ARCHAEOLOGICAL RESOURCE MANAGEMENT PLAN

OF THE

SAVANNAH RIVER

ARCHAEOLOGICAL RESEARCH PROGRAM

prepared by

the staff of the

Savannah River Archaeological Research Program

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SAVANNAH RIVER ARCHAEOLOGICAL RESEARCH PROGRAM
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CHAPTER I

INTRODUCTION

Richard D. Brooks and Mark J. Brooks

This Archaeological Resource Management Plan addresses the future cultural resource management needs of the United States Department of Energy's (DOE) Savannah River Site (SRS). The plan is presented in partial fulfillment of Contract DE-AC09-81SR10749 between the DOE and the South Carolina Institute of Archaeology and Anthropology, University of South Carolina. The archaeological information contained herein is based on prehistoric (Sassaman et al. 1989) and historic (Brooks 1988) archaeological syntheses prepared by the Savannah River Archaeological Research Program (SRARP) for the SRS. The syntheses also address future research directions that will facilitate better management of the cultural resources.

The archaeological activities on the SRS were mandated by Executive Order 11593 and the National Environmental Policy Act of 1969 (NEPA). Appendix A contains summaries of pertinent archaeological laws and regulations governing compliance on federally owned land. In accordance with these laws and regulations, the SRARP began in 1973 with a phased approach to archaeological compliance involving reconnaissance surveys, general intensive watershed surveys, specific intensive surveys, data recovery, and coordination with major land users. The data derived from these archaeological activities are used to define archaeologically sensitive areas, as depicted on individual Site Use Grid Maps (SUGMs) contained in Appendix B. The sensitivity zones and the location of the archaeological sites indicated on the SUGMs are provided for the benefit of land use planners in order to facilitate the management of archaeological resources on the SRS.

This document is a prelude to a Programmatic Memorandum of Agreement (PMOA) which, in conjunction with this Archaeological Resource Management Plan, will assure SRS continued compliance with all applicable federal laws and regulations in concert with any DOE plans, policies and directives. The PMOA specifically addresses the identification of archaeological sites by means of archaeological surveys and site testing, and provides for the maintenance of a current database and testing of predictive models. It also examines SRS land management and site use coordination within the framework of established procedures and sets forth the guidelines for implementing the Archaeological Resource Management Plan. Finally, the PMOA recognizes the value archaeological research has in cultural resource management.

The remainder of this chapter is presented in three sections. The first section defines the purpose and goals of the SRARP. Section two provides an historical perspective for the role the SRARP has played in archaeological resource management on the SRS. Report organization is presented in the final section.

PURPOSE AND GOALS OF THE SAVANNAH RIVER ARCHAEOLOGICAL RESEARCH PROGRAM

Purpose of the SRARP

The primary purpose of the SRARP is to provide the DOE with recommendations concerning archaeological matters within the Site Use Review System, as administered by the Property and Services Branch, Contracts and Services Division, Savannah River Operations Office (SROO). This assures consideration of archaeological resources in all land use planning.

Goals of the SRARP

The three interrelated goals of the SRARP are cultural resource management, research and public education. The proper management of the cultural resources is dependent upon on-going research within specified problem domains (Sassaman et al. 1989: Chapter VI, and Brooks 1988: Chapter 6) in order to accurately assess archaeological site significance (e.g., 36CFR60.6(d) and 36CFR800.10). The integration of management and research goals form the backbone of public awareness/educational goals.

The cultural resource management goals of the SRARP guide the new cooperative agreement between the DOE and the SCIAA, USC. They are:

1) Provide a rapid response and turn-around time for future SRS/DOE special archaeological projects.
2) Provide management guidance to the DOE for the protection and preservation of the archaeological resources of the SRS.
3) Cooperate with the DOE, Westinghouse Savannah River Company, Savannah River Forest Station and other contractors in site use planning and coordinating efforts.
4) Implement successfully the Archaeological Resource Management Plan (Chapter V) and the PMOA (Appendix C).
5) Conduct additional testing of archaeological sites to enable, in light of SRARP research problem domains, the evaluation of cultural resources currently deemed potentially eligible for nomination to the National Register of Historic Places.
6) Refine the predictive models, as presented in the prehistoric and historic syntheses, through additional survey and site testing. Integrated with SRARP research goals, this will enable better decision making in site use planning.
7) Emphasize, from both a management and research perspective, the role of SRS archaeological sites as environmental resources and as a research data base, both of which are integral constituents of the SRS as a National Environment Research Park.
8) Prepare, for intra-SRS distribution to appropriate planning managers, a manual summarizing the SRARP program goals and archaeological results to date in light of the legal mandates and compliance responsibilities of the DOE.
9) Enhance, as mandated by 36CFR79, the curation facilities maintained by the SRARP. The preservation in perpetuity of the archaeological data base, whether in situ or in research collections, is an integral aspect of cultural resource management.

The research goals of the SRARP are:

1) Conduct archaeological, geoarchaeological and historical research pertinent to the SRS and the Savannah River Valley. This will enable the SRARP to:

a) Test and refine the predictive models of prehistoric and historic settlement variability, as presented in Sassaman et al. (1989) and Brooks (1988).
b) Use the predictive models to conduct regional-level comparisons by physiographic province and cross-cutting drainages.
c) Use the results of b) above to construct nomothetic-level contributions of relevance to the broader discipline of anthropology.
The knowledge from a)-c) above will enable the DOE to manage better the cultural resources of the SRS.

2) Disseminate research results through a DOE-sponsored publication series, professional journals, books, and meetings.
3) Enhance the curation facilities of the SRARP in order to facilitate better access to the research collections by SRARP staff and colleagues.

The public awareness and educational goals of the SRARP are:

1) Continue to develop and implement an educational outreach program in the SRS area. This will be accomplished through public presentations that explain the methods, goals, and results of the SRARP/DOE joint effort to identify, understand, and preserve our cultural heritage.
2) Continue the hands-on approach of the volunteer program, with the goal of providing the general public with actual archaeological work experience. This will increase not only the public awareness of the goals and methods of archaeology, but also awareness of the effort by DOE/SRARP to identify, understand and preserve our cultural heritage.
3) Involve graduate and undergraduate students in a hands-on training program in archaeological research and cultural resource management.

The above goals form the basis of the working relationship between the DOE and the SRARP/SCIAA and are consistent with both the letter and spirit of the law.

PROGRAM HISTORY

1973-1977

Archaeological investigations on the SRS were initiated at the request of the DOE (formerly the Energy Research Development Administration, earlier the Atomic Energy Commission) in 1973 in order to comply with Executive Order 11593. Table 1 presents general and specific project surveys undertaken by the SRARP between 1973 and 1987. Figure 1 shows the locations of special projects conducted by the SRARP between 1976 and 1987.

The first two seasons of fieldwork (1973) were directed by John Combs, with the assistance of David Miller. The second season (1974-1975) was executed by David G. Anderson and Robert Asreen. Both seasons were general reconnaissance surveys of the SRS and are reported in Hanson, Most and Anderson (1978).

Glen T. Hanson directed and conducted an intensive survey of the Talatha Unit in 1976. This area was originally part of SRS, until the early 1970s when it was transferred to the United States Department of Agriculture (USDA) for recreation and multiple-use programs, including forest management. Under the purview of Executive Order 11593 and NEPA, this was an inventory of three parcels of the Sumter National Forest adjacent

to SRS (Hanson and Most 1978). This work was undertaken for the USDA and not for the DOE. The Talatha Unit reverted back to the SRS in the 1980s.

