoration activities can be limited to in-kind replacement. Again, Fort Drum will provide SHPO with documentation supporting its effect determinations at any time.

Treatment of Effect: In those cases where Fort Drum proposes an undertaking that will adversely affect a historic property, then Fort Drum will consult with the SHPO and the other consulting parties on mitigating the adverse effect through an approved treatment plan. Fort Drum will draft the plan (or have a qualified contractor prepare it for them), and submit it SHPO and other consulting parties for review and comment. All work done will be conducted in accordance with the appropriate standards developed by the Secretary of the Interior. Once the work is completed, copies of any reports or other documents will be sent to the consulting parties.

In addition, Fort Drum proposes to limit further architectural recording, as part of any treatment, for a specific list of buildings and structures that were inventoried during the development of historic context studies by Louis Berger and Associates (LBA). In the process, LBA prepared detailed recordings of buildings and structures effectively capturing the information that will be relevant in cases where treatment is required in the future. In these cases, Fort Drum proposes that it be given the ability in the PA to determine if additional information for treatment is needed or not. This limitation will only apply to the buildings and structures listed in the appendix. All other buildings and structures will be subject to full recording as part of any treatment.

Qualifications: To ensure that all work performed under the terms of the PA is conducted by qualified individuals, Fort Drum commits to hiring and contracting with individuals who meet the Secretary of the Interior’s professional qualifications.

Exemptions: Fort Drum believes that certain kinds of undertakings can be excluded from review under the terms of the agreement because they will have little or no potential to affect historic properties. A list of the exempted actions will be added as an appendix to the PA. Any activities not on that list will be subject to review. The list of exempted activities will be developed and circulated for comment as part of the drafting process for the PA.

In addition, there are parts of the Fort Drum that contain hazardous materials, e.g., unexploded ordinance, resulting from past military exercises that make these areas too dangerous to access for

cultural resources investigations. Fort Drum proposes to exclude these areas from future survey. These areas will be indicated on a map attached to the PA as an appendix.

Unanticipated Discoveries: As a contingency, Fort Drum will include in the PA a provision that would apply if and when there is an accidental discovery of cultural resources that occurs during project construction. These instances will include any action, exempted or otherwise, in which an archaeological site is found or a historic building or structure is affected in a way that was not anticipated. Under these circumstances, Fort Drum will ensure that the construction is halted and through a series of expedited steps, including SHPO consultation, resolve the situation so that construction can continue.

Human Burials: If human graves and grave goods are found, either as an unanticipated discovery, or during archaeological data recovery, Fort Drum will follow a special contingency plan. Because the installation is on federal land, any Native American graves found on base will fall under the provisions of the Native American Graves Protection and Repatriation Act. Fort Drum will follow these requirements. In addition, Fort Drum has a signed Inadvertent Discovery Agreement with the Oneida Indian Nation and will follow the procedures as outlined in the agreement. If, however, Fort Drum determines that the grave is either not Native American or cannot be identified as to origin, then Fort Drum will consult with the SHPO to resolve the situation.

Tribal Consultation: Fort Drum has established positive consultative relationships with the Oneida Indian Nation, the Onondaga Nation, and the St. Regis Mohawk Tribe, all of which have ancestral connections to the land within the base. The tribes are regularly consulted on all matters regarding the management of Native American cultural resources at Fort Drum and this will continue under the terms of the PA. In the future, Fort Drum intends to enter into a separate protocol governing Section 106 consultation with each tribe. Until that time, provisions will be added to the PA ensuring that the tribes will be included in the consultation process. Fort Drum is also aware that there are two archaeological sites that have religious and cultural value to the tribes. It will name these in the PA and commit to their protection.

Amendments, Termination and Dispute Resolution: Standard provisions for changing the agreement, ending the agreement and resolving any disputes that arise in the course of the agreement will be included.

Annual Report: The idea behind an annual report is that it commits Fort Drum to an accounting of its actions for which prior SHPO consultation is not required. These include decisions made about survey, eligibility and effect determinations. Again, under both the sections dealing with eligibility and effect, the SHPO can request documentation on these decisions at any time, but in addition, this information would be provided on an annual basis.

Biennial Review: A requirement that all parties to the PA have a face to face meeting every two (2) years is recommended because it builds in accountability and gives all the consulting parties an opportunity to talk about how the PA is working. If there are problems with its performance, then this meeting becomes an opportunity for addressing those problems and making any amendments if needed.

