

South Carolina Standards and Guidelines for Archaeological Investigations



South Carolina
Institute of
Archaeology
and
Anthropology



South Carolina
State
Historic
Preservation
Office



Council
of
South Carolina
Professional
Archaeologists

SOUTH CAROLINA STANDARDS AND GUIDELINES FOR ARCHAEOLOGICAL INVESTIGATIONS

South Carolina State Historic Preservation Office,
South Carolina Institute of Archaeology and Anthropology,
and Council of South Carolina Professional Archaeologists

2000

Acknowledgments: Council of South Carolina Professional Archaeologists, South Carolina State Historic Preservation Office, South Carolina Institute of Archaeology and Anthropology, Natalie Adams, Christopher Amer, John Cable, Lesley Drucker, William Green, Christine Hensley Sherman, Valerie Marcil, Jonathan Leader, Elizabeth Reitz, Irvin Rovner, Joseph Schuldenrein, Erin Shaw, Gail Wagner, Elizabeth Wing, and Cambridge University Press

TABLE OF CONTENTS

I. INTRODUCTION	1
A. Definitions	1
1. Area of Potential Effects	1
2. Archaeological Site	1
3. Consulting Parties	2
4. Data Recovery	2
5. Evaluation	2
6. Historic Property	2
7. Identification	2
8. Intensive Survey	2
9. Isolated Find	2
10. Reconnaissance Survey	3
B. Federal Legislation	3
1. Overview of Section 106	3
2. Native American Grave Protection and Repatriation Act	4
C. State and Local Legislation	4
1. Protection of State Owned or Leased Historic Properties	4
2. Coastal Zone Management Act	5
3. South Carolina Water Resources Planning and Coordination Act	5
4. South Carolina Mining Act	5
5. Hazardous Waste Management Facilities	5
6. Beaufort County Zoning Ordinance	6
7. Berkeley County Zoning Ordinance	6
8. Hilton Head Ordinance	6
9. Mount Pleasant Zoning Ordinance	6
10. Abandoned Cemeteries and Burials	6
11. South Carolina Institute of Archaeology and Anthropology	6
12. South Carolina Underwater Antiquities Act	6
D. Environmental Review and Section 106 Consultation Process	7
1. Documentation	7
2. NRHP Listings	7
3. Reported Sites	8
4. Project Review	8
5. Recommended Actions	8
6. Property Evaluation	8
7. Assessment of Effects	9
8. Treatment of Archaeological Properties	10
9. Summary	10
II. FIELDWORK STANDARDS FOR ARCHAEOLOGICAL SURVEY, EVALUATIVE SITE TESTING, AND DATA RECOVERY	11
A. Introduction	11
B. Documentary Research	11
1. Reconnaissance and Intensive Surveys	11
2. Evaluative Testing	12
3. Data Recovery	12

C. Field Methods for Reconnaissance Survey	12
D. Field Methods for Intensive Survey	12
1. Site Occurrence Probability Categories	12
2. Survey Strategies	13
3. Record Keeping	14
4. Archaeological Site Definition	14
E. Field Methods for Evaluative Testing	15
1. Site Map and Datum	15
2. Controlled Surface Collection	15
3. Remote Sensing	15
4. Shovel Tests	16
5. Test Units	16
6. Screening	16
7. Description of Artifacts	16
8. Features	16
9. Records	16
10. Specialized Studies	16
11. Geoarchaeological Studies	16
12. Heavy Machinery	17
F. Field Methods for Data Recovery	17
III. ARTIFACT PROCESSING, DATA ANALYSIS, AND CURATION	17
A. Field Tracking	17
B. Processing	17
C. Analysis	18
D. Conservation and Curation	18
IV. REPORTING RESULTS	18
A. Management Summaries	18
1. Project Title	19
2. Agency Requiring Work	19
3. Agency Project Number(s)	19
4. Project Location	19
5. Field Personnel and Dates of Work	19
6. Brief Statement of Project Goals and Objectives	19
7. Planned Laboratory and Specialist Analysis	19
8. Name and Location of Curation Facility	19
9. Summary of Survey Methodology	19
10. Summary of Results	19
B. Reports and Distribution	19
C. Report Content	20
1. Title Page	20
2. Abstract	20
3. Table of Contents	20
4. List of Figures, Plates and/or Tables	20
5. Introduction	20
6. Environmental Setting	21

7.	Cultural Context and Previous Archaeological Investigations	21
8.	Research Design	21
9.	Field Methods	21
10.	Artifact Description and Analysis	22
11.	Site Descriptions and Results	22
12.	Summary and Recommendations	23
13.	References Cited	24
14.	Appendices and Attachments	24
V.	PERSONNEL QUALIFICATIONS	24
A.	Archaeologist	24
1.	Principal Investigator	24
2.	Project Archaeologist	24
B.	Architectural Historian	25
C.	Historian	25
VI.	LIST OF CONTACTS	25
VII.	REFERENCES CITED	26
APPENDICES:		27
APPENDIX A.	GENERAL GUIDELINES FOR THE PERFORMANCE OF GEOARCHAEOLOGICAL WORK	29
APPENDIX B.	PALEOETHNOBOTANICAL ANALYSIS AND REPORTING OF FLOTATION SAMPLES	35
APPENDIX C.	GUIDELINES FOR APPLICATION OF PHYTOLITH ANALYSIS IN HERITAGE MANAGEMENT	39
APPENDIX D.	GENERAL GUIDELINES FOR FAUNAL STUDY	43
APPENDIX E.	REPORT PREPARATION CHECKLIST	49

I. INTRODUCTION

This edition of *Standards and Guidelines* has been designed as an advisory framework for archaeological fieldwork and reporting in the state of South Carolina. It offers guidance to project archaeologists, administrators, and other interested parties who prepare reports and case studies like those initiated or conditioned by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

In publishing this edition of *Standards and Guidelines*, South Carolina, like the majority of southeastern states, is revising its minimum specifications for the collection and presentation of technical archaeological information. NOTE: Survey or data recovery methods that do not meet the minimum standards described below may result in additional project costs and delays.

While this edition of *Standards and Guidelines* focuses on archaeological concerns, readers should note that Section 106 of the NHPA also requires the consideration of buildings, districts, structures, and objects. While this manual therefore provides an overview of the legislation and processes by which all “historic properties” (see Definitions below) are considered, the specifics of investigating and documenting buildings, districts, structures, and objects can be found in the *Survey Manual for the South Carolina Statewide Survey of Historic Places* (available from the State Historic Preservation Office [SHPO]).

If you have any questions about these *Standards and Guidelines* or about archaeology in South Carolina, please call staff archaeologists at SHPO or South Carolina Institute of Archaeology and Anthropology (SCIAA).

A. Definitions

The following definitions are provided to ensure a common understanding of the terms and concepts used in this document.

1. Area of Potential Effects

The area of potential effects is defined as “the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist” (36 CFR Part 800.16[d]). Examples of effect can be direct, indirect, cumulative, visual, atmospheric, audible, beneficial, or adverse.

2. Archaeological Site

An archaeological site is defined as an area yielding three or more historic or prehistoric artifacts within a 30-meter radius and/or an area with visible or historically recorded cultural features (e.g., shell middens, cemeteries, rockshelters, chimney falls, brick walls, piers, earthworks, etc.).

3. Consulting Parties

According to federal regulations, an agency official “shall involve the consulting parties ... in findings and determinations made during the section 106 process” (36 CFR Part 800.2[a][4]). Depending on the undertaking, consulting parties can include the State Historic Preservation Officer (SHPO); Tribal Historic Preservation Officer (THPO); Indian Tribes and Native Hawaiian organizations; representatives of local governments; and applicants for Federal assistance, permits, licenses and other approvals (36 CFR Part 800.2[c][1-5]). Consulting parties may also include “[c]ertain individuals and organizations with a demonstrated interest in the undertaking” (i.e., legal, economic, professional, or advocacy).

4. Data Recovery

When an agency's proposed action will cause an adverse effect to a historic property listed in or eligible for the National Register, the agency initiates consultation with the SHPO (36 CFR Part 800.6[a]). The purpose of the consultation is to seek agreement, usually through a Memorandum of Agreement (MOA), on ways to avoid, minimize, or mitigate the adverse effect to a historic property.

One way of mitigating adverse effect is through archaeological data recovery. However, before data recovery is carried out, a data recovery plan must be developed and approved by the agency, the SHPO, and other involved parties. For further guidance in developing a data recovery plan, see *Treatment of Archaeological Properties: A Handbook* (Advisory Council on Historic Preservation 1980) and *Consulting About Archaeology Under Section 106* (Advisory Council on Historic Preservation 1990).

5. Evaluation

Evaluation is the process of determining whether identified properties meet defined criteria of significance for inclusion in an inventory of historic properties (*Federal Register* 48:44723). Under most circumstances the evaluation should follow the criteria set forth in 36 CFR Part 60.4 for inclusion in the National Register of Historic Places.

6. Historic Property

A historic property is “a district, site, building, structure, or object significant in American history, architecture, engineering, archaeology or culture at the national, state, or local level” (*Federal Register* 48:44739).

7. Identification

Identification is the process of inventorying and locating historic properties within the area of potential effects. It includes a number of activities, such as archival research, informant interviews, field survey and analysis (*Federal Register* 48:44721).

8. Intensive Survey

Intensive survey is “a systematic, detailed examination of an area designed to gather information about historic properties sufficient to evaluate them against predetermined criteria of significance within specific historic contexts” (*Federal Register* 48:44739).

The goals of an intensive survey are twofold: identification of all cultural resources within the area of potential effects and evaluation of those resources against the criteria for inclusion in the National Register of Historic Places (NRHP) (36 CFR Part 60.4). This is the most common type of survey for CRM purposes and should be the default mode unless otherwise agreed to in advance by the agency and SHPO.

9. Isolated Find

An “isolated find” is defined as no more than two historic or prehistoric artifacts found within a 30-meter radius.

10. Reconnaissance Survey

A reconnaissance survey is defined as “an examination of all or part of an area accomplished in sufficient detail to make generalizations about the types and distributions of historic properties that may be present” (*Federal Register* 48:44739). Both predictive models and “landform surveys” are considered to be specific types of reconnaissance survey.

Reconnaissance surveys are most appropriately used to develop a historic context. They are also useful when there are multiple alternatives for a project location, or when it is necessary to assess the archaeological potential of areas that will not be immediately affected or subject to Section 106 requirements.

The results of a reconnaissance survey can provide an estimate of the number and types of historic properties expected in a particular area. Survey findings can also guide management decisions based on an area’s sensitivity relative to historic preservation. Areas surveyed in this manner often require a more intensive survey if additional information is needed about specific properties (e.g., NRHP eligibility decisions) or when a project location is finalized.

B. Federal Legislation

1. Overview of Section 106

The following federal legislation guides the SC SHPO:

National Historic Preservation Act of 1966 (as amended)

Executive Order 11593

National Environmental Policy Act of 1969

Department of the Interior regulations (36 CFR 60, 36 CFR 63, and 36 CFR 66) Advisory Council on Historic Preservation regulations (36 CFR 800).

The SC SHPO was created in 1969 to implement the statewide preservation program described by Section 101 of the National Historic Preservation Act. 36 CFR 61.2 outlines SHPO responsibility for the development of that program. In addition, under the regulations of Advisory Council on Historic Preservation that govern the Section 106 review system, SHPO is required to participate in the review process by considering and commenting on the effect that federal or federally funded, licensed, or assisted projects will have on all historic and prehistoric sites, districts, buildings, structures, and objects that are determined to be eligible for inclusion in the NRHP.

36 CFR 60 describes the National Register criteria and states, “The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and a) that are associated with events that have made a significant contribution to the broad patterns of our history; b) that are associated with the lives of persons significant in our past; c) that embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or d) that have yielded, or may be likely to yield, information important in prehistory or history.”

Section 106 of the National Historic Preservation Act requires federal agencies to review the effect their actions may have on historic properties that are listed in or eligible for the NRHP. Review procedures are referred to as “the Section 106 process” and are set forth in the recently revised regulations issued by the Advisory Council on Historic Preservation (36 CFR 800)

(amended 1999). The regulations emphasize the need for consultation between the federal agency, the SHPO, and other consulting parties. They also give the President's Advisory Council on Historic Preservation an opportunity to comment on federally assisted, licensed, or funded actions. The Section 106 process is a broadly recognized aspect of statewide historic preservation planning. It is designed to identify historic properties that are eligible for listing in the NRHP and to reduce the adverse effects of federal projects on those properties.

2. Native American Grave Protection and Repatriation Act

The Native American Grave Protection and Repatriation Act (Public Law 101-601, NAGPRA) was passed in 1990. The regulations governing this act were written and disseminated by the National Park Service in 1995 as 43 CFR 10 (amended 1997). The Act requires federal and non-federal agencies receiving federal funds to itemize specific Native American cultural items and to identify and consult with all appropriate Native American Tribes, Native Hawaiian organizations, Alaskan Native groups and villages, and lineal descendants.

Native American and associated groups named in NAGPRA have the right to request repatriation of a broad range of cultural materials. These include human remains, funerary objects (both associated and non-associated), sacred objects, and "inalienable objects of cultural patrimony." Ownership of these materials is considered *a priori* to be the rightful possession of the indigenous tribe, nation, or organization that is able to fulfill the requirements for ownership as defined in NAGPRA. There is no statute of limitation and very few materials defined by the Act are considered to be exempt from claim. The only exceptions are those items that possess such a unique, exceptional and clear degree of scientific value that their loss would be devastating to the larger American community. The burden for proving this level of importance rests with the claimant. SHPO and SCIAA require all individuals, agencies, and corporations in South Carolina that receive federal funds, or are engaged in compliance activities by federal or state statute, to comply with NAGPRA.

SCIAA maintains a current list of federally recognized Native American tribes, nations, and organizations that is available upon request. A brochure outlining NAGPRA definitions and procedures is also available from SCIAA.