It was at this juncture, in 1976, that Hanson began the monthly volunteer program on the SRS. This involved both the Augusta Archaeological Society and the Archeological Society of South Carolina, Inc. in the archaeological testing of specific sites. In January and February of 1977, Hanson and Most continued the general reconnaissance survey of the SRS. With the completion of that survey, a total of 309 archaeological sites had been located on the SRS (Hanson, Most and Anderson 1978).

1978-1981

After the general reconnaissance surveys noted above, Hanson (as Program Manager) submitted a proposal to DOE for the continuation of archaeological investigations on the SRS. The first objective was the continued examination of the general archaeological record within the SRS boundaries in order to obtain an accurate sample of data, as mandated by Executive Order 11593. The proposal outlined a stratified sampling strategy based on two environmental variables (landform-soil zone and hydrology), using the Patrol Index Grid system as the sampling framework. It was also proposed to initiate intensive archaeological survey, as required by NEPA and the Archaeological and Historic Preservation Act of 1974, in specific areas which were slated for development.

Table 1. Archaeological Compliance Activities on the SRS 1973-1987.

Year	Survey/Project	Dates Conducted	Reference
1973-1977			
1973	General Survey	Nov. & Dec.	Hanson, Most and Anderson 1978
1974	General Survey	Oct. to Dec.	Hanson, Most and Anderson 1978
1975	General Survey	Jan.	Hanson, Most and Anderson 1978
1976	Talatha Unit	July to Sep.	Hanson and Most 1978
1977	General Survey	Jan. & Mar.	Hanson, Most and Anderson 1978
1978-1981			
1978	Ind. Spent Fuel Storage Facility	July to Aug.	Hanson and Brooks 1979a
	Mills *Atlas* Verification	Sep. to Nov.	Hanson and Brooks 1979b
	Defense Waste Processing Facility	Dec.	Brooks and Hanson 1979
1979	Defense Waste Processing Facility	Jan.	Brooks and Hanson 1979
	Mills *Atlas* Verification	Feb.	Hanson and Brooks 1979b
1980	Cemetery Survey	Mar. to May	Hanson, Brooks and Brown 1981
	Four Mile Branch Survey	May to Dec.	Sassaman et al. 1989
	Savannah River Swamp Survey	July to Dec.	Stevenson 1981, 1982
1981	Savannah River Swamp Survey	Jan.	Stevenson 1981, 1982
	Saltcrete Survey	Jan.	Brooks 1981b
	L-Area Reactivation	Jan & Feb.	Hanson, Brooks and White 1981
1981-1987			

1981	Pen Branch and Steel Creek Survey	Sep. to Dec.	Sassaman et al. 1989
1982	Pen Branch and Steel Creek Survey	Jan. to Apr.	Sassaman et al. 1989
	Upper Three Runs Survey	Nov. & Dec.	Sassaman et al. 1989
1983	Upper Three Runs Survey	Jan. to Dec.	Sassaman et al. 1989
1984	L-Lake Phase I Survey	Feb. & Mar.	Brooks 1984
	L-Lake Phase II Survey	Mar. & Apr.	Brooks and Martin 1984
	Canal Redredging	Apr. to Oct.	Sassaman et al. 1989
	C & K Cooling Ponds	May to Aug.	Martin, Hanson and Brooks 1985
	L-Lake Phase III Data Recovery	May & Aug.	R. Brooks 1987; Brooks and Hanson 1987
	L-Lake Phase III Data Recovery	Oct. to Dec	R. Brooks 1987; Brooks and Hanson 1987
	Aiken Co. Hist. Museum Display	Nov. & Dec.	
1985	L-Lake Phase III Data Recovery	Jan. to May	R. Brooks 1987; Brooks and Hanson 1987
	Aiken Co. Hist. Museum Display	Jan. to Mar.	
	Lower Three Runs Survey	June to Aug.	Sassaman et al. 1989
	SCE&G Survey	June to Aug.	Brooks, Hanson and Brooks 1985
	Thermal Mitigation (D Area)	Oct. to Nov.	Hanson 1986
	Waste Management Survey I	Oct. to Dec.	Brooks 1986
	Waste Management Survey II	Nov. to Dec.	Brooks, Hanson and Brooks 1986
1986	Waste Management Survey I	Jan.	Brooks 1986
	Waste Management Survey II	Jan. to Feb.	Brooks, Hanson and Brooks 1986
	Lower Three Runs Survey	May to Aug.	Sassaman et al. 1989
1987	Burial Ground Closure	June to Aug.	Sassaman 1987