Sunset Provisions: The agreement will include a provision that automatically terminates that agreement after a set period of time, ten (10) years for example, unless the parties agree to extend the agreement for another term.

In conclusion, the proposed stipulations presented here are all subject to negotiations but indicate what Fort Drum wants to achieve in developing a PA. In short, Fort Drum is looking for greater authority and flexibility in meeting its Section 106 responsibilities. With the proper safeguards and accountability measures included in the PA, Fort Drum believes that it can achieve more effective planning and compliance outcomes and be more responsive to the mission needs of the US Army.

Summary of Proposed Stipulations

Identification

- Ft Drum will apply the Glacial Landscape Model whenever undertakings are proposed that may result in ground disturbance.
- Those undertakings located in areas identified as low sensitivity areas for archaeological sites will not require archaeological survey unless they are within 50 meters of a navigable stream or river.
- Those undertakings located in areas identified as high sensitivity areas for archaeological sites will require archaeological survey
- Fort Drum will utilize the Glacial Landscape Model together with three other models (Prehistoric Pathways, Paleo-Maritime, and Adirondack Foothills) to plan for cultural resources identification conducted under Section 110 of the NHPA.
- Fort Drum shall establish archaeological site definitions.
- All areas within the cantonment shall be subject to historic building inventory or archaeological survey, as needed, whenever undertakings are proposed.

Evaluation

- Fort Drum will apply the National Register criteria to all cultural resources recorded through identification for each undertaking.
- Fort Drum shall not be required to consult with SHPO on National Register eligibility, unless Fort Drum requests such consultation.
- All records on eligibility determinations will be submitted to SHPO at their request at any time.

Effect

- Fort Drum will not be required to consult with SHPO for findings of “no historic properties affected,” and “no adverse effect,” but may request SHPO guidance in these cases as needed.

- Any maintenance, repair or restoration activities carried out by Fort Drum involving the buildings and structures associated with the LeRay Mansion Historic District that are: 1) carried out following existing and approved architectural plans and specifications as developed by Crawford and Stearns, Preservation Architects, and 2) limited to in-kind replacement, will have no adverse effect, and shall not require prior SHPO consultation.
- All records on effect determinations will be made available to SHPO at any time upon written request.

Treatment of Effect

- Fort Drum will consult with the SHPO and other consulting parties whenever an undertaking will have an adverse effect on a historic property.
- Fort Drum will prepare a treatment plan and submit the plan to the consulting parties for review and comment.
- Buildings and structures previously recorded for the development of certain historic contexts will not require additional recording as part of treatment. To be listed in an appendix.
- Fort Drum will conduct treatment of adverse effects in accordance with the appropriate standards and guidelines issued by the Secretary of the Interior.
- Copies of all reports will be provided to the consulting parties upon completion.

Qualifications

- Fort Drum will ensure that the Cultural Resources staff meets the qualifications for archaeologist or historian, as appropriate, as specified in the Secretary of the Interior's Professional Qualifications Standards.
- Fort Drum will ensure that any fieldwork, analysis, testing, treatment and report production conducted by an outside contractor for Fort Drum shall also meet the Secretary of the Interior's Professional Qualifications Standards.

Exemptions

- Certain undertakings will be exempted from Section 106 compliance on Fort Drum because they have little or no chance of affecting historic properties. To be listed in an appendix.
- Certain areas within Fort Drum contain hazardous materials resulting from past military land uses. These areas will be exempted from Section 106 requirements (To be identified in an appendix).

Unanticipated Discoveries

- If during construction a previously unknown archaeological site is encountered or a historic building or structure is affected in an unanticipated manner, Fort Drum will follow a set of emergency stipulations to be defined.
- These might include the following: 1) construction at the discovery is halted, 2) the discovery is secured from further harm, 3) Fort Drum makes an assessment of eligibility and effect, 4) the SHPO is consulted, 5) expedited treatment, if warranted, is conducted.

Human Burials

- Fort Drum will ensure that if human graves are encountered anywhere on the base during treatment or in unanticipated discovery, all work ceases at the grave location, and the grave and its contents are protected from further harm.
- If Fort Drum determines the grave is Native American, it will follow the procedures outlined in the Inadvertent Discovery Agreement signed with the Oneida Indian Nation. The Installation will also consult with the appropriate tribe or tribes pursuant to the Native American Graves Protection and Repatriation Act.
- If Fort Drum determines the grave is not Native American, or the identity of the grave is undetermined, Fort Drum will consult with SHPO pursuant to Section 106 of the NHPA.