C. **State and Local Legislation**

Although South Carolina currently has no single, over-arching law to protect state or local cultural resources, it does have several laws that protect cultural resources in particular situations:

1. Protection of State Owned or Leased Historic Properties

In 1992, the State amended Title 60 of the 1976 Code of Laws of South Carolina by adding Chapter 12 "Protection of State Owned or Leased Properties." Chapter 12 gives "authority to the Department of Archives and History to identify, record, and evaluate all State-owned or leased facilities to determine which of these facilities may be considered historically significant...[and to] institute a historic preservation review process for permanent improvements and construction affecting historic properties or facilities." Section 60-12-30 of the law also requires state agencies to "consult with the department when planning projects that might adversely affect those properties listed in the National Register of Historic Places at the time of consultation."

2. Coastal Zone Management Act

The Office of Ocean and Coastal Resource Management (OCRM) ensures that projects requiring state or federal permits within the Coastal Zone of South Carolina comply with the mandate of the Coastal Zone Management Program as defined in the Federal Coastal Zone

Management Act of 1972. The Coastal Zone consists of the following eight counties: Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper.

Section 48-39-150(6) of the South Carolina Coastal Zone Management Act of 1979 (amended 1990), states that OCRM must consider “the extent to which development could affect...irreplaceable historic and archaeological sites of South Carolina's coastal zone.” Section 48-39-80(4) of the same act requires this comprehensive management program to “inventory and designate areas of critical state concern within the coastal zone.”

Under its Coastal Zone Management Program, OCRM has designated certain natural and cultural areas as “Geographic Areas of Particular Concern” (GAPCs). GAPCs include archaeological sites that are in or are eligible for inclusion in the NRHP. The SHPO is asked to advise OCRM on the management of cultural resources and to determine the eligibility of archaeological sites, structures, objects, and districts for nomination to the NRHP.

3. South Carolina Water Resources Planning and Coordination Act

Under the 1967 South Carolina Water Resources Planning and Coordination Act (Section 49-3-10) (as amended), the state's Department of Natural Resources must consider the effect that development near the state's ground and surface waters will have on cultural and environmental resources. This department works closely with the Office of Ocean and Coastal Resource Management and county planners to protect cultural resources.

4. South Carolina Mining Act

The South Carolina Mining Act of 1990 (Section 48-20-10 et seq.) states that the South Carolina Land Resources Conservation Commission will require all reclamation plans to specify “proposed methods to limit significant adverse effects on significant cultural or historic sites” (Section 48-20-40 Part 15[g]).

5. Hazardous Waste Management Facilities (DHEC)

The South Carolina Department of Health and Environmental Control (DHEC) has published regulations governing the location of hazardous waste management facilities (South Carolina Code of Regulations 61-104). The regulation stipulates that hazardous waste treatment, storage, and disposal facilities will be prohibited in areas where they will "adversely impact an archaeological site as determined by the State Historic Preservation Officer and the State Archaeologist or a historic site as determined by the State Historic Preservation Officer" (R. 61-104, IV, D.2.a.). The SHPO provides comment on how hazardous waste facilities will affect historic properties.

6. Beaufort County Zoning Ordinance

In 1999, Beaufort County added Article 8, a historic preservation section, to its Zoning and Development Standards Ordinance. Section 8.500 of the ordinance enables the county planning director to require a cultural resource survey if he/she believes that the proposed development may affect NRHP listed, eligible, or potentially eligible cultural resources. According to the ordinance, “identified resources shall be preserved and/or the effects of the proposed project mitigated in accordance with the applicable federal and state laws and guidelines” (Section 8.510). The ordinance also allows for the assessment of penalties for anyone caught excavating, altering or otherwise damaging an archaeological or historic site unless such activity is pursuant to a permit issued by the county planning director (Section 8.520).

7. Berkeley County Zoning Ordinance

The intent of Berkeley County's ordinance (Sec. 9.2, Code 87-9-19), adopted in 1997 and revised in 1999, is to preserve the integrity of NRHP listed properties in the county. A special area permit is required for any development that might affect such properties. In addition, the ordinance sets standards for developments that are issued special area permits so that adverse effects will be minimized.

8. Hilton Head Ordinance

Hilton Head Island developed South Carolina's first local ordinance to protect archaeological sites (Ordinance No. 90-10B, Proposed Ordinance No. 90-16, amending Title 17 of the Municipal Code 17-2-112). The ordinance protects all archaeological sites—as well as any area, structure, or artifacts on such sites—from disturbance or removal without written permission from the town manager or a designee. The SHPO gives the Town technical advice on the suitability of specific archaeological survey and excavation plans and reports.

9. Mount Pleasant Zoning Ordinance

The Impact Assessment Section (156.264) of the Mount Pleasant Zoning Code specifies that developers must provide “proof of coordination with the SCDHEC-OCRM” for cultural and archaeological resources in a development area. Resources should be identified and impacts described. Coordination with SHPO is also required.

10. Abandoned Cemeteries and Burials

Several South Carolina Codes protect historic cemeteries (South Carolina Code 27-43-10, Removal of Abandoned Cemeteries; 27-43-20, Removal to Plot Agreeable to Governing Body and Relatives; 27-43-30, Supervision of Removal Work; and 16-17-600, Destruction of Graves and Graveyards). A 1989 amendment to Section 16-17-600 clarified and extended legal protection to the remains of Native Americans by changing the word “graveyards” to “burial grounds.” This amendment also made the destruction or desecration of human remains a felony punishable by a maximum fine of \$2,000 and imprisonment for not less than one (1) year and up to ten (10) years.

Permits provide an additional check on burial disturbance. These are required for the exhumation and transport of human remains from cemeteries by SC DHEC (South Carolina Code of Regulations Section 61-19-28, 29) and are available from the Division of Vital Records.

11. South Carolina Institute of Archaeology and Anthropology (SCIAA)

The South Carolina Code of Laws, 1976, Section 60-13-210, as amended in 1990, gives SCIAA a mandate to create and maintain a statewide inventory of archaeological sites, curate the state's archaeological collections, advise SHPO, conduct research on behalf of the state, and ensure the adequacy of all archaeological research and reports of archaeological investigations carried out in the state.

12. South Carolina Underwater Antiquities Act

The South Carolina Underwater Antiquities Act of 1991, South Carolina Code of Laws, Section 54-7-610 et. seq., makes SCIAA responsible for managing and protecting the state's underwater archaeological resources on behalf of the State Budget and Control Board. Delegation of shipwrecks to state authority ultimately devolves from the federal Abandoned Shipwreck Act (PL100-298). No artifact or fossil may be removed from a state-owned river or ocean bottom, nor may it be disturbed without formal review and license issued by SCIAA Underwater Archaeology

Division. Section 54-7-815 states that no person may excavate or salvage any sunken warship found within state waters that contains, or is believed to contain, human remains without express approval. Persons violating this section are guilty of a felony and may be fined at the discretion of the court and/or sentenced to a term not to exceed five (5) years. Other violations are considered misdemeanors.

In addition, SCIAA advises SHPO on the eligibility of underwater archaeological resources. The current regulations covering licensing, survey, and salvage are available as brochures from the SCIAA Underwater Archaeology Division.

D. Environmental Review and Section 106 Consultation Process

Consultation requests for projects that are subject to environmental review are directed to SHPO. Among these are federally sponsored, funded, or permitted projects that might affect cultural resources and projects requiring permits or certification from OCRM or other state agencies. Through the consultation process, SHPO can review project documentation and assess the need for a cultural resource survey.

SHPO reviews consultation requests within 30 days of receipt. Registered Mail, Priority Mail, Express Registered Mail, or another form of traceable conveyance (e.g., FedEx with delivery notification) is recommended for all official communications. SHPO provides telephone responses to inquiries as information only. These conversations, because of the danger of misunderstandings, do not constitute the agency's formal comment or opinion. SHPO will write the official agency response under the Archives and History letterhead.

1. Documentation

To facilitate SHPO review, include the following in your request for consultation:

- a) *State or Federal Permit Numbers.* Provide when applicable.
- b) *Project maps.* Include a copy of a 7.5' USGS topographic map that clearly and accurately depicts the project boundaries and contains the quadrangle name and a bar scale.
- c) *Description of the Project Area.* Include written statement.
- d) *Rationale for the Review Request* (e.g. state or federal permitting or funding requirement).
- e) *Previous Land Use History.* Briefly describe when possible.
- f) *Identify Responsible Agency.*
- g) *Applicant's Contact Information.* Include name, address, and phone number.
- h) *Routing Information.* Include list of individuals, organizations, and companies requiring a letter of comment from SHPO.

2. NRHP Listings

SHPO checks to see if your project will affect any archaeological sites, buildings, structures, objects, districts, or landmarks that are listed on the NRHP. SHPO maintains an up-to-date county

listing of all NRHP properties. These locations are also digitized and maintained through ArcView GIS (ESRI).

3. Reported Sites

SHPO reviewers must also determine whether your project will affect any sites, districts, objects, or structures that have not been formally evaluated. SHPO survey files identify those areas where the built environment has already been surveyed. In addition, all archaeological site locations are maintained in a GIS database at SCIAA and SHPO.

4. Project Review

SHPO reviewers recommend a course of action based on the following factors:

- a) *Known Archaeological Site Locations.* Consider the presence, density and types of sites within and near the project area.
- b) *General Environmental Factors of Site Location.* Consider the larger patterns of site location relative to topographic features, stream courses, resource zones, soil types, etc.
- c) *Historic Features.* Consider the potential affect of historic roads, navigable waters, and paths on site locations in the vicinity of the project area.
- d) *Past and Present Land Use.* Consider the affect of prior land use (i.e. historic urbanization, agriculture, land contouring, etc.) on site preservation and visibility.
- e) *Previous Coverage.* Consider the amount and intensity of previous archaeological investigation in and near the project area.

5. Recommended Actions

- a) *No Action.* If no significant resources are recorded in the project area and the reviewer thinks such a probability is slight (see criteria a - h above), SHPO will recommend no further action. A letter to this effect will include the caveat that should any archaeological materials be discovered, SHPO will be informed immediately. If SHPO receives such information, it will respond within 48 hours, specifying whether the archaeological resource that has been identified is eligible for the NRHP. If SHPO cannot make this assessment, it may recommend an archaeological investigation.
- b) *Survey Required.* Whether significant resources have been previously recorded in the project area or not, SHPO may decide that a cultural resource survey is necessary. If no adequate survey has been conducted and information indicates that archaeological resources are likely to be present within the project area, SHPO typically recommends a cultural resource survey. A letter to this effect will be sent to the applicant and to state or federal agencies involved in the project. Upon request, SHPO archaeologists will also review a scope of work for any project. For large or complex projects, SHPO recommends that applicants submit a scope of work before starting fieldwork.

6. Property Evaluation

After completion of a cultural resource survey, SHPO will determine whether any historic properties will be affected by the proposed undertaking. To do this, SHPO reviews the results,

recommendations, and adequacy of the report and applies the National Register criteria for site evaluation (36 CFR 60.4).

Although archaeological sites typically are considered eligible under Criterion D (information potential), in certain circumstances they may also qualify under Criteria A, B, or C. For instance, a battlefield or historic home site might be associated with significant events (Criterion A) or people (Criterion B). Sites with earthworks or elaborate landscaping might be considered eligible as examples of the work of a master or the best existing example of a particular type or period of construction (Criterion C).

NOTE: For federally assisted or permitted undertakings, the federal agency official is ultimately responsible for determining site eligibility. Federal regulations, however, require the federal agency official to reach this determination in consultation with SHPO (36 CFR 800.4 [c]). If the federal official and SHPO fail to agree on the eligibility of any property, the federal official can obtain a determination from the Secretary of the Interior (36 CFR 63). For projects initiated by state regulations, including OCRM certification, SHPO will decide the eligibility of the identified properties.

7. Assessment of Effects

If historic properties are located within the area of potential effects, the federal agency will consult with SHPO to determine the project's effect on these properties.

- a) *Federal Undertakings.* The federal agency official must assess the effect of the undertaking on any property listed in or eligible for the NRHP. As with determinations of eligibility, federal regulations require the federal official to make this assessment in consultation with SHPO; failure to agree may be referred to the Advisory Council for resolution. One of three assessments may be made:
 - (1) *No Historic Properties Affected.* If no eligible properties are located within the area of potential effects, or if there are historic properties present but the undertaking will have no effect upon them, SHPO will recommend a finding of no historic properties affected and no additional work will be required (36 CFR 800.4[d][1]).
 - (2) *No Adverse Effect.* If the undertaking will have an effect on properties eligible for the NRHP, but will not alter, directly or indirectly, any of the characteristics that qualify it for inclusion in the NRHP, then a finding of no adverse effect may be proposed. Alternatively, the undertaking may be modified or certain conditions imposed that would also allow a finding of no adverse effect (36 CFR 800.5[b]).
 - (3) *Adverse Effect.* An adverse effect can be found “when an undertaking may alter, directly or indirectly, the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association”(36 CFR 800.5[a][1]). At that time, the federal agency official, SHPO, and any other consulting parties, will consult on ways to “avoid, minimize, or mitigate the adverse effects ”(36 CFR Part 800.6[a]).
- b) *State Projects.* Determinations of effect pertain to Section 106 of the National Historic Preservation Act. This act and related procedures provide SHPO with a model to review and advise on OCRM regulated and certified projects, projects initiated by other state agencies, and projects subject to local ordinances. SHPO uses a series of steps based on 36 CFR 800 along with these various laws, regulations, and

ordinances to determine effect. If SHPO concludes that a project will have an adverse effect on an eligible property, consultation among involved individuals, agencies, and municipalities is initiated.