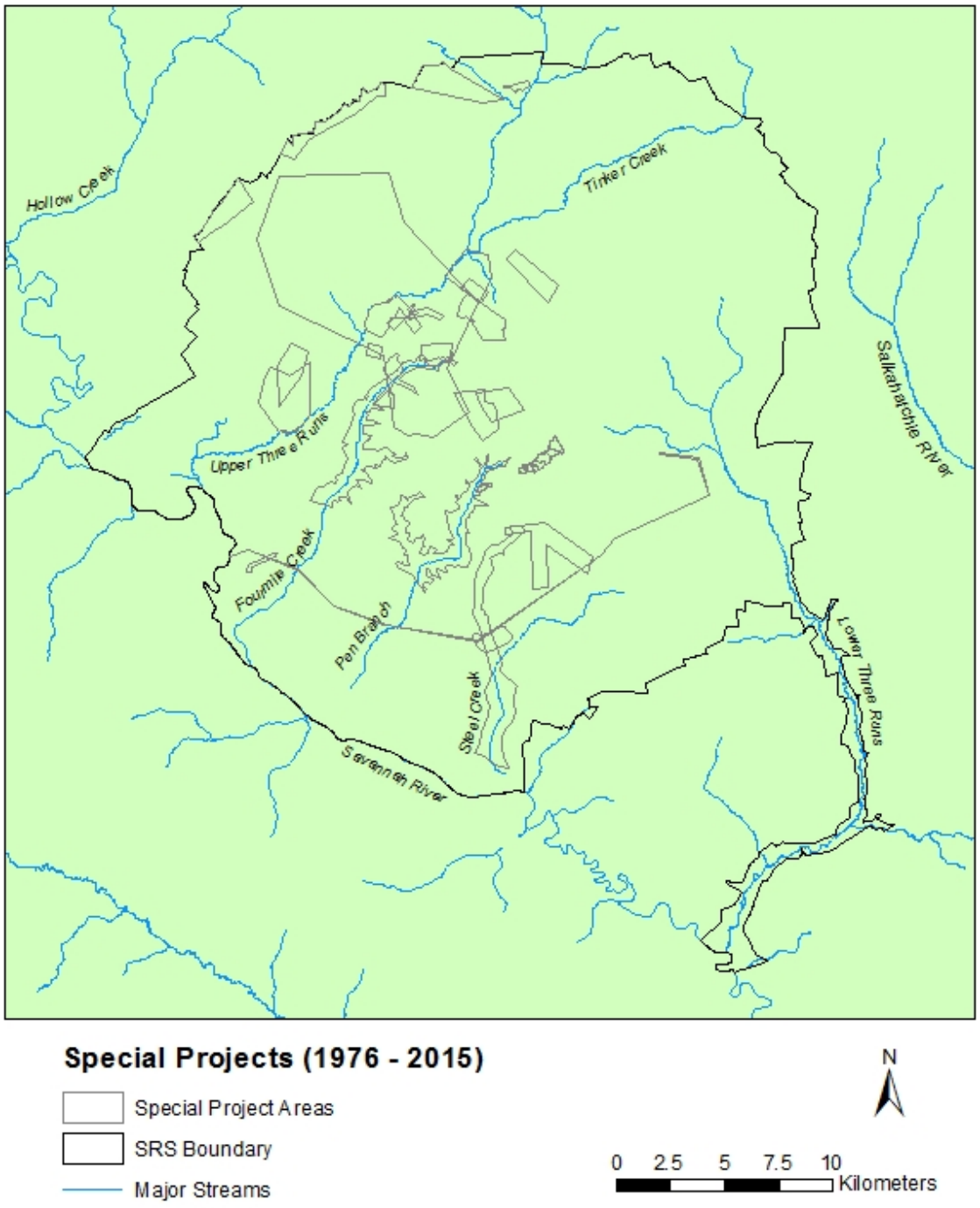

Figure 1. Locations of special projects undertaken by the SRARP during the period 1976-2015. Note: A.N.W.S.F. refers to the Alternative New Waste Site Facilities; D.W.P.F. refers to the Defense Waste Processing Facility; and the I.S.F.S.F. refers to the Independent Spent Fuel Processing Facility.

Additionally, the specific survey work would include SR-88 Site Use surveys as well as large construction projects. Contract DE-AS09-78SR01072 was awarded in July 1978. Hanson and Richard D. Brooks began the new contract in 1978 with a specific survey of the Independent Spent Fuel Storage Facility (Hanson and Brooks 1979a). This was followed, also in 1978, by Brooks' Mills' *Atlas* (1825) site verification survey (reported in Hanson and Brooks 1979b).

In December 1978 and January 1979 Hanson and Brooks conducted an intensive survey of the Defense Waste Processing Facility. This survey and testing of sites was in a 400 acre tract in the Aiken Plateau (Brooks and Hanson 1979).

A continuation of Contract DE-AS09-78SR01072 was granted in 1979 to continue through April of 1981. The continuation outlined six tasks to be completed. These included: the Four Mile Branch watershed survey; the completion of the Tinker Creek site (38AK224) testing that was begun in 1977 with the volunteers; an historic overview; a survey of remnant historic cemeteries; a Savannah River floodplain study; and, the initiation of the Automated Site Use System, a part of the SR-88 process (see Chapter V).

During the remainder of 1979, Hanson completed the analysis and prehistoric research on the Tinker Creek Site and a re-analysis of all archaeological material collected through 1979. At the same time, Brooks conducted background historic research at the South Carolina Department of Archives and History and at the South Caroliniana Library, resulting in an historic overview (Brooks 1981a).

Fieldwork for the inventory and identification of 36 remnant historic cemeteries on the SRS was conducted in 1979 using help from the newly formed Augusta Genealogical Society. This work was undertaken to provide DOE with a document listing all known pre-1950s cemeteries and to identify graves remaining on the SRS or those removed by the Corps of Engineers in the early 1950s (Hanson et al. 1981a).

Geologist Anne E. Stevenson joined the program to undertake geological investigations of the Savannah River Swamp. These investigations, during 1980 and 1981, provided the data necessary for a report on the geomorphology of the Savannah River Swamp (Stevenson 1981) and for Ms. Stevenson to complete her Masters Thesis (1982). The remainder of 1980 was spent by Hanson and Brooks surveying and testing sites in the Four Mile Branch watershed.

The intensive survey of the Saltcrete Area of the Defense Waste Processing Facility was undertaken in January 1981 (Brooks 1981b). During this same period, archaeologist John W. White joined the program to help in the special intensive survey of Steel Creek for the L-Area Reactivation Project. This intensive survey and testing of archaeological sites was along the Steel Creek floodplain where archaeological sites might be impacted by thermal effluent from the restart of L-Reactor (Hanson et al. 1981b).

In May 1981, the DOE requested a proposal (RFP) for archaeological work on the SRS. The three prime objectives were to: 1) complete the general survey under Executive Order 11593 and NEPA; 2) provide ongoing archaeological consultation; and 3) prepare a

long range archaeological resource management plan with special recommendations for land use planning (Hanson 1981).

The RFP also outlined nine specific tasks to be completed by the end of the contract period. These tasks were included as part of Contract DE-AC09-81SR10749 and are:

1) Conduct a 40% probabilistic intensive survey within the watersheds of Upper Three Runs Creek, Lower Three Runs Creek, Pen Branch, and Steel Creek.
2) Conduct archaeological testing at potentially significant sites to determine their extent, content, integrity, and density of archaeological material.
3) Prepare a comprehensive archaeological report(s) on all research conducted since 1973 (Brooks 1988; Sassaman et al. 1989). This document is subsumed under this task.
4) Provide DOE with consultation relating to the SR-88 Site Use Review System.
5) Provide DOE with consultation pertaining to the Automated Site Use System.
6) Coordinate with the Savannah River Forest Station on all timber management activities.
7) Provide DOE with specific information relating to historic cemeteries within the SRS. The purpose of this task is to provide information to relatives of those who were buried within the SRS prior to Federal acquisition.
8) Conduct special intensive archaeological surveys in areas of potential construction.
9) Prepare two displays depicting the archaeological research program and results on the SRS.

1981-1987

During the first two years of the contract, survey was conducted in the Pen Branch, Steel Creek, and Upper Three Runs watersheds. Several special projects were designated by DOE for immediate investigation in January 1984. At this time, the program acquired archaeologist Debra K. Martin. The projects included the: Phase I survey of L-Lake; Phase II survey of L-Lake; Canal Redredging Project; and, Thermal Mitigation Project for proposed C & K cooling ponds. Each of these projects were undertaken to provide the DOE with a complete inventory and evaluation of archaeological resources for the management and protection of the resources.

The L-Lake Phase I intensive survey and testing of archaeological sites included the dam, borrow areas, discharge structure and diversion canal areas. Except for the diversion canal, the areas were either in recently planted pine plantation or had been cleared for dam construction. Seven known sites were revisited and three new sites were located (Brooks 1984).

The L-Lake Phase II areas included the embankment and lake areas During this portion of the project, twenty known sites were revisited and 6 new sites were located. The report presented mitigation plans for ten sites eligible for nomination to the National Register of Historic Places (Brooks and Martin 1984).

The intensive archaeological survey of potential cooling ponds for Pen Branch and Four Mile Branch included the floodplains and terrace edges to an elevation of 210 feet amsl. Thirty-eight known sites were revisited and 27 new sites were located. All 65 archaeological sites were shovel tested. A mitigation plan was included for 23 of the 65 sites that might have been impacted had the ponds been constructed (Martin, Hanson and Brooks 1985).

The mouth of Upper Three Runs Creek was the area of intensive survey for the redredging of three canals. No new sites were located, and only one previously known site was tested (Sassaman et al. 1989).

In August of 1984, the program acquired archaeologist Mark J. Brooks to undertake the data recovery at four prehistoric sites in the L-Lake Project area that were considered eligible for nomination to the National Register of Historic Places (Brooks and Hanson 1987). Richard D. Brooks undertook the data recovery at the seven historic sites considered eligible for nomination to the National Register of Historic Places (Brooks 1987).