Tribal Consultation

- Fort Drum will consult with the Oneida Indian Nation, the Onondaga Nation, the St. Regis Mohawk Tribe, and all other federally recognized tribes with an ancestral connection to the land within the base, whenever a proposed undertaking will adversely affect a prehistoric archaeological site.
- The purpose of these consultations will be to consider the views of the tribes regarding places of religious and cultural significance in the planning process.
- Fort Drum has identified two prehistoric archaeological sites of religious and cultural significance to the Oneida Indian Nation, the Onondaga Nation and the St. Regis Mohawk Tribes. The sites are the Calendar site and the Iroquois Village site.
- Fort Drum will protect and preserve these sites from future disturbance by maintaining their status as off limits to unauthorized personnel

Amendments, Termination and Dispute Resolution

- Any signatory to this PA may request that it be amended, whereupon the parties will consult on the proposed amendment.
- Any signatory to this PA may terminate it by providing thirty (30) days notice to the other parties, provided that the signatories and concurring parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, Fort Drum shall comply with 36 CFR Part 800 with regard to individual undertakings covered by this PA or with regard to all remaining actions under this PA.

- Should any party to this PA object in writing to Fort Drum regarding any action carried out or proposed with respect to the undertaking or implementation of this agreement, the agency shall consult with the objecting party to resolve the objection. If Fort Drum determines that the objection cannot be resolved, it shall consult with Advisory Council and request Advisory Council comments.

Annual Report

- Every year, within thirty (30) days of the anniversary of the signing of this agreement, Fort Drum will submit a report to the SHPO on activities under the Identification, Evaluation and Effects stipulations above in which prior SHPO consultation was not required.

Biennial Review

- Every two (2) years Fort Drum will meet with the SHPO and the other consulting parties to review the performance of this agreement and determine if amendments are needed to improve its effectiveness.

Sunset Provisions

- This PA shall become effective on the date it is signed and shall remain in effect for a period of ten (10) years unless extended by unanimous approval of the signatories or terminated.

APPENDIX D

CONCEPTUAL SIGNIFICANCE MODEL FOR UTAH TEST AND TRAINING RANGE

Lynne Sebastian

The important thing to note at the beginning of this discussion is that what follows is a simplified example of how one might go about constructing a “significance model,” by means of set of rules or algorithms to classify sites into significance categories. Although I have used information from the Utah Test and Training Range (UTTR) to construct the example, I am not proposing that this model should be used by UTTR. In order to construct an actual model that would be scientifically rigorous and useful for management purposes, substantial discussion would need to take place among UTTR cultural resource staff, stakeholders such as the State Historic Preservation Officer (SHPO) and culturally affiliated tribes, and the professional archaeological community in order to identify appropriate significance categories and appropriate variables to use in assigning sites to those categories.

UTTR as a Case Study

UTTR provides an excellent case for experimenting with the concept of an archaeological significance model. It has near optimum physical characteristics—good surface visibility, widely distributed archaeological survey coverage, and a substantial (455), but not overwhelming, number of recorded archaeological sites. The installation participates in the Intermountain Antiquities Computer System (IMACS) which provides a database record of several dozen variables for each recorded site. Additionally, the recently completed geoarchaeological sensitivity model for UTTR (Young 2008) provides information on the archaeological third dimension (depth as well as surface manifestations) that is currently unavailable to many military installation cultural resources management (CRM) programs.

UTTR is also ideal because of its location in the Great Basin, where the archaeological record has been studied, debated, and synthesized with great intensity. The archaeological community of Basin scholars is unusually cohesive—in the sense of having worked closely together over a long period, not (I hasten to add) in the sense of having achieved consensus about the meaning of the archaeological record that they have parsed so carefully over the past half century and more. This lack of consensus about the *answers* to archaeological questions is not a problem for the current experiment in modeling. What is much more important and valuable in terms of this project is that Basin researchers have achieved a high level of consensus about the *questions*.