8. Treatment of Archaeological Properties

When the review process reveals that a project will have an adverse effect on historic properties, the agency official, or an applicant who has been authorized by the agency, initiates consultation among the parties involved. The goal of consultation is to develop a Memorandum of Agreement (MOA) based on one or more of the actions listed below:

- a) *Avoidance.* If project plans can be altered to avoid listed or eligible sites, an “adverse effect” finding may be changed to “no historic properties affected.”
- b) *Protection/Stabilization.* A finding of “no adverse effect” may be found if a project can use green-spacing to protect a historic property. SHPO will also consider proposals to obtain a finding of “no adverse effect” through burial of a site beneath a protective cap of sterile fill, or through other methods of protection.
- c) *Data Recovery.* If an agreement to avoid or protect historic properties cannot be reached, it is possible to mitigate the adverse effects through data recovery. This will only be done, however, if SHPO approves a detailed data recovery plan and all parties have signed a Memorandum of Agreement (MOA). Data recovery should adhere to the professional guidelines given below (see also *Federal Register* 64:27085-27087 for recommended approaches to data recovery).

9. Summary

Projects submitted for SHPO review will generally follow this sequence:

- a) *Completion of the Cultural Resource Report.*
- b) *Review of the Survey Report by SHPO.* Review will determine if methods used, evaluations, and management recommendations are appropriate. Archaeological reports should be evaluated within the framework of the NRHP eligibility criteria. Recommendations of effect should also be presented in the report based on survey results and specific construction plans.
- c) *Determinations of Eligibility.* SHPO will draft a letter outlining eligibility determinations based on the results of the submitted report. These determinations may or may not concur with the findings of the report.
- d) *Consultation.* Discussions will be held among involved agencies and individuals to determine the treatment of any eligible historic property that will be affected by the undertaking.

II. FIELDWORK STANDARDS FOR ARCHAEOLOGICAL SURVEY, EVALUATIVE TESTING, AND DATA RECOVERY

A. Introduction

The following guidelines are offered as a baseline for archaeological survey, evaluative testing, and data recovery. They are based on a working knowledge of South Carolina's archaeological resources and environments. These guidelines are specifically useful to field archaeologists, agency personnel, and the contracting agent (as appropriate). They can be used as a yardstick to ensure compliance with federal and state regulations, comparability of research results, and evaluation of research designs and project reports.

Consulting with SHPO before starting fieldwork is suggested, especially if you are conducting a large or complex project or are proposing to use alternative field procedures. In the latter event, SHPO will expect archaeologists to justify their proposals with sound scientific reasoning, especially if less effort, rather than an equal or greater effort is suggested. In such cases, the archaeologists' rationale must be presented in detail in the research design or report.

B. Documentary Research

1. Reconnaissance and Intensive Surveys

To help locate possible historic and prehistoric sites, map and documentary research should be undertaken before the field survey begins. Sources to consult may include:

- a) *South Carolina State Site Files (SCIAA)*. SCIAA maintains the official archaeological site file repository and is the authorizing agency for state site number assignment.
- b) *Maps showing county, city, and thematic surveys*. The South Carolina Department of Archives and History (SCDAH) maintains an extensive collection of municipal and county maps.
- c) *Land use maps*. Particularly relevant are aerial photographs and modern soil surveys that can be examined at the Department of Natural Resources, Land Resources, and Thomas Cooper Map Library.
- d) *Predictive Models*. Although not well represented in the state currently, it is expected that such documents when relevant to a particular project will be consulted. Individuals at SCIAA and SCDAH can assist in identifying models that may be useful.
- e) *Geographic Information System (GIS) and USGS Topographic Maps*. SCIAA and SCDAH are currently in the process of making GIS data on site locations available.
- f) *Historical Maps*. Common historic map sources consulted include Mills' Atlas (1825), Mouzon Map of 1780, Cook Map of 1773, DeBrahm Map of 1758, 19th century coastal charts, Sanborn tax maps, early 20th century soil surveys, early and mid 20th century USGS topographic maps, 20th century county highway maps, county timber maps, etc. SCDAH, Thomas Cooper Map Library, and the South Caroliniana Library maintain large historic map inventories. Cartographic surveys are currently available for Beaufort, Charleston, Georgetown, and Greenville Counties (SCDAH). Cartographic surveys often are a compilation of historic maps mentioned above.

2. Evaluative Testing

Evaluative testing assumes completion of survey level documentary research. For historic sites, additional documentary research at the testing level may consist of chain of title searches and examination of property plats, if available (SCDAH - colonial plats and the McCrady Plat Collection, county register of mesne conveyances, and other county-specific sources).

3. Data Recovery

For historic sites, additional documentary research may also include census data, such as Agricultural, Population, and Industrial Censuses (SCDAH), slave schedules (SCDAH), family papers, wills, probate inventories, daybooks, etc. (SCDAH; county courthouses; local and regional libraries and repositories) and informant interviews (particularly for early 20th century sites).

C. Field Methods for Reconnaissance Survey

Unlike an intensive survey, whose goal is to identify all historic properties that may be affected by a project, a reconnaissance survey produces only predictive statements. An intensive survey is usually required when a project location is established, while a reconnaissance survey is most appropriate when there are multiple options for a project location, or when it is necessary to assess the archaeological potential of large areas that will not be immediately impacted or subject to Section 106 requirements.

Reconnaissance surveys often use a sampling scheme that will generate predictions about the number and types of cultural resources in a project area. The sampling methods used will depend on the research design. When reporting reconnaissance survey findings, the investigator should minimally document implemented field methods, survey results and the extent and types of groundcover and previous disturbances.

D. Field Methods for Intensive Survey

During an intensive survey, all land within the project boundaries requires inspection. By preliminarily inspecting the project area and reviewing documentary resources, investigators may be able to stratify the project area by general categories of site occurrence probability.

1. Site Occurrence Probability Categories

- a) *Indeterminate Probability*. Areas that are permanently or seasonally inundated; tidal areas; and active floodplains (or other active depositional environments) where deposits are so deep that finding sites using conventional methods is unlikely.
- b) *Low Probability*. Areas with slopes greater than 15 percent; areas of very poorly drained soil (as determined by subsurface inspection); and areas that have been previously disturbed to such a degree that archaeological materials, if present, are no longer in context. Documentation of disturbance can include recent aerial photographs, ground views, or maps showing the disturbance (e.g. recent construction).
- c) *High Probability*. Areas that do not meet any of the foregoing criteria are considered to possess high probability.

Archaeologists should not omit parcels from an intensive survey simply because they have been classified as “poorly drained” by the USDA Soil Conservation Service. Similarly, areas should not be automatically excluded because of plowing or forestry activities.

2. Survey Strategies

- a) *Indeterminate Probability Strategies.* An alternative method of fieldwork may be necessary in areas of indeterminate probability (e.g., deep testing with a backhoe or auger). Monitoring of such areas may be necessary during construction to ensure that no sites are destroyed.
- b) *Low Probability Strategies.* Field investigation of low probability areas should include a surface inspection of all areas where the slope is greater than 15 percent, such as rockshelters, caves, mines, quarries, and/or petroglyphs. In disturbed areas or in areas where the soil is very poorly drained, subsurface inspection (i.e., shovel testing, coring, or augering) may be used to verify soil conditions at intervals no greater than 60 meters.
- c) *High Probability Strategies.* Generally, survey of high probability areas should follow these guidelines:
 - (1) *Pedestrian Survey.* Pedestrian survey is considered a valid site discovery method, and can be used with different subsurface survey methods, as follows:
 - (a) Pedestrian survey may be used with 60-meter interval or less shovel tests in areas where surface visibility exceeds 50 percent. Highly eroded areas, where subsoil is visible at or just below the surface, and recently plowed fields are the most common instances where such high visibility exists. The archaeologist’s judgment concerning visibility is especially critical in fallow or dry fields, where close-interval (30 m) subsurface testing will often be necessary.
 - (b) If an area has good surface visibility, but is in a dynamic depositional environment (e.g., the foot of a slope or adjacent to an aggrading waterway), then 30-meter or closer interval subsurface testing is required.
 - (c) In general, pedestrian survey should be systematic. The maximum interval between surveyors should not normally exceed 30 meters.
 - (d) When pedestrian survey locates a site, close interval subsurface testing will be necessary to determine the site’s stratigraphy and boundaries.
 - (2) *Subsurface Survey.* In most instances some type of subsurface investigation will be necessary to discover sites. Testing methods will depend on field conditions and the types of sites anticipated. Under most conditions, shovel testing is the preferred method. Alternative methods may be used at the investigator’s discretion, but should be approved by both the lead agency and SHPO.
 - (a) Shovel tests should measure 30 x 30 cm or greater and be placed at intervals no greater than 30 meters. All fill should be screened through 1/4-inch hardware cloth. Tests are to be excavated to at least 80 cmbs (depth), or until impenetrable substrate (i.e., bedrock or clay), a known sterile subsoil, or the water table is reached. Individual shovel tests are to be

recorded on project maps, but may be more generally described in the report. The total number of excavated shovel tests should be included in the report.

(b) Posthole diggers are not to be used as a survey technique, in most instances.

(c) Mechanical topsoil stripping should not be used as a survey technique, in most cases.

(d) Mechanical augers, while not recommended, can be used in areas that have impregnable ground cover (e.g., urban areas with concrete, brick rubble, etc.). They are to be placed at intervals not greater than 30 meters. Fill should be screened. Auger tests should be documented in the same manner as shovel tests.

(e) Mechanical deep testing (e.g., backhoe trenches or coring) may be necessary in active depositional environments. All deep testing should comply with OSHA *Standards for Excavation Safety* (29 CFR 1926 Subpart P and appendices).

Rigid adherence to systematic sampling at fixed intervals may fail to yield optimal survey results, since fixed intervals may not uncover sites that would have been located using a judgmental technique. Thus, a combination of systematic and intuitive shovel testing is probably the most efficient method for site discovery.

3. Record Keeping

- a) *Responsibility*. The Principal Investigator or Project Archaeologist is responsible for maintaining daily notes and transferring survey data to master project maps.
- b) *Mapping of Recovery Units*. Each shovel test or test unit should be recorded, noting its location, depth, soil profile, artifact yield, general conditions, and other pertinent information. Each shovel test should be given a unique field designation, and materials recovered from it are to be analyzed and cataloged by discrete provenience.
- c) *Photography*. Photographs are to be taken of representative project environments and areas where different survey strategies were used.

4. Archaeological Site Definition

When artifacts or features older than 50 years are discovered during field survey, the investigator will establish whether the resource is a site or an isolated find (see definitions in Section I-A). Site investigations should address physical integrity, horizontal and vertical boundaries, and the quantity and type of cultural materials present. Intensive survey methods may include:

- a) *Surface Collection*. At the survey level, a complete surface artifact collection should not normally be made unless the site is subject to active looting or vandalism. If a surface collection is made, an appropriate sampling method should be based on the investigator's assessment of field conditions as well as the type and density of visible artifacts. Alternatively, the investigator may choose not to collect material, but instead describe the material and its location on the project map. Surface visibility and topography alone do not sufficiently define a site. Although a surface collection may

help to define horizontal site limits, more thorough delineation of the site is necessary through subsurface testing.

- b) *Subsurface Testing.* Systematic subsurface testing, along with surface inspection, is necessary to establish both the horizontal and vertical extent of a site. Site boundaries are to be established by excavating radial shovel tests in no less than four directions. A 10-15 meter testing interval along each radial is recommended. Site boundaries can be tentatively established when at least two consecutive negative shovel tests are excavated and there are no other related cultural materials within a 30-meter radius. It is often advisable to excavate larger test units (e.g., 50x50 cm or 1x1 m) during intensive survey if a site is believed to be eligible or potentially eligible for the NRHP.
- c) *Site Documentation and Demarcation.* A South Carolina Archaeological Site Form (Site Inventory Record 68-1, Rev. 85) must be completed for all sites found within the project area. Only official SCIAA site numbers can be reported in drafts and final reports. If a site has been previously recorded, a revisit form will be completed, noting the current site conditions and any new site information. All site forms must be submitted to SCIAA before completion of the final report. Site boundaries are to be accurately located on project maps and USGS topographic maps. Potentially eligible sites, eligible sites, and undocumented cemeteries (i.e., not located on USGS topographic maps) are to be recorded using either a licensed land surveyor or a Global Positioning System (GPS) receiver capable of at least 15-meter accuracy. These units are available from SCIAA for a small fee. For sites less than 1/4 acre in size that do not meet the previous criteria, a single set of coordinates taken at the site's center will suffice. Larger sites are to be recorded by obtaining a number of coordinates around the perimeter of the site.

E. Field Methods for Evaluative Testing

Sometimes it is impossible to make definitive site eligibility assessments using intensive survey methods. In these situations, sites are considered potentially eligible for inclusion in the NRHP, and additional site testing is usually necessary. Site testing strategies should be designed to provide not only information about site eligibility, but also information that will help in mitigation planning (if ultimately necessary). Evaluative testing methods can include:

1. Site Map and Datum

The site map should depict site boundaries, datum, surface features, excavation units, and topography. An easy-to-relocate, permanent datum should be established and clearly identified with the state site number.

2. Controlled Surface Collection

If a complete collection of surface artifacts is impractical or inappropriate, a systematic sampling scheme should be considered. Any such collections are to be provenienced according to some type of coordinate system.

3. Remote Sensing

Metal detectors are useful for investigating historic sites. Other forms of remote sensing, such as ground penetrating radar, electrical resistivity, and magnetometer are also useful for particular sites and settings.

4. Shovel Tests

If additional shovel tests are necessary at this stage, they are to be at least 30 x 30 cm and screened through 1/4 inch (or smaller) mesh. Shovel test placement will depend on the research design.

5. Test Units

Site characteristics and conditions will govern test unit size. Unit placement will depend on the results of shovel testing and, if applicable, the results of surface collection. Test units should be excavated by natural or cultural strata, but can include arbitrary levels within strata. Although the plowzone may be excavated as a single vertical level, regardless of thickness, it is usually advisable to excavate the interface between plowzone and unplowed soils as a separate level.

