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Ce bulletin technique est le quatrième d'une série concernant les problématiques de la stabilisation des sites archéologiques ainsi que leur protection. Chacun des Bulletins Techniques précédents de la série a décrit une technique potentiellement utile au maintien de l'intégrité des dépôts archéologiques. Celui-ci concerne l'échange d'information, qui fait partie de l'objectif de promouvoir l'interaction entre les institutions gouvernementales, les professionnelles et le secteur privé. Il ne s'agit pas ici d'un guide complet de l'information existant sur la stabilisation, les diverses bibliographies sur le sujet disponibles dans différentes disciplines étant plus appropriées. Il ne s'agit pas non plus de remplacer la prise de contact avec des agences ou des professionnelles ayant réalisé avec succès des projets de stabilisation, dans le but d'obtenir de l'information détaillée. Ce bulletin a plutôt été conçu dans l'intention de fournir une référence disponible des sources, qui recueille et distribue de l'information ayant rapport à la stabilisation des sites archéologiques. Ces sources d'information peuvent se constituer comme points de départ utiles au développement de projets de stabilisation, ainsi que comme des références importantes pour la comparaison des avantages des alternatives les plus appropriées. Elles devraient aussi encourager toute personne étant en cours de planification de projets cherchant à projeter une ample fourchette d'information au niveau pluridisciplinaire, car, bien souvent, d'autres professions ne sont pas pleinement conscientes de combien importants peuvent être leurs savoirs et de leurs capacités pour la préservation de biens archéologique non-renouvelables.

Introduction

The recognition that archeological sites form a class of non-renewable resources has become a key element of the legislative and regulatory process during the last several decades. In the past, the principal alternative used to mitigate adverse effects on significant archeological resources subject to construction or other kinds of land development has simply been systematic archeological excavation. Recently, however, a direction of resource treatment has been to seek a broader range of mitigation alternatives that are in keeping with statutory mandates, and cultural resources management programs have begun to implement activities that provide long-term solutions and preservation in situ. Management of resources for future generations as well as the present is an objective of those mandates, and preservation through site stabilization is a significant aspect of that process.

This Technical Brief is designed to provide an introduction to the variety of sources of baseline stabilization data that can be used when site stabilization efforts are to be planned and initiated. These data will serve equally well for designing solutions to site loss problems and designing management plans to prevent the beginning of site loss. Since budgeted money for managing archeological resources seldom is adequate to meet all of the needs of any given agency, some degree of innovation must be applied when designing stabilization projects. As a direct consequence, archeologists and land managers who are responsible for archeological resources should have a multidisciplinary information base available for their use. Familiarity with this information will enable the cultural resources manager to communicate with engineers and other stabilization specialists during the design phase of a project.

There should be well developed mutual understanding between the cultural resources manager and stabilization specialists, particularly since the latter will follow traditionally accepted or defined standards. Engineers generally will approach a stabilization project design from the perspective of structural technique applications, and they have a tendency to design strengths into a project that are beyond the archeological needs for adequate site protection. Soil scientists and environmental engineers are likely to emphasize a naturalistic approach, such as revegetation. Also, it is not unusual for decisions to employ site stabilization methods to be made by cultural resources managers who may not have an extensive archeology background. Academic programs leading to an advanced degree in anthropology, within which archeology is a sub-field in the United States, may offer coursework in resource management, but few professional archeologists have had any exposure to the wealth of multidisciplinary expertise available to aid in the design and implementation of site stabilization projects. All of these factors highlight site stabilization as a significant alternative to be considered in archeological preservation activities that is both information-rich and management-oriented.