The vast majority of prehistoric and protohistoric archaeological sites in the Great Basin reflect a single adaptation: broad-spectrum hunting and gathering. Around the margins of the Basin, archaeologists have encountered a variety of more specialized adaptations, including the horticultural Fremont groups in the UTTR vicinity. But in general, the archaeology of the Great Basin is the archaeology of hunters and gatherers—the lifeway that archaeologists call the Archaic. In most of the United States, the Archaic lifeway was replaced by more sedentary lifeways that usually included agriculture and generally more complex social and political organization, which developed hundreds of years before European contact. Only in harsh and isolated regions such as the Great Basin did Archaic lifeways persist, and nowhere else did they persist virtually intact through the early nineteenth century.

Because of the organizational and technological simplicity of Great Basin cultures and the extreme constraints that the Basin environment exercised on cultural decision-making, the Basin has been an excellent laboratory for archaeological studies of the complex interaction between humans and their environment. This has led archaeologists in the region to pursue an unusually consistent (for archaeologists) set of research issues, as most of the works listed in the bibliography for this project demonstrate. The approaches, the techniques, and some of the specific questions have changed enormously over time, but it has been an evolutionary change, with constant refinement and building upon the work of the past. Youthful researchers in the Basin today are still building on many of the issues raised by pioneers such as Jesse Jennings and Robert Heizer, explored by archaeologists of the next generation such as C. Melvin Aikens and John Marwitt, refined and expanded by David Hurst Thomas, Robert Bettinger, David Madsen and others, and taken in new theoretical and methodological directions by James O'Connell, Steven Simms, and others.

This long and cohesive intellectual history in Great Basin archaeology has lead prehistoric archaeological research in the area to focus on a fairly uniform set of issues, as a review of the literature identified in the bibliography demonstrates. The research design for northeastern Utah (Bischoff et al. 2000:30–31) summarizes seven research themes as:

- *Paleoenvironmental Reconstruction*
- *Chronology*
- *Resource Procurement and Technology*
- *Paleoarchaic Adaptations*
- *Wetland Adaptations*
- *The Numic Spread*
- *Fremont Adaptations*

It is these seven research themes that form the basis for the simplified example significance model proposed here.

Variables Used in Modeling

The initial variables used in this example model have to do with the physical characteristics of the currently known archaeological sites within UTTR—the proportional representation of various site types along with any information about their age/cultural affiliation. In order to make this example model consistent with the Young (2008) geoarchaeological model and to integrate their information on geomorphic setting and potential for buried sites into the algorithms developed here, I have used the nine morphological site types that Young and his colleagues defined rather than the mixed functional and morphological site types that appear in the Hill AFB Integrated Cultural Resource Management Plan (ICRMP). These types are:

- *Simple Flaked Stone Assemblage* (i.e., flaked stone only, no features; n=307)
- *Simple Ground Stone Assemblage* (i.e., flaked stone assemblage containing at least one milling stone, no features; n=62)
- *Complex Flaked Stone Assemblage* (i.e., flaked stone with processing, habitation, or storage features, may also include ceramics; n= 25)
- *Complex Ground Stone Assemblage* (i.e., flaked and ground stone with processing, habitation, or storage features, may also include ceramics; n=17)
- *Rockshelter* (n=36)

- *Ceramic Assemblage* (n=2)
- *Fire-cracked Rock Concentration* (i.e., the thermally altered rock typically associated with hearth and roasting features; n=2)
- *Quarry* (i.e., a source of raw material for stone tools or pottery clay; n=2)
- *Other* (n=2)

It is not clear why Young and his colleagues chose not to make a site type differentiation between complex flaked and ground stone scatters that include ceramics and complex flaked and ground stone scatters that do not include ceramics. This information could be a valuable addition to the site type scheme, one that would be important to two of the research themes—*Fremont Adaptations* and *the Numic Spread* (i.e., the migration of Numic-speaking peoples across the Great Basin and beyond). For full-scale model development, this could be accomplished by using the IMACS ceramic variables; I chose to leave the site types as they are for simplicity sake in this example model. Here I substitute the word “scatter” for the word “assemblage” (e.g., Young et al.’s *complex flaked stone assemblage* becomes *complex flaked stone scatter* or simply *complex flaked stone* to indicate site type), and I augment the site type called *rockshelter* with the word “cave” (*cave/rockshelter*).

In addition to using their site types, I also used the temporal periods adopted by Young and his colleagues. According to their data (Young 2008: Appendix A), more than 32 percent of the sites at UTTR (n=146) date to the Early Archaic (or Paleoarchaic) period, which they date to 13,000–6800 years before present (BP). This is not a period that is well represented in most places in the American West, so the sites dating to this period at UTTR may have important contributions to make to our understanding of some of the earliest inhabitants of the region. No other time period at UTTR can begin to approach the level of occupation represented by the Early Archaic.