6. Screening

Soil will be screened through hardware cloth no larger than 1/4 inch. Flotation or soil samples will require finer screens (see Appendix D). Because recovery rates for all classes of materials, particularly faunal and botanical, increase as screen size decreases, investigators are encouraged to estimate relative recovery rates by systematically using finer mesh to sample soils. The choice of dry screening, water screening, and mechanical screening depends on the research design and the specific factors at each site.

7. Disposition of Artifacts

Artifacts are to be bagged by discrete provenience (i.e., unit and level). Typically, all artifacts are collected. However, any material not collected—such as brick, mortar, shell, or fire-cracked rock—may be counted, measured (when appropriate), weighed, sampled by provenience, and discarded in the field. See Section III for further specification regarding the treatment of cultural materials.

8. Features

Features identified during excavation are to be mapped, drawn to scale, and photographed. A representative sample of features should be bisected to reveal profiles and recover cultural materials.

9. Records

All above and below ground features and subsurface tests are to be mapped, drawn to scale, and photographed. Appropriate notes and forms will be maintained. A Munsell chart will be used to record soil colors, and USDA soil texture classifications will be used to characterize soil texture.

10. Specialized Studies

If flotation, soil, radiocarbon, or other samples will be obtained, consultation with a specialist is recommended prior to retrieval.

11. Geoarchaeological Studies

Consultation with a geomorphologist is recommended during evaluative testing to interpret site formation processes and help identify areas likely to contain intact archaeological deposits. Further guidelines for faunal, botanical, geomorphological, and geoarchaeological studies are presented in Appendices A through D.

12. Heavy Machinery

Site areas should not be stripped before a controlled surface collection is made and/or shovel tests and test units are excavated. Heavy machinery also should not be used to remove sub-plowzone cultural deposits. However, the use of heavy machinery for limited stripping of surface deposits is encouraged, since this can often indicate whether cultural features are present.

F. Field Methods for Data Recovery

Data recovery plans require a great deal of flexibility, and researchers are encouraged to use creative and state-of-the-art methods. These may include representative sampling schemes, remote sensing techniques, and specialized analyses. A detailed description of all proposed field and laboratory methods should be included in all data recovery plans. The following principles guide SHPO review of data recovery plans (see also *Consulting About Archaeology Under Section 106* (Advisory Council on Historic Preservation 1990): (1) a clear statement of research potential and context, (2) specification of appropriate methods of excavation and analysis, and (3) adequate documentation and curation of recovered materials and notes.

III. ARTIFACT PROCESSING, DATA ANALYSIS, AND CURATION

While minimum standards for artifact processing, analyses, and curation are outlined below, investigators will want to tailor their activities to each project. Overall, it is advisable to consult with SHPO, the curatorial facility, and any specialists early in the planning process.

Processing, analyzing, and curating artifacts must occur in secure and safe environments to prevent loss of significant data. The Principal Investigator (PI) and Project Archaeologist (PA) are ultimately responsible for ensuring that artifact data and integrity are preserved. The laboratory staff responsible for basic artifact processing and analysis must have sufficient knowledge to do the job, have access to appropriate comparative collections, and have access to experts when needed.

A. Field Tracking

The choice of a system for tracking artifacts in the field is at the discretion of the investigator. However, the tracking system should be consistently applied throughout the project. During fieldwork, the recorder will enter a preliminary description of the artifacts in field notes and forms before placing them in labeled containers that fully protect them from damage. Artifacts can then be brought back to the laboratory for cleaning and analysis.

B. Processing

Before cleaning each artifact, the recorder will check its condition (e.g., for friability) and analyze its surface for easily lost information (e.g., pseudomorphs, organic materials, pigments, etc.). After they are clean, all appropriate artifacts will be labeled using permanent markers to record site number, provenience, and catalog number. Care should be taken to ensure that important features like edge wear are not obscured during labeling.

Numbers written on an artifact should be sealed with an appropriate sealant such as 10% - 15% percent solution of Acryloid B-72 in acetone or toluene. Avoid using clear fingernail polish as a sealant whenever possible, since commercial polish contains additives that shorten its effective life. If you do use commercial polish, please clearly state this in the report.

After the appropriate artifacts have been labeled, identification tags for boxes or bags should be prepared, whether individual artifacts are labeled or not. Tags will be made of an inert, waterproof, archivally sound material (e.g., Nalgene, Tyvek, polyweave, etc.) and marked with ink that is fade-proof, waterproof, and archivally sound. The bags containing the artifacts should be labeled as well.

C. Analysis

If detailed analysis of certain archaeological materials is planned, it is advisable to include appropriate specialists as early in the project as possible. Additional information on specialists is provided in Appendices A through D.

Because most archaeological sites are valuable primarily because of their research potential, artifact analysis generally should follow well-established classification schemes and typologies. The choice of a specific system will depend on the investigator's goals and should be fully defined and referenced in the project report. Regardless of which classification system one uses, certain basic descriptions and analyses must be included in the report. These include: (1) Artifact identification number, (2) Material (e.g., lithic, ceramic, glass), (3) Class (e.g., projectile point, sherd, bead), (4) Count and weight (NOTE: Many artifacts, such as flakes and pottery sherds, need not be individually weighed; instead, they can be weighed as a group by provenience and type), (5) Dimensions, if appropriate, (6) Type (e.g., Clovis, Creamware, etc.), and (7) Noteworthy attributes (e.g., form, decoration, method of use, internal or external dating).

A laboratory or catalog sheet printed on archival paper with archivally sound, waterproof ink should be used to record the analyst's observations. In addition, the analyst may keep a diary of any observations, impressions, drawings, and any special analyses performed on the artifacts. This will become part of the official record when the collection is curated.

D. Conservation and Curation

Conservation is a necessary component of all archaeological projects. The American Institute for Conservation has a free referral service open to the public, as well as brochures to help investigators choose a conservation professional. SCIAA may also be contacted for advice and consultation.

Curatorial facilities should meet 36 CFR Part 79. Selection of a facility is best made early in the project and, minimally, before the laboratory analysis has begun. The designated curation facility will be identified in the project report.

IV. REPORTING RESULTS

A summary of the minimum standards for archaeological reports appears below. For in-depth treatment of reporting standards, see Secretary of the Interior's "Standards and Guidelines," *Federal Register*, 48:44734-44737; McGimsey and Davis 1977; and Bense et al. 1986. For matters of style refer to the "Style Guide" for *American Antiquity* (1988).

A. Management Summaries

Initially, management summaries were developed to allow lead agencies and SHPO to evaluate whether or not the field methods for data recovery followed the initial scope of work and/or research proposal. With increased land development in South Carolina, especially on our coast, many private developers now have to comply with various cultural resource regulations, and much of their funding depends on phased bank loans. To accommodate their needs, SHPO will accept

initial management summaries for data recovery projects regulated by OCRM. Final project approval, however, still requires submittal of a final project report within two years after project completion. To ensure timely SHPO review, management summaries must include the following:

1. Project Title
2. Agency Requiring Work
3. Agency Project Number(s)
4. Project Location (include a 7.5-minute USGS topographic map and project planning maps)
5. Field Personnel and Dates of Excavation
6. Brief Statement of Project Goals and Objectives
7. Planned Laboratory and Specialist Analyses
8. Name and Location of Curation Facility
9. Summary of Survey Methodology (include total area excavated, number of excavation units, etc.)
10. Summary of Results (include any statements regarding whether additional work is deemed necessary)

For federally regulated projects, SHPO is asked to concur with an agency's recommendations. Once SHPO concurs, the agency has satisfied its Section 106 consultation requirement. Therefore, SHPO will review only draft and final reports for federally regulated data recovery projects, and will not accept management summaries.

B. Reports and Distribution

All reports submitted to SHPO for review should be printed on 8.5" x 11" paper, however, foldout maps are permissible. Two (2) copies of a draft report are to be submitted for review and must be marked "DRAFT." Copies should be sent directly to the lead agency responsible for the undertaking. That agency is responsible for forwarding the drafts to SHPO with a request for comment. For OCRM and other state projects, copies may be sent directly to SHPO:

South Carolina Department of Archives and History
8301 Parklane Road
Columbia, South Carolina 29223

Upon receipt, SHPO will review one draft copy and may send the other for peer review. Outside reviewers are persons who have demonstrated a research interest or expertise that pertains to the report's content.

After SHPO has provided comments to the lead agency, at least four (4) copies of a final report are required to complete the consultation process: two (2) copies for SHPO (or three [3] if structures are found) and two (2) for SCIAA. For curation and distribution purposes, SCIAA requires that its copies include both a floppy or compact disk version and a bound, acid-free hard copy that can be opened flat. Investigators should send all copies directly to SHPO. SHPO will distribute the appropriate copies to SCIAA.

In most cases, the agency may also require report copies. The investigator is responsible for providing the agency with these copies.

C. Report Content

Although the exact format and content of the report is usually a decision reached by the agency, client/applicant, and consultant, reports should minimally contain the following information:

1. Title Page

- a) *Report Title.* Include type of investigation and project location.
- b) *Author(s).*
- c) *Principal Investigator(s)'s Information.* Include name, affiliation, address, telephone number, and signature.
- d) *Client Information.* Provide name and address of client for whom report was prepared.
- e) *Name of Lead Agency.* Include contract number, permit or State Clearinghouse number.
- f) *Report Date.*
- g) *Report Status.* Examples would include Draft, Revised Draft, or Final.

2. Abstract

- a) *Description of Project and Purpose.*
- b) *Summarize Findings, Evaluations, and Management Recommendations.*

3. Table of Contents

4. List of Figures, Plates, and/or Tables

5. Introduction

- a) *Purpose of Report and Nature of the Undertaking.*
- b) *Identify Legislation or Regulations Governing the Work.*
- c) *Client Information.* Provide name(s) of project sponsors, contract/permit numbers, and other appropriate agency-specific information.
- d) *Description of Undertaking.* Include area of potential effect (APE), project footprint, and nature and extent of anticipated disturbance. Identify and describe the features or facilities associated with the undertaking. Give the size of the undertaking in acres/hectares or linear distance and width (e.g., road corridor). If the size of an area surveyed is different from the total undertaking, state the survey area in acres/hectares as well.

- e) *Location Map.* Illustrate portions relevant portions of 7.5' USGS topographic maps, clearly delineating the boundaries of the undertaking, as well as type of survey done in each area (i.e., pedestrian survey, shovel testing, etc.). Figures should include quad name, bar scale, and north arrow.
- f) *Dates.* Supply dates when work was conducted.
- g) *Personnel.* List the names and project titles of the key personnel.
- h) *Project Documentation.* Provide the location and disposition of field notes, artifacts, and other records.

6. Environmental Setting

Include physiographic province, landform type, nearby drainages and water sources, roads, dominant soil association, and current land use. This section should discuss the nature of potential environmental impacts upon cultural resources. If limiting factors affected the survey, describe and discuss them. Include representative photographs of the general project area.

7. Cultural Context and Previous Archaeological Investigations

This section includes an overview of cultural history of the project region. Length and detail of discussion should be appropriate to the level of investigation and materials recovered. This section should also include a review of previous archaeological investigations in the project area and its vicinity (e.g., drainage or county as appropriate), as well as a description of all archaeological sites within a reasonable distance from the project area. Author(s) should also describe their historical research, including a list or description of all resources reviewed, repositories and specific collections consulted, and a list of persons interviewed.

8. Research Design

Research designs present explicit statements of theoretical and methodological approaches followed in a particular cultural resource study, and, therefore, are to be included in nearly every type of report. The nature and level of detail in this discussion will be consistent with the undertaking and type of investigation. If a research design has been previously developed for a specific geographic region, type of investigation, or type of resource, the author(s) should reference and discuss this material.

9. Field Methods

Field methods should be described in a way that lets reviewers and future researchers easily reconstruct what was done and why. The following suggestions should be considered when describing field methods:

- a) *Maps.* Cartographic illustrations should depict pedestrian survey areas, subsurface tests and/or excavations, and any relevant field descriptions (e.g., vegetative cover). All maps will include a north arrow (magnetic north, true north, or grid north), a map scale (e.g., 1:24000), and a bar scale. For sites located using GPS, the type of equipment and its error range should be indicated.
- b) *Surface Survey.* Specific techniques should be described and justified for both the general project area and for each individual site (if different from the general methodology). Describe locations examined, intervals between transects, surface visibility, and methods of collection.

- c) *Subsurface Survey*. Techniques should be described, including shovel test and test unit dimensions, depths, transect intervals, and method of artifact recovery.
- d) *Remote Sensing*. Techniques should be described and evaluated when used.
- e) *Constraints on Fieldwork*. Factors such as limited access, poor ground visibility, and adverse weather conditions should be discussed. Note which areas of the project area were not examined or received only limited investigation.

10. Artifact Description and Analysis

- a) *Classification Scheme*. Describe the classification systems deployed in the analysis of artifacts. If a previously defined typology is being used, provide a brief description along with a reference.
- b) *Assemblage*. Provide a complete description of recovered artifacts by provenience (except shovel tests and surface collections). Detailed artifact descriptions, measurements, and attributes can be provided in tabular form as an appendix. Typically, artifact descriptions should include material, class, and type of artifacts recovered, along with counts, weights, and any measured attributes of diagnostic material (e.g., projectile points, ceramics, beads, etc.).
- c) *Illustrations and Photographs*. Representative and/or important artifacts should be illustrated either as line drawings or photographs.
- d) *Results of Special Studies*. Describe any special analytical methods used. For radiocarbon dates please include the following information:
 - (1) *Site Number and Provenience*.
 - (2) *Laboratory Number*.
 - (3) *Material Dated*.
 - (4) *Method of Dating*. Examples include conventional, extended counting, AMS, etc.
 - (5) *Conventional C-14 Age*. Express in radiocarbon years before present plus or minus one sigma error (e.g. 2420 ± 60 BP).
 - (6) *1-Sigma Calibrated C-14 Age*. Express in calendar years (range) within one-sigma range of error. NOTE: Include all intercepts (e.g., cal BC 755 to 685 and cal BC 540 to 400).
 - (7) *2-Sigma Calibrated C-14 Age*. Express in calendar years (range) within two-sigma range of error (e.g., cal BC 780 to 380).
 - (8) *Reference*. Provide citation for calibrated results (e.g., Stuiver et al. 1993).
 - (9) *Associations*. List any associated artifacts and/or phase/period affiliations.