At the request of DOE, Hanson designed and directed the construction of a permanent archaeological display for the Aiken County Historical Museum. The display, which opened in April 1985, presented the history and prehistory of the region posed against the backdrop of world history.

The survey of the Lower Three Runs watershed began in June 1985 and ran concurrently with the Plant Vogtle-Savannah River Plant 230 KV Line survey. The Lower Three Runs watershed survey was interrupted by the Thermal Mitigation Project (D-Area) survey and two Waste Management surveys.

The intensive archaeological survey and testing of archaeological sites along the transmission line of the Vogtle-Savannah River Plant 230 KV Transmission line was directed by Mark J Brooks. No new archaeological sites were discovered, but five known sites were revisited and evaluated (Brooks, Hanson and Brooks 1985).

The intensive archaeological survey of two Thermal Mitigation Alternate Routes for the D-Area was directed by Hanson. The survey was conducted on the terrace edge, along portions of Beaverdam Creek and an unnamed tributary of the Savannah River. No new sites were located. Only one site was previously known on the terrace edge and it received testing during the general survey of the plant in 1983 (Hanson 1986).

The intensive archaeological survey of 82 existing waste sites was directed by Mark J. Brooks. Only one new site, which consisted of a single hafted biface, was located during this survey (Brooks 1986). The intensive archaeological survey of 6 potential new waste sites was also directed by Mark J. Brooks. Five archaeological sites were revisited and eight new sites were located within the project areas (Brooks, Hanson and Brooks 1986).

The Lower Three Runs watershed survey resumed in May 1986 and was completed in August 1986 (Sassaman et al. 1989). With the completion of the Lower Three Runs watershed survey, 850 archaeological sites had been recorded. In order to process archaeological materials more quickly through the SRARP analysis system, the SRARP acquired archaeologist George Ballo in 1986 to serve as Lab Director.

Since August 1986, the SRARP has conducted numerous SR-88 Site Use surveys. This involved mainly timber management, small waste management and small proposed

construction area surveys. During the summer of 1987, in response to an SR-88 Site Use, the SRARP acquired archaeologist Kenneth E. Sassaman to conduct test excavations at two sites for the proposed Burial Ground Closure. These field investigations were initiated at the request of DOE to evaluate archaeological resources associated with the possible removal of borrow material for the closure of the Mixed Waste Management Facility. This extensive testing and excavation program provided an opportunity to collect research data on prehistoric utilization of upland sandhills environments (Sassaman 1987).

In October 1987, a five year cooperative agreement for *Archaeological Research Investigations on the Savannah River Plant* was signed between the South Carolina Institute of Archaeology and Anthropology, University of South Carolina and DOE. Ten tasks are outlined in the agreement and include:

1) Conduct archaeological research into the cultural systems in the region through surveys and limited excavation at potentially significant sites.
2) Develop and implement a Programmatic Memorandum of Agreement with the South Carolina State Historic Preservation Officer for the management of archaeological resources at the SRP.
3) Prepare annual updates to the comprehensive archaeological reports (Brooks 1988, Sassaman et al. 1989) and the Archaeological Resource Management Plan (Chapter V).
4) Provide advice on matters related to the SR-88 Site Use Review System. As part of this work, small scale archaeological survey may be necessary to assure the absence or preservation of significant archaeological resources within the area of a proposed site use.
5) Provide guidance on matters pertaining to the Automated Site Use System.
6) Coordinate with the Savannah River Forest Station on all timber management activities.
7) Maintain and curate all collections derived from the SRP in accordance with prescribed guidelines for the curation of government-owned artifacts.
8) Disseminate research results to the scientific and non-professional communities to enhance knowledge.
9) Participate in a public education program by conducting public presentations as requested.
10) Conduct special large scale surveys and data recovery work as necessary.

This brief program history covered the major objectives and results/projects associated with the SRARP compliance and management activities through 1987. These activities were undertaken to fulfill DOE's cultural resource compliance requirements and to provide the research necessary to properly understand and manage the archaeological resources of the SRS.

ORGANIZATION OF REPORT

The remainder of this report is organized into four chapters and three appendices. The purpose of Chapters II, III, and IV is to provide a background framework for the Archaeological Resource Management Plan in Chapter V. The second chapter presents a brief environmental, archaeological, and historical background of the region. Chapter III briefly discusses survey coverage, locational analysis and predictive modelling of site location. This information was generated to provide the DOE and land users with a sensitivity map of probable location, density and significance of various types of archaeological sites (Appendix B). This map is intended to be used in conjunction with the Archaeological Resource Management Plan (Chapter V). Chapter IV presents a

history of SRS land use activities and their impacts on archaeological sites between 1973 and 1987. The final chapter (V) presents the Archaeological Resource Management Plan relative to the land use activities identified in Chapter IV and the archaeological sensitivity zones identified in Chapter III. Appendix A is an outline summary of the pertinent archaeological laws and regulation under which the DOE and SRARP operate. Appendix B contains the aforementioned SUGM sensitivity maps for land use planning. Finally, by way of implementing the Archaeological Resource Management Plan, a Programmatic Memorandum of Agreement between the SROO, DOE and the South Carolina State Historic Preservation Officer is presented as Appendix C.

CHAPTER II

ENVIRONMENTAL AND ARCHAEOLOGICAL BACKGROUND

Mark J. Brooks, Richard D. Brooks, Glen T. Hanson and Kenneth E. Sassaman

INTRODUCTION

Background discussions of environment, prehistory and history of the SRS region are provided in this chapter. Drawn largely from the extant literature of the region, these background summaries do not include specific results of archaeological investigations on the SRS. For detailed accounts of SRS-specific results, the reader is referred to the historic and prehistoric syntheses of the SRS (Brooks 1988; Sassaman et al. 1989).

ENVIRONMENTAL BACKGROUND

Occupying portions of Aiken, Barnwell and Allendale counties, the SRS is located in the Upper Coastal Plain physiographic province, 240 km up the Savannah River from the Atlantic Ocean, and some 30-40 km below the Fall Line. The SRS is comprised of two physiographic subregions, the Aiken Plateau and Pleistocene marine terraces, having elevations ranging from 30 to 120 m amsl (Figure 2). The Savannah River delineates the 50 km southwestern border of the SRS with an expansive floodplain containing swamps as wide as 3 km. Most of the site, however, consists of upland sandhills which have been dissected, deeply in places, by five major tributaries and their numerous feeder streams.

Paleoenvironmental conditions relevant to prehistoric human occupation of the SRS area are presented below. This is followed by data on the extant environment which are then used to draw inferences about the prehistoric and historic food resource potential of the area.

Paleoclimate and Vegetation

Full Glacial (25,000 - 15,000 B.P.). Pollen studies at White's Pond, South Carolina (Watts 1980); Bob Black and Quicksand Ponds, northwest Georgia (Watts and Stuiver 1980); Pigeon Marsh, northwest Georgia (Watts 1975) and Singletary and Bladen Lakes, North Carolina (Whitehead 1965, 1973) indicate a full glacial climatic condition in the region, which was xeric and cold. Throughout the Piedmont and Coastal Plain provinces of the region, cold-adapted vegetation composed of predominantly spruce and jack pine characterizes the pollen records. These species, accompanied by less common oak and ironwood, suggest a much colder and drier climate than exists today (Watts 1980: 326).