{rokbox title=|Figure 1 :: Shoreline stabilization test area, Cumberland Island National Seashore--placing shell rake, Cumberland Island, GA. (Photos courtesy Robert M. Thorne.)|}images/stories/estandares/12A.JPG{/rokbox}

Projects that are designed specifically to protect an archeological property are nearly identical to those developed for construction and other land development purposes by the U.S. Army Corps of Engineers, the Soil Conservation Service, various transportation agencies, and other land managing agencies on a daily basis. The most important and elementary difference is that the cultural resources manager will be trying to protect a specific element within a matrix, i.e., evidence of various human activities in the past, and not just the matrix in which these data are found. The variety of demonstrably successful techniques for protecting archeological and nonarcheological deposits are the same, however. The cultural resources manager can become familiar with these techniques and should participate fully in the design process. The cultural resources managers may experience some degree of difficulty with the project design process because of the difference in the magnitude of archeological stabilization projects in comparison to most other agency-sponsored stabilization efforts. It is important to understand that most site stabilization projects are down-scaled versions of traditional efforts with one primary difference: the goal is to protect an archeological resource that cannot be replicated.

Finally, cost effectiveness of any site stabilization program must always be a consideration in project design. Even though maximum resource protection must be the primary consideration in a design plan, the most expensive technique is not necessarily the best.

{rokbox title=|Figure 2 :: Boat used to transport shell for experimental shell rake, Cumberland Island National Seashore, Cumberland Island, GA.|}images/stories/estandares/12B.JPG.jpg{/rokbox}

If the cultural resources manager can provide alternative approaches to the design specialist, frequently innovative techniques and approaches can be devised. Familiarity with the variety of stabilization techniques available for a given situation will allow the manager to suggest ways to cut both initial and long-term costs. These can include such things as: using recyclable

materials that can be acquired at little or no cost; the solicitation of contributed materials and supplies, the value of which may be used as a tax deduction by the contributor; or contributed labor from various agencies and organizations.

A stabilization project is likely to be most successful when a systematic approach is taken. Stabilization project designs should, in addition to providing protection to a resource, attempt to improve wildlife habitat, protect endangered species whenever possible, contribute to the aesthetic quality of the area around the resource, and/or provide some level of public education. A systematic approach may initially appear to make planning more difficult, but the advantages that will accrue from a design based upon sound applications of multidisciplinary methods will more than outweigh initial planning problems.

Sources of Technical Information

Corps of Engineers

The U.S. Army Corps of Engineers operates three major research units, called laboratories or centers, that produce information that can be useful in designing site stabilization projects. While each of these units is oriented toward either a geographic region or specific type of research, the kinds of data that they produce can cross regional boundaries or can be applied to other disciplines. The Waterways Experiment Station (WES) and the Coastal Engineering Research Center (CERC) are located in Vicksburg, MS. The Cold Regions Research and Engineering Laboratory (CRREL) is in Hanover, NH, and the Construction Engineering Research Laboratory (CERL) is in Champaign, IL.

Of the three laboratories, WES is the least specialized in regional coverage and research orientation, and to some extent, its breadth of research coverage is better suited to purposes of this discussion. Pertinent Technical Reports, Contractors Reports, and the Archeological Sites Protection and Preservation Notebook provide information that goes beyond waterways research and ranges from data on topics as diverse as vegetation and geosynthetics to cultural resources management and archeological site stabilization. An unannotated index of publications that is updated periodically is available. It is categorized by research unit and further subdivided according to the type of report, i.e., Technical Reports and Contractors Reports. Reports that are no longer available from WES may be obtained from the National Technical Information Service (NTIS). Any WES publication can be obtained through interlibrary loan from the WES technical library. Recently, WES has incorporated much of its experience in research and applications into a training course that serves to introduce the topic of site stabilization and focuses on protection problems in fluvial and lakeshore settings. In cooperation with the Denver Museum of Natural History, WES produced an introductory videotape that demonstrates a wide range of stabilization projects conducted in several different environments. A booklet is available that describes the range of WES technical assistance services that complement its research and publications programs.

The Coastal Engineering Research Center (CERC) is concerned principally with coastal engineering and stabilization problems, but some of the techniques developed there can be modified for application to inland environments. For example, CERC research on coastal dune stabilization can be applied whenever dune instability is a problem.