11. Site Descriptions and Results

- a) *Site Description*.
 - (1) *Narrative Description*. Describe each site in narrative form including dimensions, stratigraphy, quantity of artifacts, and features. Include discussion of shovel tests, soil cores, and test units, as appropriate. Include drawings and photographs of representative wall profiles, as well as a written description of soil stratigraphy (including Munsell Soil Colors) for a representative sample of shovel tests and for each test unit.

(2) *Site Maps*. Individual site maps should depict general topographic characteristics, placement of subsurface tests, and features. These maps must include a north arrow, date, bar scale, legend, and site number.

(3) *Associations*. Enumerate, describe, and interpret artifacts. Describe and interpret features, including those above ground. Include drawings and photographs of representative features.

(4) *Archival Research*. For historic archaeological sites, summarize results of the archival research. For larger projects, most of the archival research can be included as a separate background section, and only site-specific information needs to be presented in this section. All archival and oral history should be referenced in a systematic manner that lends itself to source relocation.

b) *Site Significance*.

(1) *Statement of Significance*. Statements of significance must be presented for each identified site, with reference to specific NRHP criteria listed at 36 CFR 60.4. Most archaeological sites are recommended as eligible under Criterion D, and in these cases evaluations should address the potential of sites to contribute information about specific research objectives. This process should be documented in sufficient detail for the reader to judge how the investigator reached these conclusions.

(2) *Recommendation of Ineligible*. If a site is recommended as not eligible, state the rationale for this evaluation.

(3) *Recommendation of Eligible*. If a site is recommended as eligible or potentially eligible, present supporting evidence, including research topics that might be addressed. Discuss types of data known to be or thought to be present, and indicate information that can be inferred from these data.

(4) *Insufficient Information*. If there is not enough information to evaluate a site's eligibility, state this explicitly.

c) *Site Integrity*. Identify and explain any factors that have or may have affected site integrity.

d) *Project Impacts*. If known, identify and describe potential project impacts for each site and evaluate potential effects.

12. Summary and Recommendations

a) *Summarize Recommendations*. List and review sites recommended as eligible and potentially eligible or not eligible for the NRHP. If site eligibility is indeterminate and the archaeological work was conducted at a survey level, appropriate recommendations for further work might include site testing to determine NRHP eligibility. For evaluative testing, recommendations for further work might be to avoid a site or to mitigate adverse effects through data recovery. Please outline the nature and extent of any recommended additional work.

b) *Additional Survey*. State whether additional work may be necessary in portions of the project area that were not surveyed.

- c) *Evaluate Stated Research Design.* Discuss the results of the project in relation to the research design. Consider how constraints on the investigation may have influenced the reliability and value of the information recovered.

13. References Cited

14. Appendices and Attachments

Analysis data generated as a consequence of a project should be contained in appendices. In addition, a common practice is to include specialist reports as individual appendices. Finally, the Vitae of the Principal Investigator should be included at the back of the report if the individual is not RPA certified.

V. PERSONNEL QUALIFICATIONS

Archaeological projects require the services or input of professionals in archaeology and other related disciplines. It is essential that cultural resource surveys and evaluations be performed and supervised by qualified professional personnel. Agencies, institutions, corporations, associations, or individuals will be considered “qualified” when they meet the Secretary of the Interior’s *Professional Qualifications Standards* (36 CFR 61 and *Federal Register* 48:44738-44739). The qualifications for archaeologist, architectural historian, and historian are presented below.

A. Archaeologist

The minimum professional qualifications for an archaeologist are a graduate degree in archaeology, anthropology, or closely related field plus: (1) at least one year of full-time professional experience or equivalent specialized training in archaeological research, administration, or management, (2) at least four months of supervised field and analytic experience in general North American archaeology, and (3) a demonstrated ability to carry research to completion. In addition to these minimum qualifications, a Principal Investigator must have at least one year of full-time supervisory experience in the study of related resources (e.g., historic archaeology, prehistoric archaeology or underwater archaeology).

1. Principal Investigator

The Principal Investigator (PI) is the individual responsible for planning and investigating cultural resources and for the validity of the material presented in cultural resource reports. All archaeological investigations must be carried out under the direction of the PI, who will minimally meet the standards outlined by the Secretary of the Interior (see above) and have at least 6 - 12 months of archaeological experience in South Carolina or the southeastern United States. A PI is presumed to meet these qualifications if he/she is certified with the Registry of Professional Archaeologists (RPA). If a PI is not RPA-certified, he/she must attach a vita detailing his/her professional experience as an appendix to the report.

2. Project Archaeologist

The Project Archaeologist (PA) must spend at least 50 percent of the allocated project field time working in the field. The PA will minimally meet the standards for his/her area of expertise (see above). SHPO recommends that a PA have at least 6 - 12 months of experience in South Carolina or the southeastern United States.

B. Architectural Historian

The minimum professional qualifications for an architectural historian are a graduate degree in architectural history, historic preservation, or a closely related field with coursework in American architectural history; or a B.A. in architectural history with a concentration in American architecture; or a B.A. in architectural history, art history, historic preservation, or a closely related field. In addition one of the following criteria is required: (1) at least two years of full-time experience in research, writing, or teaching in American history or restoration architecture with an academic institution, historical organization or agency, museum or other professional institution; or (2), a substantial contribution through research and publication to the body of scholarly knowledge in the field of American architectural history.

C. Historian

The minimum professional qualifications for a historian are a graduate degree in history or closely related field; or a bachelor's degree in history or closely related field plus one of the following: (1) at least two years of full-time experience in research, writing, teaching, interpretation, or other demonstrable professional activity with an academic institution, historic organization or agency, museum, or other professional institution; or (2), a substantial contribution through research and publication to the body of scholarly knowledge in the field of history.

VI. LIST OF CONTACTS

Advisory Council on Historic Preservation (ACHP)	(202) 606-8503
American Institute for Conservation (AIC)	(202) 452-9545
SC Department of Archives and History, State Historic Preservation Office (SHPO)	(803) 896-6196
SC Department of Health & Environmental Control (DHEC), Office of Ocean and Coastal Resource Management (OCRM)	(843) 744-5838 (receptionist) (843) 747-4323 (automated)
SC DHEC, Bureau of Land and Waste Management	(803) 896-4000
SC DHEC, Division of Vital Records (Disinterment Forms)	(803) 898-3630
SC Department of Natural Resources (DNR), Land Resources Division	(803) 734-9108
SC Institute of Archaeology and Anthropology (SCIAA)	(803) 777-8170
SC State Library	(803) 734-8666
US Army Corps of Engineers (COE), Charleston District	(843) 727-4330
US Army COE, Savannah District	(912) 652-5492
University of South Carolina (USC), South Caroliniana Library	(803) 777-3132

VII. REFERENCES CITED

Advisory Council on Historic Preservation

1980 *Treatment of Archaeological Properties: A Handbook.*

1990 *Consulting about Archaeology under Section 106.*

Bense, J. A., H.A. Davis, L. Heartfield and K. Deagan

1986 Standards and Guidelines for Quality Control in Archaeological Resource Management in the Southeastern United States. *Southeastern Archaeology* 5(1): 52-62

McGimsey, Charles and Hester Davis

1977 *The Management of Archaeological Resources: The Airlie House Report.* Society for American Archaeology, Washington, DC.

APPENDICES:

- APPENDIX A. GENERAL GUIDELINES FOR THE PERFORMANCE OF GEOARCHAEOLOGICAL WORK**
- APPENDIX B. PALEOETHNOBOTANICAL ANALYSIS AND REPORTING OF FLOTATION SAMPLES**
- APPENDIX C. GUIDELINES FOR APPLICATION OF PHYTOLITH ANALYSIS IN HERITAGE MANAGEMENT**
- APPENDIX D. GENERAL GUIDELINES FOR FAUNAL STUDY**
- APPENDIX E. REPORT PREPARATION CHECKLIST**

APPENDIX A. GENERAL GUIDELINES FOR THE PERFORMANCE OF GEOARCHAEOLOGICAL WORK

*J. Schuldenrein, GRA
Geoarcheology Research Associates
Riverdale, New York*

A. Introduction

Geoarchaeology refers to the application of geological methods to archaeological problems. In recent years, it has become clear to archaeological practitioners that it is impossible to interpret the context of archaeological remains without a comprehensive understanding of the landscapes and sediments with which these remains are associated. Moreover, since environments are dynamic, there is a need to reconstruct landscape histories in order to understand why certain components of the archaeological record are preserved while others are not. It follows that planners and managers working in preservation, conservation and regulatory settings must incorporate an understanding of landscape and geological systematics in order to effectively design preservation plans and to structure strategies for administering cultural resources.

Specifically, geoarchaeology is concerned with landforms, sediments, soils, and the processes explaining the interface between the natural and the cultural environments. As such, geoarchaeologists are trained in a variety of natural sciences ranging from soil science to geomorphology, sedimentology and hydrology. Because of the variability in their training, geoarchaeologists have particular research orientations that archaeological project leaders must take into account before selecting consultants for particular field problems.

It is critical that consulting geoarchaeologists have the archaeological experience necessary to answer questions that archaeologists pose. In many cases, the inability of the archaeologist to formulate a particular research question for investigation can result in misdirected advice and application of irrelevant earth science strategies. To eliminate such situations the archaeologist must be familiar with the consultant's archaeologically-oriented work. Second, the geoarchaeologist must be a part of a research team at the outset of a project.

Since most of the archaeological work undertaken in the US is performed under the aegis of the environmental compliance process, it is convenient to link the role of the geoarchaeologist to the widely accepted components of the compliance cycle. This is typically manifest in the identification, evaluation, and data recovery levels of investigation.

B. Identification: Survey, Site Location, and Generic Context

Initial archaeological survey can be either areal or linear in scope. Systematic survey requires a field strategy that is, at the very least, sensitive to terrain gradients as well as the edaphic conditions of the terrain. The geoarchaeologist is helpful in designing the survey strategy by understanding the subsurface of the terrain and the potential for that terrain to house preserved artifact contexts.

Accordingly, before finalizing a survey strategy, the archaeologist should use the services of the geoarchaeologist to undertake the following:

1. Geological Dating. Identify the antiquity of the terrain to be traversed for survey.

2. Geological Mapping. Provide a map of the geology or geomorphology of the survey terrain to establish which components of the landscape may have significant accumulation of Late Quaternary sediment.
3. Interpreting Historic Maps. Examine land use maps, records, and aerial photos to assess which components of the landscape have been substantially affected in the modern era, since these can thereby be eliminated from intensive surface survey.
4. Ground Truthing. Perform a "pre-survey" ground truthing walkover of the project area.

The geoarchaeologist should walk over the study terrain in conjunction with project leaders to refine the survey strategy. Ultimately, it is possible to formulate a detailed survey plan that is scientifically sound, comprehensive, and cost-effective for the identification of cultural resources.

C. Evaluation: Survey, Site Testing and Integrity Assessments

Once sites are selected for evaluative investigations, preliminary stratigraphic observations must be made. These must be performed initially by the geoarchaeologist in order to develop consistent protocol for stratigraphic designation. Following establishment of a sequence for a particular set of sites by the geoarchaeologist, the task of establishing stratigraphic designations can fall to the field director, or even crew chief until the next visit by the geoarchaeologist. Stratigraphic designations should never be made by more than one or two people. Otherwise, it is impossible to unravel inter-site or even intra-site stratigraphies, once the field records are in and more critical interpretations are required by the geoarchaeologist.

In most cases, sites are investigated as groups in similar settings (i.e. along a given reach of a floodplain). The application of uniform nomenclature for stratigraphy is therefore pivotal. Archaeological designations of strata are almost invariably misleading. The most critical infraction is the alphabetic assignments of strata as "A", "B", "C", "D", and "E." In fact, "A", "B", and "C" are formally defined soil horizons, "D" means nothing, and "E" is a legitimate soil horizon, generally bracketed between the formal "A" and "B". Moreover, the designation of horizons as soils is not necessarily relevant to all archaeological stratigraphies, as in the case of dynamic floodplain sequences when the depositional succession is more critical than the soil succession (see discussion on litho-stratigraphy and pedo-stratigraphy below).

For these reasons, it is recommended that a Master Stratigraphy be developed by the geoarchaeologist and followed by the archaeology team member who is responsible for reporting the site sequences back to the geoarchaeologist for assimilation and standardization.

Special samples should be collected when subsurface investigations are initiated. Minimally, two types of samples that should be taken here are (1) radiocarbon specimens for dating, and (2) anomalous sediments that are inconsistent with primary strata represented on site.

Formerly, the only radiocarbon samples taken from archaeological sites were the charred remains of cultural activity (i.e. burnt charcoal, hearth fills, pit fills). It is now recognized that the antiquity of the bracketing sediments—overlying and underlying the cultural materials—may be just as critical for site chronology. These sediments are often rich in composite organic matter, or specifically, disaggregated humic sediment that can now be dated by the accelerator method (AMS). Wherever possible such sediment should be taken from site profiles. Most archaeologists refer to humically enriched horizons as "the buried A", typically a banded, black-gray horizon up to 20 cm thick, and offset from the more commonly encountered, browner sediment. A "brick" of the humic sediment should be excavated from the profile within "the buried A" and submitted for radiometric determinations.

Anomalous sediments often refer to events of a highly localized nature that disrupt the stratigraphic continuity of the general landform of the site. In many cases, they are the *raison d'etre* for the site. For example, Archaic sites on floodplains may have discrete sandy lenses underlying them that have accounted for unique landform build-up and advantageous drainage, the main reasons for site selection. Mississippian sites are often characterized by clay linings signaling floors, and linear, darkened trench fills indicative of stockade lines. When discovered in isolation, these are signals of anthropogenic sedimentation that may ultimately reveal site structure. Such unique sediments should be sketched in stratigraphic or plan view and then removed and submitted to the geoarchaeologist for more detailed analysis and interpretation.