There are six time periods associated with archaeological sites on the UTTR, an additional class representing sites that could not be dated, which accounts for 43 percent (n=195) of the total, and a final class that represents the remaining 39 sites, which are temporally mixed.

- Paleoindian (>13,000 BP); n=1
- Early Archaic (13,000–6800 BP); n=146
- Middle Archaic (6800–1600 BP); n=24
- Late Archaic (1600–650 BP); n=29
- Fremont (1600–650 BP); n=4
- Late Prehistoric (<650 BP); n=17
- Temporally Mixed (i.e., one or more time periods); n=39
- Temporally Indeterminate; n=195

In developing this simplified example significance model, I also have incorporated the portion of the sensitivity model developed by Young and his colleagues that predicts areas with high, medium, and low potential for buried sites within UTTR.

The example model consists of a series of decision-making “modules” for assigning sites to various significance (and management) categories (which are discussed below). For two of the three modules (**Modules 1 and 2**), I have used Young et al.’s sensitivity model as a quick proxy measure of potential for buried deposits at the known sites. I employed this measure because Young and his colleagues produced a maximum of three potential values for this variable, making it easy to use for the purposes of this example. In the one module where a finer-grained approach to this issue would be especially important (**Module 3**), I have used the IMACS variable “on-site depositional context.”

Finally, I have included among the variables used in development of this example model “proximity to prehistoric lake shores,” a measure developed by Young and his colleagues based on elevation data and on the Currey et al.’s (1984) research on pluvial Lake Bonneville shorelines. I have made the assumption that this variable could indicate which sites have potential to yield information important to the research theme *Wetland Adaptations*.

The remaining variables used in the example model are based on the following information that is coded in the IMACS database:

- depositional context (surficial versus buried; i.e., archaeological deposits on the current ground surface only versus archaeological deposits that are likely buried)
- lithic tools (i.e., the number of formal tools, such as projectile points or scrapers)
- lithic debitage (i.e., estimated quantity of lithic debris resulting from the tool-making process)

One variable that would have been useful in this exercise is presence/absence and assemblage size for obsidian artifacts on the sites, but this information is not available through either the IMACS-encoded data or the data appended to the Young geoarchaeology model. Young and his colleagues make a good argument for the utility of obsidian hydration dating as a source of relative chronology for the sites on UTTR. Since *Chronology* is one of the major research themes here, and especially given the long period encompassed by the Paleoarchaic period as defined, presence of material suited for even relative dating could greatly increase the information potential of a site.

If an actual significance model were to be constructed for UTTR, it would be worthwhile to go back through the site forms and code presence/absence and assemblage size information for obsidian. Although 455 site forms is a substantial number, this would be a manageable task and almost certainly a very useful addition to modeling significance for the installation’s two ranges.

The Significance Categories

Determining what would be the appropriate and useful significance categories for a particular installation is the most critical step in the significance modeling process. It is also one of the steps that would require the greatest amount of discussion and negotiation between the installation and its cultural resource stakeholders. What is important to remember is that these categories are not permanent assignments or indications of some absolute inherent meaning or importance. These are tools for management and decision-making.

Categories and assignment criteria can and should be re-evaluated periodically and as needed. If, for example, an actual significance model were to be developed for UTTR using the currently available variables, and then presence/absence and assemblage size data for obsidian were added to the set of available information for each site, the assignment criteria could be changed and those sites with obsidian samples of sufficient size would potentially be assigned to different categories.

The categories that I have developed for this example model are:

Category 1. These are sites that have potential to yield important information relative to current research questions. These sites would be: (a) considered eligible to the National Register of Historic Places (NRHP) for the purposes of National Historic Preservation Act (NHPA) Section 106 undertakings, (b) used in evaluating relative impacts to the quality of the human environment under the National Environmental Policy Act (NEPA), and (c) given avoidance priority in planning. If sites in this category would be impacted by an installation project or program, they would be subject to full-scale, research design-based data recovery.

Category 2. These are sites with limited data potential. These sites would be considered to be of undetermined NRHP eligibility for the purposes of Section 106 and would not be given priority for avoidance. If sites in this category would be impacted by an installation project or program, they would be subject to pre-established standard treatments under a programmatic agreement between the installation and its stakeholders/consulting parties.