{rokbox title=|Figure 3 :: Crosstie erosion barriers, Toltec Mounds Park, AR.}images/stories/estandares/BRF12C.JPG.jpg{/rokbox}

Recently, CERC publications have been listed in the same index with WES publications, while publications that predate CERC's relocation to Vicksburg may be obtained from NTIS. A limited number of CERC publications, such as the Shoreline Protection Manual may be purchased from the Government Printing Office. Library access to WES and CERC publications, as well as some of those from CERL and CRREL, will be most readily available at the various Corps District and Division libraries. WES and CERC maintain a library that has an active interlibrary loan program.

Of the three Corps laboratories, WES and CERC research data are likely to be most applicable to the solution of archeological site stabilization problems. This is the case primarily because of the diversity of research interests housed at these two facilities. The research emphases of CRREL and CERL are more restricted in scope, with the former dealing exclusively with the colder regions of the world and the latter conducting primary research on construction related issues. Like the other labs, CRREL and CERL maintain indexes of publications that are available.

Department of Agriculture

In general terms, some of the most difficult pertinent information to identify has been produced by the various bureaus of the Department of Agriculture (USDA). In part, the difficulty arises from the very diversity of programs and research units within USDA, which maintains a national agricultural database at the USDA National Agricultural Library in Beltsville, MD. This database, AGRICOLA, can be accessioned from most university libraries and searched by author, title, and subject.

The bureau within USDA that is likely to prove most useful in providing information to be used in solving archeological site stabilization problems is the Soil Conservation Service (SCS). Local SCS offices have pamphlets and brochures that deal with solving erosion problems and each office has a copy of a Technical Guide that specifies erosion control practices that are applicable to specific States. The brochures and pamphlets can be excellent guides in selecting species of plants that can be used in protecting and maintaining archeological sites. When used in combination with the Technical Guide, an appropriate stabilization plan can be developed.

When more detailed information or specific site problem assistance is necessary and a revegetation approach is anticipated, the SCS Plant Materials Centers can be especially helpful. The SCS maintains 26 of these Centers that are established on a regional basis to develop erosion control vegetation suited for each Center's research universe.

These Centers develop and test appropriate species, and once developed, turn the propagation and sale of materials over to the private sector. A national database that lists plant materials nurseries is headquartered in Fort Collins, CO. Access to this database is through one of the Plant Materials Centers. Listings are organized by region, soil type, genus and species. Contacts with the Plant Materials Centers can be made through the SCS Regional Plant Materials Specialists, whose telephone numbers are given in the Appendix.

Information on the properties of soil as a material is available from the USDA Soil Sedimentation Laboratory in Oxford, MS. This unit's research emphasis, and consequently the potential for site stabilization applications, is integrative and multidisciplinary. An index of publications is available from the Librarian and can be obtained by calling (601) 232-2900. Some of these publications are technical beyond the needs of cultural resources managers, but others are useful particularly in developing case histories of erosion and filling processes.

National Clearinghouse for Archaeological Site Stabilization

The National Clearinghouse for Archaeological Site Stabilization at the University of Mississippi maintains a partially annotated bibliography whose entries are directly applicable to the solution of site stabilization and protection problems. The bibliography is divided into four sections: (1) Philosophy; (2) Technical Support; (3) Management Recommendations; and (4) Practical Applications. While the entries in the Clearinghouse bibliography have been drawn from a variety of sources, it is clearly evident that Corps of Engineers publications are central to the listing. This is in part a reflection of the way that the bibliography has been developed, but more significantly, it is an indication of the level of useful information available from the various Corps of Engineers research units. As a note of caution: no single entry in the bibliography is likely to provide sufficient background data to serve as the sole support for the design of a particular stabilization/protection scheme. Rather, data from several sources will need to be combined, and in many instances re-interpreted, to properly support project design.