Typically, however, the most detailed sampling is reserved for data recovery investigations. The procedures for data recovery are described below.

D. Data Recovery: Environmental Reconstruction and Site Formation Studies

The most rigorous geoarchaeological studies are applied during data recovery, when research objectives require the application of the most comprehensive inter-disciplinary skills available to the investigative team. Earth science strategies are often mobilized on a large scale at this juncture, although recent experience suggests that the application of some of the most critical methods—coring and deep testing—are generally even more relevant during earlier phases of the investigation. In the Northeast, for example, subsurface exploration is mandated during identification and evaluation to establish baseline stratigraphic relations early in the compliance process.

The following steps should be followed when attempting to explore subsurface relationships and to reconstruct site environments and site formation sequences.

1. Investigate the Site Landscape and Depositional Environment

In general, data recovery programs will require investigation of buried deposits and more significantly, landscapes. In these instances it can be assumed that site burial was caused by a variety of processes related either to flooding (alluviation), gravity (colluviation), wind movement (aeolian deposition), or most critically in the 20th century, land filling.

The task is performed in three stages: (a) reconnaissance and mapping of the contemporary landform surfaces; (b) subsurface investigations describing buried cultural horizons, soils, stratigraphic units and marker horizons; and (c) soil sediment and radiocarbon sampling to resolve more detailed issues of sedimentation and soil formation.

2. Systematic Subsurface Exploration

This is done to determine the macro-stratigraphy of a site setting, and in many cases that setting is a floodplain or terrace environment. These are really segmented environments that are vertically and laterally complex. It is necessary to break out active floodplains, terraces, levees, marsh edges, strand lines, etc. In most cases, these segments can be identified only by subsurface exploration. Excavations are performed with the use of backhoes, corers (manual or machine powered), or shovel probes.

In most cases, coring and backhoe equipment can be used to excavate to depth. Backhoes can be used for the most diagnostic locations or those for which extensive lateral exposure is necessary. Cores are used for bridging stratigraphic relations across landforms and situations where access for heavy equipment is impractical. Combinations of cores, backhoes, and shovel probes can be a valid strategy as well. When using heavy equipment, it is necessary to comply with OSHA standards.

3. Data Recording

The stratigraphy should be recorded as carefully as possible. When looking at an excavation trench (backhoe excavated), detailed and measured observations should be confined to one wall. Any stratigraphic variability exhibited in the other exposures should be carefully documented as well. Measurements should be done in meters, but English system conversions may be undertaken later, as necessitated by project report standards. Photographs should be taken of each profile using a meter scale and photo board, whenever possible. Do not under- or overexpose.

At all exposures, sequences should be recorded according to the following schemes: *Lithostratigraphy* and *Pedostratigraphy*.

- a) *Lithostratigraphy*. Reference is made to observable changes in depositional environments. Each parent material is given a separate successive Arabic numeral ("1", "2", "3", etc.) beginning at the top of the sequence (youngest to oldest). An example of an extreme lithostratigraphic break would involve an unconformity separating two different, naturally occurring deposits (i.e. alluvial or aeolian). Since most archaeological contexts involve subtle fluvial and alluvial settings, it is important to separate litho-strata if a principal change in depositional type is recognized. This means that if you see a break between a channel and overbank sediment, assign each one a separate Arabic numeral. On the other hand, if a fining upward sequence is observed, a single litho-stratum will suffice. The geoarchaeologist must use his judgment here, but must be consistent. There is a space on the form for notes. If it does not suffice, use additional paper. Many basal strata will preserve high-discharge gravels. The practitioner should do the best he/she can in describing gravel morphometry, lithology, imbrication, coatings, etc. The most important element to note is that these types of sediments are preserved in the sequence.
- b) *Pedostratigraphy*. Reference here is made exclusively to soil environments. Terraces are more likely to have evidence of some weathering (or soil formation) than active floodplains. Along many of South Carolina's rivers, Inceptisols and Entisols are common in floodplain contexts (i.e. "A-Bw-C" and "A-C" successions), especially in more laterally extensive flood belts. It is possible to encounter some well-weathered ("Bt") horizons, but not very many on well-drained and older terraces. The most critical column on the form is "Stratum." An example for a hypothetical deep section is "A-AB-C-2A-2Bw-2C-3Cox." All of the other categories on the form are self-evident. Carefully note that the form identifies standard structure and boundary classifications, since these are the most likely to generate confusion.

4. Sampling

As noted earlier, the most critical samples that should be taken are radiometric. Take as many as there are organically enriched deposits. After excavation it is possible to submit selected specimens to determine which stratigraphic locations should be filtered out. Typical samples include charcoal, logs, and humate specimens. Our experience has shown that humate is dateable even from A-C or B horizons. One should be liberal in taking samples. Better safe than sorry.

At archaeological excavation or landform exposures, column samples should be taken for geochemical and sedimentological testing. This is preferably done by the geoarchaeologist, but if he/she is unavailable, the rule is to take "brick"-like samples (see procedures for evaluative testing) at 10 cm intervals within a single stratum or at evenly divided smaller increments in strata that are thinner than 20 cm. These samples are taken for analysis in soil/sediment laboratories as defined below.

5. Laboratory Analysis

Comprehensive granulometry and geochemical testing are typically performed on stratigraphic columns of natural, cultural, and mixed (natural and cultural) origin. The more standard tests are described below.

Composite granulometry or grain size analysis (three fraction: sand, silt, and clay) is usually used for sequences to determine changes in channel activity, sedimentation, and flooding regime. It is necessary, for example, to isolate lateral accretion from overbanking. Dry and/or wet sieving segregates size grades within the sand fraction, while the hydrometer method separates the broader sand, silt, and clay fractions. To isolate variability within the size frequency distributions, a series of statistical parameters are examined. In addition to standardized size grade fractionation, parameters of sorting (So), skewness (Sk), and kurtosis (Kg) are calculated using the method of moments (after Friedman and Sanders 1978).

A battery of quantitative geochemical tests are applied to soil horizons to obtain signatures of limited weathering on the floodplain (T-0) and evidence for human occupation in the form of disaggregated cultural residues. Varying contributions of organic and chemical elements are often associated with formerly stable surfaces that may have sustained prehistoric occupations. At many archaeologically dense sites, these tests are also critical for determining the degree to which colloids and clay-charged organics are mobilized vertically in the water table. Often, for example, intact Archaic and Woodland components can be preserved in sealed "Ab", "AB" or even "Bw" horizons. It is possible to detect hidden cultural signatures geochemically.

The elements, or ions, most often tested to identify weathering and anthropogenic additions to a profile include calcium (Ca), magnesium (Mg) potassium (K) and phosphorous (P). The most common cultural residues isolated by these ion tests are bone, wood ash, excreta, and animal meat and tubers (Cook and Heizer 1965; Anderson and Schuldenrein 1985; Kolb et al., 1990; Schuldenrein 1989). To examine the degree of weathering and oxidation/reduction in the sola (i.e., "Bw", "Bwg", or "Bcg"), relative concentrations of mobile iron (Fe) and Manganese (Mn) are measured, along with organic matter (OM) and pH. Covarying trends can help to determine if vertical or lateral changes in a profile are attributable to soil forming processes, human input into the sediments, or combinations of pedogenic and anthropogenic transformations to the matrix.

Finally, geochemical analyses of phosphates are often undertaken to infer human activity and behavioral patterns based on geochemical analysis of features. The extent and performance of specific activities at the site may be determined by measuring concentrations of inorganic phosphates and assessing fractionation patterns. This method facilitates reconstruction of the types of activities, duration, and even the relative antiquity of particular feature types. Techniques in this study followed the methodology initially outlined by Eidt (1984) for phosphate fractionation and subsequently refined by Schuldenrein (1995) for North American hunter-gatherer sites.

References Cited

- Anderson, David G., and Joseph Schuldenrein
1985 Prehistoric Human Ecology along the Upper Savannah River: Excavations at the Rucker's Bottom, Abbeville, and Bullard Site Groups. *Russell Papers 1985, Vol. I and Vol.II*. National Park Service, Archeological Services Branch, Atlanta.
- Cook, S. F. and R. F. Heizer
1965 *Studies on the Chemical Analysis of Archaeological Sites*. Publications in Anthropology No. 2. University of California Press, Berkley.

- Eidt, Robert C.
1984 *Advances in Abandoned Settlement Analysis: Application to Prehistoric Anthrosols in Colombia, South America*. The Center for Latin America, University of Wisconsin-Milwaukee, Milwaukee.
- Friedman, G. M. and J. E. Sanders
1978 *Principles of Sedimentology Rocks*. John Wiley & Sons, New York.
- Kolb, M. F., N. P. Lasca, and L. Goldstein
1990 A Soil-Geomorphic Analysis of the Midden Deposits of the Aztalan Site, Wisconsin. In *Archaeological Geology of North America*, edited by N. P. Lasca and J. Donahue, pp. 199-218. Centennial Special Vol. 4. The Geological Society of America, Boulder, Colorado.
- Schuldenrein, Joseph
1989 Soil Phosphate "Prints" and the Detection of Activity Loci at Prehistoric Sites. Paper presented at the 54th Annual Meeting of the Society for American Archaeology, Atlanta.
- 1995 Geochemistry, Phosphate Fractionation, and the Detection of Activity Areas at Prehistoric North American Sites. In *Pedological Perspectives in Archeological Research*, edited by Mary E. Collins, Brian J. Carter, Bruce G. Gladfelter, and Randal J. Southard, pp. 107-132. Soil Science Society of America Special Publication 44, Madison, Wisconsin.

APPENDIX B. PALEOETHNOBOTANICAL ANALYSIS AND REPORTING OF FLOTATION SAMPLES

*Gail E. Wagner
University of South Carolina
Columbia, SC*

A. Analysis

The more information you supply the analyst, the better the report they will be able to write for you. Generally, paleoethnobotanists clean, identify, count, and weigh everything 2.0 mm in size and larger from both the light and heavy flotation fractions. Identifications must be based on a modern comparative collection or on morphological comparison with specimens in an herbarium. Reference books may be used as secondary sources.

Most paleoethnobotanists scan all light and heavy fraction plant remains less than 2.0 mm in size, noting the presence/absence of all plant taxa and pulling out seeds and other interesting items such as squash (*Cucurbita* rind). Sometimes a particular type of plant remain, such as acorn shell, may be sorted, counted, and identified to a size smaller than 2.0 mm. Generally, analysts identify up to 30 pieces of wood per flotation (light and heavy combined) sample. As a rule of thumb, it is better to analyze parts of many samples rather than only a few entire samples if time/money are limiting considerations (see Toll 1988). The best way to subsample is to use a geological riffle sorter.

The analyst will be able to do a better job reporting if the archaeologist cooperates in sharing information about the site. The analyst expects at least the following minimal information: (1) a map showing the location of the site within the state, (2) a map of the site showing the excavation units, features, (3) information about the features, midden, or other sampled proveniences (e.g., maps of features, cultural association/age, sampling strategies, size of samples), (4) details about the sampling strategies, recovery methods, and size of samples, and (5), the common name, if any, and the tripartite site number for the site.

The value of your report will be enhanced if you involve your analyst in the project while you are still in the field. The analyst may advise you on sampling strategies, sample sizes, and recovery methods, and may even be able to give you fast feedback on individual samples so you may revise any of the above. In general, the analyst will appreciate samples from ALL of the different contexts at the site, not just from features (Lennstrom and Hastorf 1995). In general, single component contexts give the most valuable information. If your sherds and/or lithics are of mixed time periods within a context, your charcoal will also be of mixed time periods. The analyst may prefer to process the flotation heavy fractions rather than have your lab crew do so.

Make sure that you send the paleoethnobotanist a copy of the final report. The analyst needs to be able to refer to the report in any follow-up correspondence. It is also critical to make the paleoethnobotanist a part of your final edit team, since you may change the paleoethnobotanical report in ways that are botanically incorrect.

B. Minimal Standards of Reporting

Paleoethnobotanical studies are an investment in time and effort. Basic information must be supplied in the report for the study to be accurately evaluated and used in future research. Seven points are provided below to ensure that at the very least a minimum acceptable level is reached in the report.

1. Recovery Technique

Recovery methods and screen sizes used must be detailed. What type of flotation system was used? How was the light fraction recovered and with what size mesh? Specify what size mesh was used to capture the heavy fraction. The common use of window screen or 1/16th inch mesh [1.0-1.5 mm] by field archaeologists is not recommended by paleoethnobotanists. Instead, it is strongly recommended that one use 0.8 mm mesh or smaller (Wagner 1988). Specify how the heavy fraction was sorted - was it sorted entirely by hand, or was some or all of it refloated (and in what type of liquid). It is important to note that while hand sorting is common, it is not recommended. Refloating is the preferred technique. Make sure that you specify whether the dirt was screened before it was floated. Again, screening before floating is not a recommended practice. If the plant remains were recovered by screening, specify wet or dry and give the screen size(s), (Overall reference: Wagner 1988).

2. Field Sampling Strategy

The sampling strategy for recovery contexts should be fully documented and detailed. Consult Lennstrom and Hastorf (1995) and Pearsall (1989) for a discussion of this topic.

3. Volumetric Measurement

The amount of dirt in liters should be listed with each sample. Also the measurement device should be noted along with when the sample was taken.

4. Analytical Strategy

What fragment sizes were completely sorted and identified? What sizes were scanned? What sizes were not scanned, if any? What numbers are presented in the report -- actual counts and weights (recommended) or have the numbers been inflated by figuring the ratios of those plant remains only scanned but not counted/weighed (not recommended). How were identifications made?