Category 3. These are sites whose data potential has been exhausted through survey recordation. These sites would be considered ineligible to the NRHP and would not receive further consideration in planning or compliance.

Category 4. These are sites whose data potential may be substantial at some point in the future, but cannot be realized at the current time given the state of our knowledge and available archaeological and analytical techniques. These sites would be considered to be of undetermined NRHP eligibility for Section 106 purposes. Reserves containing clusters of Category 4 sites of different types would be set aside in various topographic/geomorphic settings to ensure that samples of these sites would be available for future research. Aside from the reserves, Category 4 sites would not be given special consideration for avoidance. If sites of this type would be affected by an installation project or program, a very small sample of sites might be subject to full data recovery or a slightly larger sample of site might have limited, specifically targeted data recovery carried out if appropriate. The establishment and management of the reserves and the details of the scaled-back data recovery efforts would be developed through a programmatic agreement between the installation and its consulting parties/stakeholders.

Category 5. These are sites with very high traditional cultural values. This is a hypothetical category for this exercise since it is one that would be developed through consultation with Native Americans who attribute religious and cultural significance to types of properties or places within the installation.

Sorting Algorithms

As with establishing the significance categories, selection of the variables to use in sorting sites into categories for an actual model would be a subject of substantial consultation between the installation and its consulting parties/stakeholders. For the purposes of this simplified example, I chose to begin the sorting process with the variable “site type;” other variables such as “time period” could certainly be used, but site type is probably the most useful starting point.

As shown in the diagram for **Module 1**, the first pass through the site data categorizes the rarer site types. Because of the presence of features, the high degree of spatial integrity, and potential for preservation of organic remains, *Cave/Rockshelter*, *Complex Flaked Stone*, and *Complex Ground Stone* sites have the highest potential to yield important information relative to several of the research themes and would be assigned to Category 1. Although quarries can inform us about

Resource Procurement and Technology, they generally have a fairly limited range of information and are amenable to limited data recovery. Thus, they are assigned to Category 2.

Ceramic Scatters and *Fire-cracked Rock (FCR) Concentrations* tend to have very limited information potential. Because *Ceramic Scatters* relate to the Fremont and Late Prehistoric time periods and because sites of these periods are rare at UTTR, however, these sites deserve some consideration in relation to the *Fremont Adaptations* and *Numic Spread* research themes. Likewise *FCR Concentrations* do have some potential to contribute to the *Resource Procurement and Technology* research theme. Using the assumption that ceramic scatters and especially *FCR Concentrations* are more likely to yield at least some information about resource procurement and technology if they include buried materials, the first module sorts these sites into Category 2 for limited data recovery if their Buried Sites Potential score from the Young (2008) model is “high” or “medium” and into Category 3 if their score is “low.”

The second pass through the site data, as shown in the diagram for **Module 2**, focuses on the *Simple Flaked Stone* and *Simple Ground Stone* sites that can be assigned to a specific time period. Because of their rarity, sites dating to the Fremont and Late Prehistoric periods are assigned to Category 1; anything that we learn from these sites may be important to our understanding of *Fremont Adaptations*, the *Numic Spread*, and *Resource Procurement and Technology* at UTTR during these little known periods.

Sites dating to the Middle and Late Archaic periods are also relatively rare at UTTR, which gives them a higher potential to yield useful information relative to the *Resource Procurement and Technology* and *Chronology* research themes. **Module 2** uses the Buried Sites Potential score to sort these sites into Category 1 for full data recovery if they have a score of “high” or “medium” and Category 2 for limited data recovery if they have a score of “low.”

As noted earlier, sites dating to the Early Archaic constitute an unusually high proportion of the total site assemblage at UTTR. Sites of this period have the potential to inform on most of the key research themes: *Paleoenvironmental Reconstruction*, *Chronology*, *Resource Procurement and Technology*, *Paleoarchaic Adaptations*, and *Wetland Adaptations*. Because the “Old River Bed” distributary system and the various stands of pluvial Lake Bonneville were determinants of human use and occupation in the UTTR, **Module 2** uses the Distance to Lakeshore metric developed by Young and his colleagues as a variable for sorting the Early Archaic sites. **Module 2** uses the cut-off distance for Young et al.’s “Class 3” distance from the lakeshore elevations—247 meters—to separate sites that were on or near wetland resources from those that were more distant from those resources. Like all of the variables used to develop these modules, this one could be adjusted up or down in the future, based on excavation data or other new information.