Late Glacial (15,000 - 10,000 B.P.). A trend toward increased deciduous species marks this climatic episode, as indicated by an abundance of oak, beech, hickory, black walnut, hazelnut and ironwood (Watts 1980). These species reached a peak in occurrence during the period between 12,810 and 9500 B.P. at White's Pond (Watts 1980). Spruce and jack pine greatly decline across all sample areas (Watts 1975, 1980; Watts and Stuiver 1980;

and Whitehead 1965). The oak/hickory/hemlock/elm vegetation pattern extant during this period reflects a relatively warmer and moister than existed during the full glacial (Watts 1980: 326). It is during this climatic episode that the first well documented human occupation of the region occurs.

More specifically, northern hardwoods (e.g., oak, hickory, beech, birch, elm) began to replace the Full Glacial spruce-pine boreal forest in northern Georgia.

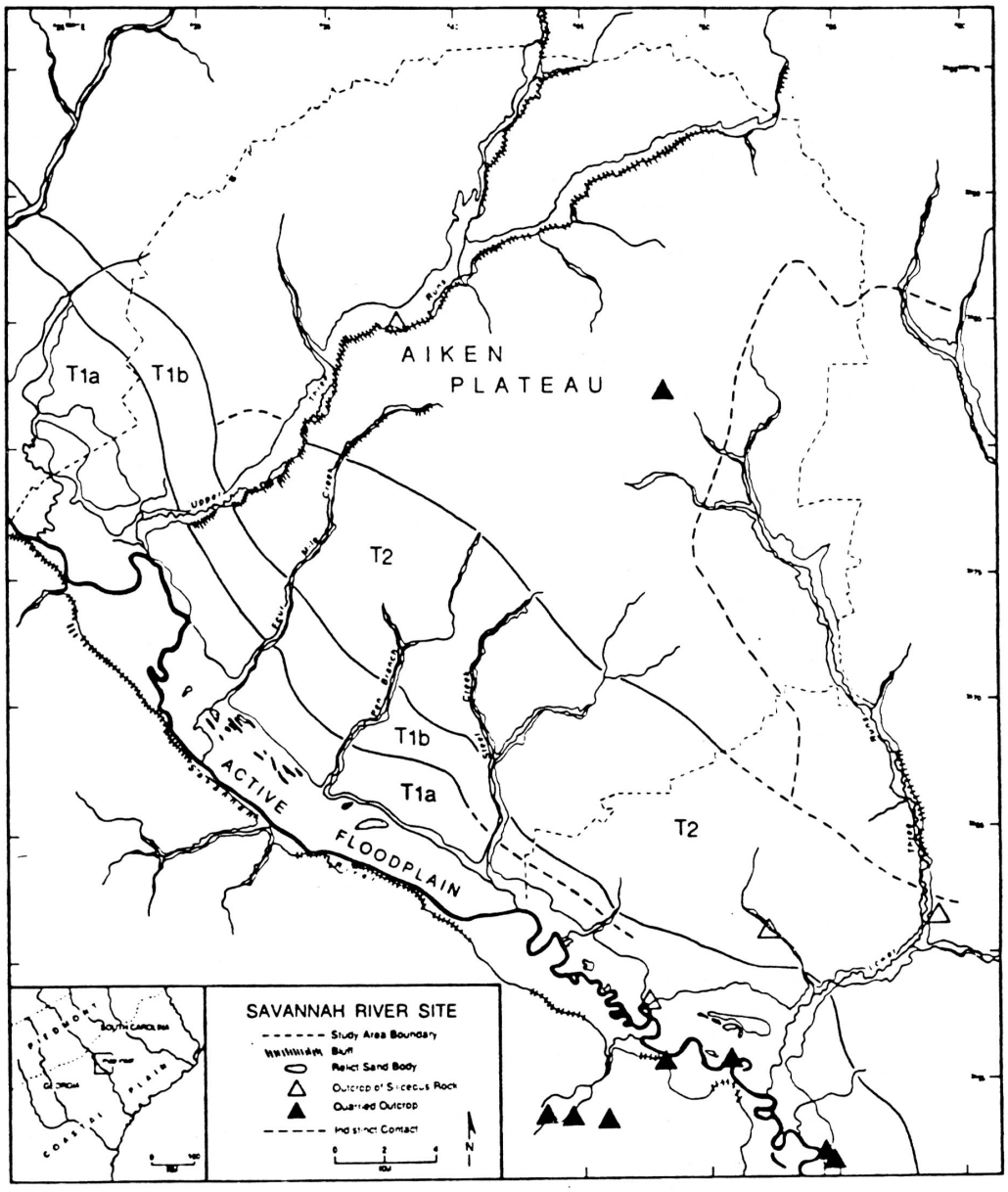

Figure 2. Physiographic and Geomorphic map of the Savannah River Site vicinity showing alluvial terraces, Aiken Plateau and lithic outcrops.

Correspondingly, temperatures were becoming warmer in summer and colder in winter, whereas precipitation was increasing (Watts 1980; Holman 1982, 1985a,b). Thus, the regional vegetational matrix was rapidly changing from a patchy (immature, or coarse-grained structure) boreal forest/parkland to a more homogeneous (mature, or fine-grained structure), mesic oak-hickory forest. Data and arguments have been presented suggesting that this transition was complete over much of the region by shortly after 10,000 B.P., and probably no later than 9,000 B.P. (Watts 1971, 1980; Delcourt and Delcourt 1983, 1985, 1987; Davis 1983; Larsen 1982).

Delcourt and Delcourt (1983, 1985, 1987) suggest that this hardwood canopy was in place south of 33 N latitude (i.e., central Georgia) considerably earlier, possibly throughout much of the previous glacial cycle. Thus, counter to the traditional view that the late Pleistocene/early Holocene was a time of major paleoenvironmental change, the lower Southeast at that time appears to have been characterized by stable, oak-hickory vegetational communities. The changes in climate and associated vegetational patterns and faunal populations during the immediate post-Pleistocene provided a much more suitable environment for human population growth. Hunting and gathering resources were more plentiful due to this change from a cooler climate to a milder climate with increases in deciduous- and seed-bearing vegetation. Although variation occurred in this early Holocene climatic sequence, the present-day character of the Coastal Plain was beginning to develop at that time.

Post-Glacial (10,000 B.P. - Present). During the early Holocene segment of this period (10,000 - 7000 B.P.), oak and hickory achieve dominance throughout the region. Walnut, hemlock and hazelnut disappear from the pollen record. By 9500 B.P., the occurrence of hickory and ironwood species had greatly declined compared to previous high levels. Replacing these species were sweetgum and blackgum, which accompanied the more persistent oaks (Watts 1980; Watts and Stuiver 1980). The changes in vegetation prior to 7000 B.P. suggest several episodes of rapid warming accompanied by increased moisture.

Oak-hickory communities persisted in the Piedmont throughout the Holocene, but in the Coastal Plain, oak diminished to less than 40% of forest composition between 8000 and 6000 B.P. (Delcourt and Delcourt 1987:254). Southern pine communities displaced the oak-dominated forests during this interval, leading to a decrease in the mast production of Coastal Plain habitats, particularly those of the Sandhills.