5. Tabular Data Reporting

The analysis for each sample or each feature/stratigraphic unit should be listed in a table or tables. Samples should be grouped by time period and/or by other criteria (i.e., for plantation site: main house vs. outhouse vs. slave quarters). To be fully comparable with other reports, counts and weights of each taxon should be listed. Generally, at least all items 2.0 mm in size and larger should be quantified. Both scientific and common names should be given.

6. Count and Weight Data

The count and weight should be given for each category of plant taxa for each sample (at least for all items 2.0 mm in size and larger). If the samples were unusually small, samples may sometimes be grouped by time period or other category rather than listed individually.

7. Include Only Actual Measurements

Only actually measured numbers should be presented: do not count/weigh the above - 2.0 mm material but then inflate your figures by adding in a similar ratio for each taxon from the scanned but unsorted less-than 2.0 mm split.

C. Minimal Standards for Curation

1. Plant Remains

The plant remains should be divided into their analytical categories and curated inside of hard, protective containers with labels. In this manner, the analysis can be checked by others at a later date should any questions arise.

2. Laboratory Tracking

The analyst should include a note inside each bag/container giving their name and the date that the analysis was performed.

3. Botanical Report

A copy of the botanical report should be kept with the collection.

References Cited

Lennstrom Heidi A. and Christine A. Hastorf

1995 Interpretation in Context - Sampling and Analysis in Paleoethnobotany. *American Antiquity* 60(4):701-721.

Pearsall, Deborah M.

1989 *Paleoethnobotany: A Handbook of Procedures*. Academic Press, NY.

Toll, Mollie S.

1988 Flotation Sampling: Problems and Some Solutions, with Examples from the American Southwest. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, edited by C. A. Hastorf and V. S. Popper, pp. 36-52. University of Chicago Press, Chicago.

Wagner, Gail E.

1988 Comparability Among Recovery Techniques. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, edited by C. A. Hastorf and V. A. Popper, pp. 17-35. University of Chicago Press, Chicago.

APPENDIX C. GUIDELINES FOR APPLICATION OF PHYTOLITH ANALYSIS IN HERITAGE MANAGEMENT

*Irwin Rovner
Binary Analytical Consultants
Raleigh, North Carolina*

A. Introduction

The single most compelling reason to employ phytolith analysis in any of the wide range of archaeobotanic contexts and research problems in heritage management is simply this: *there are phytoliths in your site*. Opal (i.e. silica-based) phytoliths are fully mineralized, microscopic cell particles produced in living plants. They are impervious to organic decay and, as a result, are well-known for unsurpassed preservation in archaeological and geological sediments. Phytoliths are not a “perfect” plant fossil system. They may be altered or destroyed by pedochemical agents, mechanical breakage, corrosion and abrasion. Not all members of the plant kingdom produce them and not all of the myriad morphological forms produced have taxonomic distinctiveness. Nevertheless, phytolith analysis is the most reliably preserved set of floral proxy data available in archaeological research. Site after site, which failed to provide preserved pollen, bone and/or flotation macroremains, have produced substantial assemblages of preserved phytoliths. Phytolith analysis is an excellent partner used in conjunction with other systems, and it presents a powerful stand-alone capability as well.

Development of plant opal phytolith analysis has progressed rapidly in recent years and is now used virtually worldwide. However, in many areas of paleoecological and archaeobotanical research is still relatively new, underdeveloped and underutilized. Archaeology of the eastern United States is one such area where interest and application is fortunately increasing. Phytoliths can provide paleoclimatic data in a format similar to a pollen profile including at sites and in regions where lack of pollen preservation is notorious. However, phytoliths do not duplicate pollen data; rather, the two systems are powerfully complementary. Pollen is strong in identifying trees where phytoliths are relatively weak; phytoliths are strong in identifying grasses where pollen is relatively weak. Moreover, phytolith taphonomy often differs from that of pollen in many positive ways. This is predicated on the fact that phytoliths are not actively dispersed by a plant, but often represent a decay-in-place botanical signature. Thus, distributional study of phytolith assemblages within a paleosol horizon or a cultural layer can provide landscape patterns at a much finer scale than typically provided by pollen. In natural settings, phytolith concentrations can show marked shifts of floral cover between ecotonal boundaries, e.g. forest-grassland edge, agricultural field boundaries, etc., at the scale of 10's of meters or even meters. Unlike pollen, phytoliths can separate grasses below the family level. Classification of grass phytoliths into three major grass tribes: Festucoid (cool, moist regimes), Panicoid (warm, moist regimes) and Chloridoid (warm, dry regimes) provides clear potential for more precise and accurate reconstruction of the climatic history of grasslands. In any ecological context, the relative frequencies of this "grass tribe triad" are very sensitive to climatic shifts of temperature and rainfall at both the macro-environmental and micro-environmental levels.

In cultural contexts, phytolith concentrations often result from specific ethnobotanical activities - food processing areas, in food residues on potsherds, on surfaces tools used in plant processing, from locations of mat and mattress placement or thatch, as vegetable temper in pottery and adobe, in human and animal feces, in animal and human tooth tarter deposits, in refuse disposal features, etc. The recognition of such point specific-data, like a floral snapshot contemporary with an individual animal, a feature, a structure, etc., has occurred frequently as a spin-off of pollen-like paleoenvironmental studies using phytoliths, but in special contexts.

In terms of taxonomic identification, all grasses produce distinctive phytoliths, including virtually all the cultivars (wheat, oats, barley, rye, millet, maize, rice, etc.); yet, separation between domesticates and close wild relatives is still problematic. Distinctive phytoliths likewise occur in beans and squash providing great potential for investigation of the New World Agricultural Complex.

Phytolith analysis, then, is a double-edge sword. It is an excellent complement to pollen analysis in regional paleoecology as well as an avenue to identify ecological parameters at a more detailed localized scale. It is also a powerful partner with the study of flotation samples from point specific contexts in archaeological sites. The latter, an emerging application of phytolith analysis, is still experimental, especially with regard to appropriate sampling strategies and research designs. More experience with the potential of this line of research in more archaeological contexts is needed, especially where parallel studies, e.g. flotation, is being conducted allowing for comparative assessment of results. A CRM project is an outstanding context in which to conduct a robust, development study of this new avenue of archaeobotanic research into the history of the human interaction with and exploration of their ecological context at both the general and specific levels.

B. Prerequisites for Phytolith Analysis

Two prerequisites are essential for effective application of phytolith analysis: Phase I testing and reference taxonomy.

A Phase I determination, very simply, is an initial test for the existence of adequate phytoliths in contexts of interest. Availability of good phytolith data is a positive factor in determining the significance of a site, just as is the presence of artifacts, features, bones, or any other conventional data system. As a site is tested during a Phase I test, soil samples should be collected for preliminary testing and assessment. The number of samples collected is determined by the complexity of the site and the extent of archaeological testing, but normally a set of 1-2 from each major context of interest should be sufficient at this stage. Small sites may need only two or three samples tested, and larger sites perhaps as many as 6 to 12. The purpose is to determine the nature of phytolith evidence to aid in the evaluation of site significance and to design an appropriate strategy for incorporating phytolith analysis in the research plan should the site be selected for mitigation/excavation. Any site, large or small, with six or more samples taken from a variety of critical contexts which prove sterile is not a candidate for phytolith analysis.

Extraction of phytoliths from soil samples at this stage should address basic planning questions. Are phytoliths present? Are they well preserved? Are phytoliths morphologically diverse, indicating that significant taxonomic groups are represented? In general, what plant taxa were observed? Are the significant phytoliths sufficiently abundant to provide the data needed to address more complex, strategic archaeobotanic and paleoecological research problems? No actual archaeobotanic data or interpretations are usually provided since this requires considerably more intensive scanning, counting, etc. at obviously greater cost.

A reference taxonomy is essential to interpretation of phytolith assemblages from an archaeological site. Having abundant, well-preserved phytoliths with no idea of their taxonomic origin renders them virtually worthless. Unfortunately, there is no comprehensive reference database for identification of flora in this region. This task is monumental—and expensive. It cannot be realistically accomplished as part of any given project. However, every project can contribute to alleviating this project by supporting study of a small number of reference plants for phytolith content. If each project included support for selecting some 6 to 10 plants of specific interest to the project that have not been tested previously for phytoliths, the result will enhance both the specific value of data from a given project as well as the general development of phytolith analysis in archaeological research.

C. Determining Research Strategies for Incorporating Phytolith Analysis in Phase II/III Excavations

A standard or universal sampling strategy for all sites does not exist for phytolith analysis. Pollen profiles are vertical, and specific location of that profile, given the reliance of regional pollen rain, is not significant. Such a strategy does not utilize the capabilities of phytoliths effectively. Given the local to extremely local patterns of deposition possible with phytoliths, sampling profiles should be *both* vertical and horizontal. Plant deposition patterns will likely be very different inside and outside a feature. A grass lining along the sides and bottom of a storage pit will not be present in a sample taken from the middle. Samples from a house structure that intrude on fallen roof thatch, or straw bedding or a plant processing area may produce huge numbers of phytoliths while a sample taken two meters in lateral distance in the same level may produce nothing. Specific location is fundamentally important in a phytolith sampling strategy requiring that it be “custom-designed” for each site. Given the nature of discovery during archaeological investigations, it will most often be necessary to determine the sampling strategy in the field during the course of excavation. Generally speaking, many small individual samples are better than a few big ones. Advance planning for phytolith sampling should focus on raising the level of awareness of field supervisors and excavators, rather than on promulgating fixed rules for the number and pattern of phytolith samples to be taken.

D. Taking Phytolith Samples in the Field

Taking phytolith samples is relatively straightforward, essentially following pollen protocols. The surface to be sampled should be freshly exposed to avoid airborne contamination. Tools for taking samples should be wiped clean, rinsed and dried before taking the next sample. Tap water, river or lake water should never be used as biosilica contamination is highly likely from diatoms and sponge spicules (as well as phytoliths). Diatoms and sponge spicules are mineralogically similar to phytoliths and appear in phytolith extracts. Their presence often adds significant information; thus, contamination should be avoided. Distilled water or water filtered to remove particles of less than 5 microns (less than 1 or 2 microns is better but takes longer to process) should be used for cleaning sampling tools. For the overwhelming majority of phytolith samples, a size equivalent to a 35mm film can is sufficient and film cans are, in fact, excellent containers for this purpose. Sealing, double-bagging, etc., as necessary is warranted to avoid contamination and/or spillage. Waterlogged samples should be dried to avoid growth of spores if they are to be curated. Otherwise samples not sent for laboratory processing may be curated indefinitely without requiring any further special ambient conditions.

Annotated Suggested Readings:

Brown, Dwight A.

- 1984 Prospects and limits of a phytolith key for grasses in the central United States. *Journal of Archaeological Science* 11(4):345-368. [Still one of the most complete catalogues of grass phytolith morphological variation available.]

Middleton, William D. and Irwin Rovner

- 1994 Extraction of opal phytoliths from herbivore Dental Calculus. *Journal of Archaeological Sciences* 21:469-473.

Pearsall, Deborah M.

- 1989 *Paleoethnobotany: A Handbook of Procedures*. Academic Press, Inc., San Diego [A lot of basic practical information on field and laboratory methods, but protocols for taxonomic identification, i.e. for maize, are unreliable and fraught with explicitly contradictory and non-supporting data and assessment.]

Pearsall, Deborah M. and Dolores R. Piperno, editors

- 1993 *Current Research in Phytolith Analysis: Applications in Archaeology and Paleocology*, Volume 10. MASCA Research Papers in Science and Archaeology, Philadelphia [A serendipitous collection of interesting papers.]

Rapp, George R. Jr., and Susan C. Mulholland

- 1992 *Phytolith Systematics: Emerging Issues*. Plenum Press, New York. [More for the phytolith specialist, but considerable information on non-grass phytoliths and more.]

Rovner, Irwin

- 2000 Phytolith Evidence for Large-scale Climatic Change in Small-scale Hunter-Gatherer Sites of the Middle Archaic Period, Eastern USA. *Proceedings of the Second European Phytolith Research Conference*, Aix-en-Provence, France. [Good example of phytolith analysis in small prehistoric sites with big implications, the volume will have variety of useful papers]
- 1994 Floral History by the Back Door: Phytolith Analysis of Two Residential Yards at Harpers Ferry. *Historical Archaeology* 28(4) 37-48. [Good example of phytolith analysis in very specific local contexts, historic archaeology.]
- 1990: Fine-tuning Floral History with Opal Phytolith Analysis. In *Earth Patterns, Essays in Landscape Archaeology*, W. Kelso and R. Most, editors. The University Press of Virginia, Charlottesville.
- 1983 Major advances in Archaeobotany: Archaeological uses of opal phytolith analysis. *Advances in Archaeological Method and Theory*, Vol. 6, M. Schiffer, Editor. Academic Press, New York. [Becoming increasingly out-of-date, but short summary overviews are hard to find.]

APPENDIX D: GENERAL GUIDELINES FOR FAUNAL STUDY

Elizabeth Wing
Florida Museum of Natural History
Gainesville, Florida
&
Elizabeth Reitz
University of Georgia
Athens, Georgia

[Reprinted with permission of Cambridge University Press]

A. Introduction

Archaeofaunal collections begin in the field, continue in the laboratory, and are curated in perpetuity. Personnel involved at all stages of the process should give thoughtful, constant, and early consideration to collection management. Many problems arise as a result of poor management of archaeofaunal materials as they are excavated. Many subsequent misunderstandings could be avoided by some remarkably obvious and simple procedures. This section is written not to belittle the intelligence of archaeological crews, but because zooarchaeologists must routinely deal with the consequences of poor, probably hasty, decisions in these areas. The urgency of these admonitions is underscored by the fact that these collections, curated in perpetuity, will be revisited by future researchers long after the primary parties have gone. Collections should be arranged at all times in such a way that they can be understood without consulting individuals who may be unavailable.