The module sorts the Early Archaic sites that are within 247 meters of lakeshore into Category 1 for full-scale data recovery. For sites located more than 247 meters from lakeshore, the module uses Buried Sites Potential scores to sort those with “high” or “medium” scores into Category 1 and those with “low” scores into Category 4. It is likely that someday we will be able to gain substantial information from surficial Early Archaic sites, despite their lack of spatial integrity, which makes them good candidates for setting aside a sample of them in one or more reserves for future research. It is worth noting at this point, that if information on presence/absence and assemblage size for obsidian artifacts were added to the data base, the **Module 2** algorithms could easily be changed to sort surficial Early Archaic sites with substantial assemblages of obsidian into *Category 2* for their potential to yield chronological information.

Finally, **Module 3** illustrates a possible approach to sorting the large number of *Simple Flaked Stone* and *Simple Ground Stone* sites that cannot currently be dated into usable significance categories for management purposes. This is another of the components of this example significance model that would be strongly affected by the inclusion of information on obsidian assemblages in the available data. Sites with substantial obsidian assemblages might be placed differently into categories by restructured algorithms.

By definition, these site types do not have features or temporally diagnostic artifacts, including ceramics. For sites of this type that have only surface expressions, given our current archaeological methods and technology there is little chance that they can contribute information relative to the *Paleoenvironmental Reconstruction*, *Chronology* (with the obsidian caveat mentioned above), *Paleoarchaic Adaptations*, *Wetlands Adaptations*, *the Numic Spread*, or *Fremont Adaptations* research themes. Their one potential contribution, given current methods, techniques and knowledge, is to the *Resource Procurement and Technology* theme, and even that potential is limited.

In developing the module of the significance model that deals with these sites we need to take two temporal factors into account. The first is that methods, techniques, and knowledge change constantly, and we need to ensure that we do not allow all of the sites of a particular type be destroyed today, only to find tomorrow that we could have learned something important about the past from them. The second is that the landscape itself and the appearance of the archaeological record change constantly. UTTR is a very dynamic landscape. Today it may appear that these sites have no features, no diagnostic artifacts, and little potential to inform us about the majority of the research themes. Tomorrow, however, the dunes will shift location, erosion and deposition will continue, eventually the lake may comeback—all of which can affect our perception of these sites and their data potential enormously.

These and other vectors of temporal change create a dilemma for all land-managing agencies, not just the Department of Defense or Hill Air Force Base. Managers must make decisions about cultural resources today, but they are charged with managing the nation's heritage for the long term. In **Module 3**, I have attempted to balance the needs for current planning and long-term management by considering the potential for future exposure of currently buried archaeological materials and by taking advantage of the potential for setting aside representative samples of sites for future research.

Given their limited data potential relative to the identified research themes for the northeastern Great Basin, most of the sites in **Module 3** do not go into Category 1 for full-scale data recovery. Using variables from IMACS, the module assesses assemblage size and depositional context to sort most of the sites into Categories 2–4. I chose to use the IMACS variable Depositional Context rather than the Buried Sites Potential score from Young (2008) under the assumption that this more fine-grained assessment would be especially important for evaluating these sites. For assemblage size, I used the IMACS variables for Number of Lithic Tools and Estimated Quantity of Lithic Debitage, and I have made the assumption that larger assemblages have greater potential to yield information than smaller assemblages.

Conclusions

I have found, when trying out this concept of significance modeling on my colleagues, that there is an almost irresistible compulsion to argue with the assumptions on which the example sorting algorithms are based, rather than to evaluate the potential of the methods proposed. What I have

offered here is NOT a significance model for UTTR; it is an example of how such a model might be developed, using the UTTR archaeological record as the source data. In order for such a model to actually be developed, there would need to be substantial discussion and consultation among all affected and interested parties to design categories, select variables and values, and determine exactly how the model would be used for planning and compliance.

The other important thing to remember is that the purpose of a significance model is not to classify sites into permanent categories that are then used to guide all management decisions for the rest of time. Like all archaeological models, in order to do their job, significance models must be routinely re-evaluated, revised, and upgraded. The purpose of a significance model is to enable cultural resource managers to make sound, consistent decisions for day-to-day planning and compliance activities while making wise, conservation-based, long-term management decisions in the public interest.