Between 6000 - 5000 B.P. moister conditions related to increased precipitation and Holocene sea level rise began to change the composition and structure of Coastal Plain habitats. The moister conditions were manifested by the development of extensive coastal salt marshes, interior wetlands, cypress swamps and river floodplains (Brooks et al. 1989d, 1986; Colquhoun and Brooks 1986, 1987; Colquhoun et al. 1980, 1981; Davis 1983; Delcourt 1985; Delcourt and Delcourt 1983, 1985, 1987; Delcourt et al. 1983; Foss et al. 1985; Howard et al. 1980; Knox 1984; Segovia 1985; Wright 1976). From this time forward, the nature of environmental variability does not register in the pollen studies.

Paleohydrology

Large-scale and long-term changes in the Savannah River fluvial system are critical to any understanding of human adaptations to local and regional environments. Not only did such changes influence the availability and productivity of food resources, but they also accounted for changes in the relative stability of alluvial landforms and hence had a direct bearing on the suitability of sites for human habitation. Also, because alluviation was the primary depositional process at sites utilized by humans, an understanding of changing fluvial systems is essential to the reconstruction of archaeological site formation.

Two major hydrologic changes are particularly relevant to an understanding of prehistoric settlement-subsistence on the SRS. First, the rapid rise in sea level during the early Holocene (Colquhoun and Brooks 1986, 1987) reduced the gradient of the Savannah River channel, thereby promoting the lateral migration of the river toward the Georgia side of the valley. This was accompanied by the early to mid-Holocene formation of Savannah River alluvial/mesic Terrace 1a (T_{1a}) on the SRS. The high resource productivity (possibly including chert outcrops) and ecotonal setting of T_{1a} between the Savannah River and earlier terraces (T_{1b} and T_2) is expected to have promoted intensive use of this landform by early to mid-Holocene populations (Brooks et al. 1989a).

The second important paleohydrologic process in the upper Coastal Plain occurred during the mid- to late Holocene. With the relative stabilization of sea level near its present position at 6000 B.P., modern estuarine and river floodplain development proceeded in a time-transgressive, upriver manner, such that estuarine development was initiated at ca. 6000 B.P.; whereas, floodplain development in the upper Coastal Plain did not begin until ca. 4000 B.P. (Brooks et al. 1986, 1989a; Brooks and Hanson 1987). It follows that tributary stream floodplain development started sometime after 4000 B.P. Accompanying Savannah River and tributary stream floodplain development were qualitative and quantitative increases in subsistence resource productivity in these areas. At the same time, any chert outcrops located along the channels (relict or active) of the Savannah and its tributaries would have been buried by the developing floodplain.

Modern Climate

Overall, the climate of the SRS region is best described as mild. Monthly temperature averages range from 48°F in January to 81°F in July and the annual mean humidity is 70% (Langley and Marter 1973:65). Plummer (1983:3) calls this area the rain shadow territory due to the interaction of weather systems. Weather systems from the west stall in the Appalachian Mountains, while moist warm weather comes up from the Gulf to interact with weather systems coming from the Atlantic Ocean.

Serious climatic record keeping for the region of the SRS began in about 1869. The USDA (1941) calculated an annual rainfall of about 45 inches, with a growing season of 246 days. Langley and Marter (1973:73) subsequently reported that annual precipitation averages 47 inches, with extremes ranging from 28.8 to 73.5 inches. The annual rainfall

total is generally consistent within one standard deviation (Plummer 1983; and Lovingood and Purvis n.d.). Although the raw data (see Plummer 1983 and Lovingood and Purvis n.d.) indicate that rainfall during the growing season is generally sufficient to promote growth, precipitation is less consistent during the crucial growing period. Both corn and cotton, for example, need approximately 18 inches of rain during the prime growing season from early June to mid-September. According to Augusta figures, the relatively dry year of 1904 had a wetter July and August, crucial for both cotton and corn, than did the relatively wet year of 1888. However, the rainfall was not sufficiently consistent for proper growth of either corn or cotton, especially between 1904 and 1951. Overall, the data indicate that the area experienced a drying trend in the yearly rainfall during the 1904-1951 interval. From these data, it is evident that the SRS cannot be considered a prime area for agricultural, whether from a climatic or soils (see below) perspective.

Whereas the above data were compiled for the mid-nineteenth to mid-twentieth century, they have implications for late prehistoric populations in the area. First, for cultivated crops, labor costs would likely have been excessively high relative to productivity that would have tended to be low and unpredictable. Second, the relative productivity of most natural subsistence resources would have fluctuated over both the short and long-term and would, therefore, have been somewhat unpredictable. Consequently, a broad spectrum subsistence economy and organizational flexibility would have been desirable. This could account for some of the sites on the SRS that are apparent anomalies to the Hanson et al. (1981b) settlement-subsistence model (Brooks et al. 1989b, 1989c; Sassaman 1987).

Physiography/Geomorphology

The general topography of the study area can best be described in relation to the surface geological structure composed of two major components: The Aiken Plateau and the Pleistocene Alluvial Terraces of the Savannah River (Figure 2). Composed of sandy sediments, the Aiken Plateau dominates the study area and generally ranges in elevation from 250 to 400 feet amsl within the Savannah River Site. Below the 250-foot elevation level, Terrace 2 (T_2) ranges between 170 and 250 feet amsl. The first terrace (T_1) ranges between 100 and 170 feet amsl. These terraces formed in conjunction with the down-cutting and lateral migration of the river to its present position. It is probable that terrace formation occurred during rises in sea level that would have reduced the river gradient and promoted channel migration. The modern/active Savannah River floodplain, which began to develop at ca. 2000 B.C. (Stevenson 1982), occurs below 100 feet amsl at the toe of T_{1a} and floods on a seasonal basis. Terrace 1 is a generally level feature that parallels and bounds the Savannah River swamp. Finally, T_2 is a well-dissected terrace that forms the transitional zone between the Aiken Plateau and T_1 (Sipel 1967; Stevenson 1982).

The specific topography of the study area resulted from the erosive activity of streams on the plateau and terraces. Above the 150-foot contour, the terraces are less distinct, geomorphologically, due to this erosive activity. In general, the topography is most

appropriately described as steep and dissected with river and small stream terraces adjacent to the channels.

The Coastal Plain contains comparatively little lithic raw material. The Savannah River does, however, crosscut two underlying sedimentary formations that contain chert and other siliceous rock. The larger of the two is the Flint River Formation in the middle Coastal Plain. This formation contains localized outcrops of chert, technically silicified grainstone (Upchurch 1984), in Allendale County, South Carolina and Burke County, Georgia, only a few kilometers downstream from the SRS. Goodyear and Charles (1984) recently completed a survey of these outcrops and found that the more siliceous and isotropic sources were quarried prehistorically. Lower quality cherts are also found in the Barnwell Formation of the upper Coastal Plain (Upchurch 1984). Sources known to have been utilized on the SRS are highly fossiliferous (Sassaman 1987), although small pockets of isotropic rock are present today and were potentially important local sources of raw material in the past.

Macroenvironmental Zones of the SRS

Based on topographic and edaphic variation in the study area (Aydelott n.d.), four macroenvironmental zones, formerly the microzones of Hanson et al. (1981b), are deemed relevant to the analysis of human settlement and subsistence. The zones conform to basic vegetation communities defined and described by Beavers et al. (1973) and Langley and Marter (1973) as the xeric, mesic, small stream hydric, and large stream hydric. However, because the emphasis in archaeology is upon the effective environment (i.e., those elements of the environment relevant to human exploitation), the zones are defined in a somewhat different manner. Following the definitions set forth by Hanson et al. (1981b), the four zones are: Zone I - Upland Sandhills; Zone II - Mesic Terraces; Zone III - Tributaries and Bottomlands; Zone IV - Savannah River Swamp and Savannah River. Modifications of the zone definitions since the time of their inception are noted where appropriate.