{rokbox title=|Figure 4 :: Placing filter cloth on Hurricane Mound in preparation for placing riprap, Sardis Lake, MS.|}images/stories/estandares/12D.JPG.jpg{/rokbox}

The Clearinghouse conducts a variety of technical assistance activities related to development of archeological site stabilization programs. These have included systematic analyses of the current status of stabilization methodology, analyses of statutory and regulatory bases for stabilization as a preservation alternative, evaluations of preservation technology transfer, initiatives for training development, and design and testing in experimental stabilization projects. Many of these activities, especially training, have been completed in cooperation with governmental agencies, private utilities, and other organizations. The operational problems in conducting stabilization projects, especially as they relate to mid-level administrative structures of organizations, have been analyzed also. The principal result of this work has been improved understanding of cost-benefit data. These data are critical not only to establish an informed basis for selecting appropriate stabilization technologies for projects, but just as important, to specify cost efficient monitoring and maintenance procedures compatible with the ways agencies conduct their daily business.

Other Information Sources

Once the mechanisms that are operating to destroy an archeological resource have been identified, other sources of technical support become reliable beyond those listed above. Some are regional in scope, but the obtainable information can be creatively applied to fit a variety of environments and situations. Again, the objective of this Technical Brief is not to be a comprehensive guide to stabilization information, so the following short discussion of information sources is meant to illustrate potential sources that may be useful in the next stages of site stabilization project development.

The Tennessee Valley Authority (TVA) has, for a number of years, addressed the problems of site stabilization project design, implementation, and monitoring in different environments and under a variety of conditions. This has been accomplished as part of a research and demonstration program. One of the areas in which TVA has worked is strip mine reclamation. Techniques have been developed for stabilizing soils that were rendered unsuited for natural revegetation. To reach those goals, standard stabilization techniques have been altered to meet special needs. Similar information is available from the U.S. Bureau of Mines. TVA has sought to share the results of its site stabilization program through both publication of technical information and offering hands-on, problem-solving training courses.

The Federal Highway Administration has developed and maintains a set of standards that are applicable to highway right-of-way stability. These same techniques can be applied to solving archeological problems. Similarly, state-level Departments of Transportation or Highway Departments also maintain standards that may be useful.

Trade journals such as *Grounds Maintenance* and *Nursery Manager* are excellent sources of general information on site vegetation improvement and care. New products, including geosynthetics, and vegetation techniques are frequently detailed in publications of this type. Generally, each publication will include a list of companies that are suppliers for various geotextiles and other synthetic stabilizers. Most also include a classified advertisement section where suppliers of various products and revegetation materials are listed.

Finally, the various college and university departments in the academic studies of soils, geology, and engineering can provide important information once the parameters of a site stabilization project have been established and more specific questions need to be answered. They may be particularly important sources for regionally oriented information because their faculties often conduct research locally.

{rokbox title=|Figure 5 :: Rolled hay bales used for lakeshore protection/stabilization at Lake Sharp, South Dakota|images/stories/estandares/12E.JPG{/rokbox}

Conclusion

Clearly, archeological site stabilization is an important part of several organizations' programs and a significant preservation alternative. It should be clear also that in this Technical Brief the programs discussed mainly provide a starting point for sources of information or technical assistance, particularly because they represent systematic efforts to develop stabilization in a variety of contexts. There are numerous other sources of information from organizations that have conducted site stabilization projects. Frequently there is no substitute for identifying, through the information sources described above, for instance, and consulting with those contacts who have already implemented stabilization projects that appear to be similar to new ones being planned. Those individuals are able to clarify the importance of the environmental parameters that were evaluated, the implications of selecting certain preservation technologies, and, most significant, the results of monitoring and maintenance over time.

Information exchange will continue to be a fundamental goal of archeological site stabilization

programs. The results of stabilization projects should be accessible, if only as manuscript correspondence generated for intra-agency purposes, and published whenever possible. The records of stabilization projects should be preserved for the long-term similarly to archeological excavation records. Such efforts will insure that professionals in archeological resources management can develop the most effective stabilization projects, and that in the future, when the time is right for archeological study, these significant sites are still accessible to contribute to our understanding of the cultural past.