1. In The Field and Archaeological Laboratory

Some zooarchaeologists excavate and study their own materials, but most are depend upon others to excavate and send samples to them. Field and archaeological laboratory personnel can help the zooarchaeologist in several ways. While these may seem obvious to some readers, in our experience it is not obvious to many, especially as they hasten to leave the field at the end of a long, difficult season. These steps should begin with the first sample bag so that treating them carefully will be habitual when the last bags flood in from the field. Faunal remains should be given at least the same care as lithics and ceramics. Field personnel should never determine what is identifiable and what is not; all faunal remains should be sent for study in a well-lighted laboratory with a reference collection.

Animal remains are fragile and they do break when handled even gently. They should be carefully cleaned and dried, unless they are from a damp context. The condition of excavated faunal remains should be carefully monitored, and they should never be exposed to quick or extreme changes, such as drying wet bone under high heat and light or exposing dry bone to water. Many of the spiral fractures attributed to marrow extraction are actually the result of "weathering" processes that occur after excavation.

Specimens should be placed in sturdy containers that are firmly sealed and labeled with an indelible pen. Computer-generated labels should be checked for durability; many are not waterproof. Labels should also be placed inside the container. When the outside of a plastic bag becomes damp, labels made with even "permanent" magic markers become smudged and the interior label becomes the only way to identify the bag. If the materials are not dried before the container is sealed, mold will render the interior label illegible. When both "accidents" happen, as they do more times than seems credible, the provenience information for the sample is almost always irretrievable. If boxes are used, they should be taped closed even if the lid is a full one.

Each container should be numbered sequentially and a packing list with these numbers should be kept with the materials at all times; but especially when the materials are transferred to the zooarchaeologist. These numbers have a variety of names, such as inventory number, catalogue number, field number, lot number, sample number, accession number, and bag number. By whatever name, these numbers are important organizing tools. Some researchers assign multiple numbers with various meanings to artifacts; each such number increases the likelihood that errors and misunderstandings will occur. All specialists who will work with the samples would appreciate a single, sequential reference number that is used by everyone.

Usually faunal remains will be transferred from the field to another location. This may be a very short distance but sometimes the materials will be shipped several times over long distances. Such moves, however, are essential for proper study. Rough handling during shipping damages biological remains. Shipping containers should not weigh more than a normal individual can carry comfortably. Specimens on the bottom of the box bear the weight of the ones on top. Boxes receive a great deal of rough handling; well-padded samples should be sent in well-taped, sturdy boxes. Aluminum foil is not padding and, however appropriate it may be for ¹⁴C samples, should not be used for botanical or faunal specimens that will not be dated. If it is anticipated that appropriate supplies may be difficult to acquire in the field, they should be taken into the field along with other necessary field materials at the start.

Records for the site should be sent with the samples. A list of the proveniences; their catalogue, accession, or field number; and a summary of the artifacts found in each context should be sent with the faunal materials. Site maps showing where the site is and the site's relationship to physiographic features such as lakes and mountains are essential. Records should include maps of the excavated areas and profile records. Field methods should be described in detail. This includes whether arbitrary (metric) or natural levels were used or a combination of the two; definitions for zones, features, areas, etc.; and whether the depths were measured below surface or below datum. Volumetric information for the excavated units is important. While the analyst should endeavor to become familiar with the excavation and recording technique used (and should consult with the field personnel whenever there is a doubt), field personnel can help by keeping records such as maps and catalogues in such a way that they are self-explanatory. A copy of the grant proposal or a preliminary field report will help the zooarchaeologist understand the site and the research objectives. The names and addresses of the archaeobotanist, soil scientist, and biological anthropologist should also be provided. Obtaining this information is just one of many reasons zooarchaeologists prefer to be involved in the planning and excavation stages.

Sometimes worked specimens are removed from samples sent to the zooarchaeology laboratory. This limits exploration of the full range of human uses of animals, and particularly hampers the study of modifications and element distributions. Arrangements should be made for the zooarchaeologist to examine tools and ornaments so they can be integrated into the faunal study. With the end-product of the production sequence in hand, the zooarchaeologist may see evidence of on-site manufacturing that would not be recognized if the final product is unknown to the zooarchaeologist. This also provides an opportunity to diplomatically remove from the "worked" category specimens that appear worked to the untrained eye but that actually are not.

2. In the Zooarchaeology Laboratory

Remains from different archaeological contexts should never be mixed. One of the primary goals of fieldwork is to find artifacts *in situ*. This means artifacts are removed from the site while maintaining their relationship with each other as well as with the strata in which they are found. It is important to keep materials from different temporal, spatial, and behavioral contexts separate. In the field, however, the significance of a slight change in soil is often unclear, and the field crew

segregates artifacts into separate samples whenever they are unsure about contextual relationships. This conservative field procedure produces a large number of very small samples that must not be mixed during subsequent handling without the explicit authorization and instruction of the project director.

At one time it was common for archaeofaunal assemblages to be separated into subgroups along phylogenetic lines. An avian paleontologist would receive the bird specimens; a herpetologist the reptile and amphibian specimens; a malacologist the mollusks; etc. This approach is now much less common. Every effort should be made to see the relationship between humans and other animals as a living system rather than along phylogenetic lines. Only when faunal assemblages are evaluated as a whole can data be integrated and a unified pattern of site formation processes and human behavior be observed. On the other hand, it is not possible to be equally skilled in identifying all classes of animals and it is important to consult people with expertise in particularly difficult identifications whenever necessary. It is also important to consult ecologists and statisticians.

Zooarchaeologists should begin their work by establishing procedures to keep samples physically separate. Numbering specimens is a common way to do this, but it is prudent not to rely upon this procedure. Numbering specimens in the 3 mm fraction may be impractical and is impossible for specimens in the 1.5 mm fraction. If the specimens are not numbered, it is important to work with only one sample at a time. For some procedures it is necessary to have materials from more than one sample on the lab bench at the same time. In these cases, the specimens should be numbered if at all possible. Gummed colored dots are not acceptable substitutes except as the most temporary marker. If colored paint is used, the code for the color scheme should be kept with the materials at all times.

Study involves curation. As the specimens are sorted, they should be placed into vials, bags, or boxes depending upon arrangements for final curation. Each of these containers should be labeled with the sample's provenience information. By the end of the study, these labels will also contain the identification for the taxon whose remains are contained therein and whatever additional information the curating facility requires. Groups of containers from a single sample should be segregated from similar groups of containers in other samples. Under no circumstances should studied materials be discarded or returned to a common container as was once advocated. Invariably archaeological samples contain non-faunal objects, as well as some mystery items. Arrangements should be made to reunite these with other non-faunal materials.

Most specimens will be fragments of elements and in some cases these cross-mend. In general, it is preferable not to re-glue these fragments. Doing so creates a weak joint that will probably break again, causing further damage to the specimen. Glue is also a contaminate that precludes some future studies. Some research questions, however, require reassembly of specimens; in which cases the type of glue used should be recorded on the specimen tag so future conservators will know which chemicals were used.

The materials may require further conservation treatments. This is particularly the case for specimens recovered from wet sites; but many specimens may be badly weathered and require stabilization as well. Many products are available; the choice of which one to use will depend on the type of tissue involved and its condition. Bone, shell, enamel, and ivory all have different conservation requirements, as do wet, leached, burned, and worked specimens. Ideally, it would be possible to remove the chemical in the event future studies of modifications, isotopes, DNA, trace elements require it. The curational facility should be consulted beforehand and a record of the treatment should be kept with the materials at all times.

Identification is so important that the methods employed should be part of the permanent record. Some argue identifications should be accompanied by notes specifying the basis for the

identification. While it might not be necessary, or even possible, to publish these criteria, the basis for each identification should be clearly articulated some place and consistently applied. It is good practice for laboratories to have specific, written procedures that everyone in the lab follows.

Primary data may be recorded in many ways; but it is most important that the results be clear. Only procedures that are simple and replicable should be used and none of these should be left to memory. Arcane codes or personal abbreviations should be avoided. If codes are used, the key should be kept with the notes at all times. Nor is it a good practice to alter established protocols casually because this makes it difficult to duplicate them later. In some cases, the project or the laboratory may have established procedures and the curational facility may have additional guidelines; these should be followed closely. Records of primary data should be curated in a public repository with the same care as the faunal specimens themselves.

Many differences in recording techniques reflect whether the data will be computerized or not. Although computers are common in zooarchaeology labs, they are not universal, and, unfortunately, rapid advances in computer technology occasionally mean data entered on one system can be accessed by another only with difficulty, if at all. Several computer programs are specifically designed for zooarchaeology data; but as more general commercial programs become more powerful and flexible many find it satisfactory to use these instead. The computer field is rapidly changing and zooarchaeologists must consult the most current references when making decisions about computer applications. Data should not be stored only in computer files; at least one copy should be kept on archival-quality paper.

B. Long-Term Curation

Zooarchaeologists are strong advocates for long-term, professional curation of modern reference collections, archaeofaunal samples, and the associated data. The biases associated with collection management and curation decisions have been frequently encountered and are particularly distressing.

More questions may be asked of zooarchaeology data than the initial researcher may have the time, funding, expertise, or interest to explore. Although it is desirable for the published report to be sufficiently complete to encourage further analysis from the publication itself, restrictions on space may preclude including all the details. Papers, posters, and published articles cover only a limited amount of the primary data obtained through a zooarchaeology study. Refereed journals tend to publish papers devoted to method and theory rather than to the presentation and interpretation of primary or secondary data. Therefore, much data remains unpublished. This is further compounded by the realities of Cultural Resource Management. At the same time, future researchers may have new questions or want to compare data from several sites. They will need access to both the studied and unstudied archaeofaunal materials as well as the unpublished data in order to pursue their research objectives. As archaeology grows in sophistication and new techniques are applied to faunal samples, many of the remains once thought to provide little information are more interesting.

Although discarding parts of the assemblage may preclude new studies in the future, keeping an entire excavated assemblage has logistical and economic implications. Museums and libraries are repositories where the samples and data can receive permanent care. Notes should be curated for future reference in the same facility as the samples. If they are not in the same facility, it should be clear where they may be found. Reports and publications must include the location of notes and materials used in the analysis. Storage should be in areas where environmental conditions such as temperature, light, humidity, and insects are controlled. In many parts of the world it is difficult to obtain acid-free containers, air-conditioning, and secure storage cases; but every effort should be made to place the materials in as secure a condition as possible.

C. Conclusion

Each faunal collection is different, as is each archaeological project. It will be necessary to modify the procedures suggested here to accommodate these settings. However, every effort should be made to ensure that the materials are subjected to as little additional loss as possible and to facilitate their survival in the years to come. Every zooarchaeologist and archaeologist must be an advocate for the responsible management of collections and dissemination of as much data as widely as possible.

APPENDIX E. REPORT PREPARATION CHECKLIST

Please note that this checklist is meant only as a general guide: it is not exhaustive and there are some items that may pertain only to certain types of investigations (e.g., survey reports). It is the responsibility of the Principal Investigator and the lead agency to ensure the accuracy and adequacy of all information contained in the report.

Checklist for Introductory Section:

- _____ Project name.
- _____ Federal or state agency requiring the work.
- _____ Agency project number(s).
- _____ Description of the undertaking, including project location, size, anticipated impacts, etc.
- _____ Map showing project location on a 7.5-minute USGS topographic map.
- _____ List of applicable federal and state laws and regulations.
- _____ Names of principal investigator, project archaeologist/field director, and crew members.
- _____ Dates of investigation (including the total number of person-hours).
- _____ Brief statement of field methods and results.
- _____ Recommendations, including NRHP eligibility and assessment of effect.

Checklist for Environmental Background:

- _____ Discussion of current and paleo environments. This section should consider topographic setting, geology, hydrology, climate, flora, and fauna relevant to the archaeological investigation.
- _____ Types of land use within project/undertaking area, including a map delineating these areas. Include estimates of the acreage associated with each land use type.
- _____ Other environmental factors considered relevant by the investigator.

Checklist for Archaeological and Historical Background:

- _____ General overview of prehistory and history of the study area.
- _____ Summary of previous archaeological investigations and results. Include a brief discussion of all sites within a reasonable distance from the project area.
- _____ Predictions concerning anticipated site locations and types, if appropriate.

Checklist for Methodology:

- _____ Site definition used.
- _____ Field methods used, including variations in technique due to different field conditions, such as ground cover, alluviation, erosion, development, etc.
- _____ Map showing areas where different survey methods were used (e.g., pedestrian survey, shovel testing, areas not tested due to steep slope or heavy disturbance).
- _____ Number and type of shovel tests, test units, and excavation units.
- _____ Laboratory methods used, including all definitions and citations.
- _____ Brief description of specialist analyses, if appropriate.
- _____ Name of proposed curation facility.

Checklist for Field Results:

- _____ Individual site maps and descriptions, including site setting, cultural affiliation, settlement types, soil descriptions, artifact analyses, features, etc.
- _____ 7.5-minute topographic map(s) showing the location of all recorded sites and isolated finds.

- _____ Evaluation and justification for each site's eligibility according to the criteria for inclusion in the NRHP.
- _____ Assessment of potential project affect for each site.
- _____ Recommendation(s) for additional testing, no additional work, or site avoidance.
- _____ Description of the type and amount of additional work recommended (if appropriate).

Checklist for Conclusions and Recommendations:

- _____ NRHP eligibility recommendations for each site.
- _____ Assessment of project effect (i.e., no historic properties affected, no adverse effect, or adverse effect).
- _____ Recommendation(s) for additional work, if necessary.
- _____ Summary of information gained by the investigation.
- _____ Recommended procedures for post-review site discovery.

Checklist for Bibliography:

- _____ Are all references cited in the text present in the bibliography and vice versa?
- _____ Are citations complete and consistent with *American Antiquity* format?

Checklist for Appendices and Other Attachments:

- _____ Artifact catalog.
- _____ Appendices for each specialist analysis, including radiocarbon and OCR.
- _____ Vitae of Principal Investigator, if not RPA-certified.

Checklist for Site Forms:

- _____ Submit new site forms and updated site forms to SCIAA for each site identified during the investigation.