Zone I consists of the **Upland Sandhills** of the Aiken Plateau and Terrace 2 of the Savannah River. The zone is composed primarily of interfluvial ridges that gradually slope to the south. Soils of the zone are predominantly sandy and well-drained. Vegetation ranges from xeric on the high ridgetops to less xeric on the terminal ridgenoses and slopes overlooking tributary stems and springs. Contained in the communities are turkey oak, blackjack oak, bluejack oak, southern red oak, longleaf pine, shortleaf pine and loblolly pine (Beavers et al. 1973:34-35) More mesic stands contain a higher proportion of oaks relative to pines. Overall, this zone contains a very high density of small red oak group species which are excellent mast producers. In terms of hydrology, small streams with one or two branches are distributed widely in the zone. Also, some Carolina Bays are present (Schalles et al. 1989). However, many of the water resources are seasonal, thus putting a limit to the scale and duration of human settlement in this zone. Well technology of the historic era removed this constraint on human settlement.

Zone II was originally defined as the **Mesic Terrace** (T_1) between the upland sandhills and the Savannah River Swamp, but has since been modified to include the terraces of all major tributary stems in the study area (Brooks and Hanson 1987). Predominant features of the Savannah River terrace (T_1) of this zone are small backwater swamps across the ridge and swale topography of the landform. The predominant soils of the zone are sandy, though compared to upland sandhills soils they are moister and more productive, making the zone an excellent locus of food resources. Vegetation communities in

the zone are generally mesic hardwood and pine mixtures dominated by white oak with loblolly pine. Other species common to this zone are black oak, swamp chestnut oak, willow oak, mockernut hickory, pignut hickory, water oak, sweetgum, persimmon, ash and dogwood. Ranging from small headwater streams originating in the sandhills to the larger tributaries of the Savannah River, the water resources near this zone are quite variable. Of importance is the fact that this zone is always near permanent streams and the associated bottomland, thus making it an excellent intermediate location for access to both the upland sandhills and stream bottomlands.

Zone III consists of the **Tributaries and Bottomlands** from headwater springs in the Aiken Plateau to the Savannah River Swamp. Although the total gradient of the streams in this zone drops 140 feet in approximately 12 miles, no radical drops in the channel are present. This gently falling stream system thus has a moderate floodplain/bottomland along most of its margin. Because the streams and the bottomland are so mutually associated, the two are combined in this zone. Soils in this zone are composed of finer-textured soils than found in other zones and as a result are capable of holding more moisture. High nutrient values of the soils contribute to a very high productivity (Aydelott n.d.). Vegetation communities in the zone are referred to as "small stream hydric" (Beavers 1973:34-35; Langley and Marter 1973). Included in the communities are black gum, sweetgum, yellow poplar, green ash, red maple, loblolly pine, and sycamore. In the middle reaches of the watersheds, a larger stream hydric pattern exists which includes willow oak, water oak, overcup oak, nuttal oak, swamp chestnut oak, cottonwood, and sycamore. Near the junction with the Savannah River Swamp, bald cypress and tupelo gum would have been common. A recent vegetation gradient study of the Upper Three Runs Creek bottomlands by Whipple (1978) indicates that the actual composition of the community is closely associated with water levels and periodicity of flooding. Generally, most oak species tend to lack water tolerance and occur away from areas regularly flooded or saturated. Overall, the vegetation in this zone grades along the water course from moderately useful food species in the upper reaches to highly useful food species in the middle reaches to poor food resources in the lower reaches. Throughout the zone, water from flowing permanent streams is abundant. Small streams and springs provide continuous supplies of water in all areas.

Zone IV is composed of the **Savannah River Swamp and Savannah River**. The "swamp" is an irregular floodplain which has varied relief due to channel movements and associated geological formation processes. At its widest point on the SRS, the swamp, or floodplain, is about 3 kilometers in breadth. Throughout the swamp are a series of elevated ridges which parallel the river and form seasonal dry land. Thus, the swamp topography, rather than being uniform as suggested by the topographic maps of the area, consists of ridges and swales. Soils in the zone are fine-grained, with those in the upper surface levels of the swamp being poorly-drained fine silts, while ridge soils are sandy and moderately well-drained. Barry (1980) characterizes the zone as cypress-tupelo swamp, which is composed of bald cypress and water tupelo in a setting with alluvial deposits and open water circulation. Other common species are water ash, black willow, water elm, red bay, sweet bay magnolia, and American elm. On the ridge islands, which are never subjected to continuous inundation by flood waters, oaks similar to those found in the mesic terrace zone are common, as are longleaf and loblolly pines. Of importance is the fact that the islands are in most cases long and narrow with not much dry surface area. This fact would diminish their importance for oak mast production in the zone. During most of the year the Savannah River Swamp is partially flooded by modern stream and river flow. Prior to the construction of the Clarks Hill Dam in the upper Savannah River, flooding was a recurring event that inundated the entire swamp-floodplain. The water run-off from Pen Branch, Four Mile Creek and Steel Creek would have contributed to the swamp water levels. Due to this problem with flooding, habitation in the low-lying areas of the swamp would have been impossible. The islands, on the other hand, would have afforded sufficiently adequate protection from flood water to have been suitable residences during at least part of the year.

The Human Food Resource Potential of the Macroenvironmental Zones

The human food resource potential of the macroenvironmental zones defined above differs for nonagricultural and agricultural groups. For prehistoric occupants of the area,

almost exclusively nonagricultural, availability of water, aquatic plants and animals, mast resources and game, primarily deer, were the most critical factors. In contrast, access to arable land is of course of primary concern to agricultural development. In the sections which follow, the resource potential for nonagricultural, hunter-gatherer populations is considered first, followed by a brief discussion of agricultural potential across the zones.

Hunter-Gatherer Food Resource Potential. With the exception of oak mast, food resources of consequence to hunter-gatherer exploitation are the least dense and least productive in Zone I (Upland Sandhills). The low ground water content of the zone results in broad water differences relative to the productivity of various seasonal resources. Of particular interest is the high red oak group ("bitter") acorn productivity in the zone. This resource, unlike white oak group ("sweet") acorns, is more predictable from year to year and much more efficient to procure and leach (cf. Reidhead 1976:229-236). Further, these acorns are able to resist worms due to their extremely tough shells. Finally, these acorns are more reliable as a resource because they do not germinate until late winter (Fowells 1965:557-620; Olson 1974:692-701). Because of this latter characteristic, the red oak group acorns are important deer fodder during the winter, which results in higher deer density in the upland sandhills at that time.

The entire range of terrestrial fauna occur in Zone II (Mesic Terraces), making it an excellent hunting area during all but the winter season. The lack of good winter mast density in the zone, due to low frequencies of red oak species, may have made hunting a less productive pursuit compared to the upland sandhills. Other resources occur in moderate to high densities in this zone during most months of the year except winter. For this reason, food procurement in the winter may have required either seasonal movement of residence to other resource zones or logistic foraging to these zones (Binford 1980). Overall, given the optimal location of this zone between two other zones and its moderate to high food resource productivity during most of the year, inhabitants of the area would have most probably used this zone as a locus of long term residence and/or base camps (Hanson et al. 1981a).

In terms of year-round productivity and overall resource diversity, Zone III (Tributaries and Bottomland) has the potential to have provided the greatest amount of food to prehistoric hunter-gatherers. The cover provided by shrubs, vines and herbs (Whipple 1978) are capable of supporting very high deer populations. Whitetail deer tend to spend part of the day in this type of zone and the remainder in the terrace and sandhills zones. This diurnal pattern of movement would make Zone III a superb hunting area. Other fauna of both the terrestrial and aquatic types are moderately dense in the zone relative to Zones I and II. Fish are available on a permanent basis in the streams, while anadromous species enter the streams during the late winter and spring. Procurement of fish would have been a simple matter of placing either nets or weirs across the channel and collecting the catch regularly.

The fairly dense vegetal resources in Zone III would have provided a major dietary contribution. At least seven oak species, hickories, grass seeds, berries, and shoots are present. The only problem with the vegetal resources may have been the relative small area encompassed by the zone. Thus, although the resource diversity and density of this

zone are high, the zone could not have provided the total dietary requirements of any population above a minimal number, at least for vegetal resources.

The presence of resident and migratory avifauna in Zone III would have been important to prehistoric inhabitants. Twenty-three species of avifauna spend at least a portion of the year in this zone and all of these birds are edible. Although these may not have been a critical resource due to possible problems in procurement, the fowl could have been an excellent caloric and protein source.

In sum, the food resources that would have been present in the tributary and bottomland zone are the densest and most diverse of any other zone in the region. The potential for near year-round exploitation would have made the zone very important as an energy extraction location. However, due to the presence of poorly drained soils and regular flooding, it is unlikely that human groups would have resided within the zone. Rather, by situating in the mesic terrace zone (II) near Zone III, they would have had dry living areas and ready access to the streams.

Finally, whitetail deer were probably an important resource procured from the swamp of Zone IV (Savannah River Swamp and Savannah River). Other mammals such as bear, rabbit, raccoon, squirrel, muskrat and beaver were perhaps equally important. Although migratory bird density is low relative to Zone III, a high density of wood ducks would have provided some food value. Aquatic resources including freshwater mussels, resident and anadromous fish, and turtles are very common in the river and swamp. Procurement of these species would have been a relatively low-cost endeavor. As noted by Limp and Reidhead (1979), the netting of fish and other aquatic fauna is a very economical activity which can produce extremely high food yields for labor expended. This fact suggests that the use of this zone would have been quite great. A review of the food resource data from the Rabbit Mount site (Stoltman 1974) supports the contention that swamp resources were used extensively during the Late Archaic and Mississippian periods.

Overall, the resources of the swamp would have been available during most parts of the year, but procurement would not always have been equally economical. High flood waters would have made focused net fishing difficult because fish would have been able to move over most of the swamp. Instead, fishing would have been best during summer when water levels were lower and the swales became small lakes, or sloughs. Terrestrial and aquatic mammal exploitation could have been quite good if access to the resources was not inhibited by flood waters. In general, this zone would have been an excellent source of fish, mussels, vegetal foods, and mammals.

Agricultural Potential. The agricultural productivity of land in the SRS can be largely attributed to soil type and the conservation of soil. The vast majority of land supports well-drained sandy soils with moderate to severe agricultural limitations. Soils with few limitations are not uncommon, however, on stream terraces and upland slopes.

In general, differences in soil capabilities for agriculture correspond with the macroenvironmental zones defined above. To illustrate this, the capability ratings employed by Rogers (n.d.) are instructive. In his soil survey of Aiken County, Rogers recognizes a four part division of capability classes:

Class 1: few agricultural limitations.
Class 2: moderate limitations that reduce the choice of plants and require moderate conservation.
Class 3: severe limitation that reduce the choice of plants and require special conservation.
Classes 4-7: ranging from severe limitations and very careful management to unsuitable for cultivation.

Zone I (Upland Sandhills) includes soils of each class, but is dominated by soils with severe limitations. Soils with few to moderate limitations in Zone I are generally confined to terminal ridgenoses and slopes, locations requiring terracing or other measures to check soil erosion. Zone II (Mesic Terraces) contain soils of Classes 1-3, with no locations unsuitable to cultivation. Soils of Zones III and IV (bottomlands), while basically productive for mesic to hydric vegetation, require careful management to overcome the limitations to agriculture stemming from poor drainage.

In sum, prime agricultural land is concentrated on the terraces of the Savannah River and its tributaries. Selective cultivation of the better-drained soils of floodplains was possible, although these locations would be less desirable than terrace lands given sufficient rainfall. Consecutive years of drought would have placed a premium on floodplain locations, as terrace locations became increasingly dry. Good agricultural land in the upland sandhills is generally restricted to ridge noses and slopes. Ridge tops support the poorest soils for agriculture, and they would be the most risky to farm because of the susceptibility of these locations to drought and soil erosion. In terms of the scale of farming, terraces support the largest contiguous tracts of good land. Stream dissection of upland ridges has resulted in a variegated pattern of noses and slopes, so the distribution of good farm land in this zone is patchy.

Discussion. In closing this section it should be noted that the archaeological expectations inferred from these environmental data refer strictly to food resource potential. Access to human resources, non-food material resources, trade and transportation routes, and information networks has not been taken into consideration. However, human systems, regardless of their level of technological complexity, have been subject to general and specific properties of the environment that affect food acquisition and production. In a sense, environmental limitations on food resource potential provide the baseline empirical parameters against which variation in archaeological site location can be compared. Other factors affecting human locational choices, while not epiphenoma of subsistence demands, cannot contradict locational requirements without major technological, social or political change. Deviations from the locational choices predicted from subsistence requirements constitute important research problems, and future research on the SRS will aim to improve our ability to empirically document the role of these nonsubsistence dimensions.

ARCHAEOLOGICAL BACKGROUND

Archaeology in the Coastal Plain of the Savannah River Valley

Archaeological undertakings of a controlled nature in the Savannah River Valley were begun in the latter half of the last century by Thomas (1894) and Moore (1898) in their studies of prehistoric mound sites in the eastern United States. They succeeded in locating and collecting selected large sites within the Savannah River area. These pioneering efforts were important for documenting the distribution of mound sites, but little information was gained on other aspects of site variability.

Increasingly scientific archaeological research within the area began in the early twentieth century. The Cosgroves excavated a large shellmound, the Stallings Island Site, on an island in the middle Savannah River region during the 1920s (Claflin 1931). One result of this work was the discovery of the oldest pottery complex in the eastern United States. Intermittent investigations since that time have documented the stratigraphic position of this early pottery, and have also provided data on subsistence, technology and settlement patterns of the Stallings Island inhabitants (Bullen and Green 1970; Crusoe and DePratter 1976; Fairbanks 1942; Sears and Griffin 1950).

In the delta region of the Savannah River, Antonio Waring was instrumental in the initial understanding of the prehistoric archaeological record (Williams 1968). During his brief life, Waring recorded, collected and excavated many of the key archaeological sites that would form the foundation of future archaeological research in the Savannah River area. With others, Waring described the basic ceramic types and general ceramic complexes such as the Deptford ceramic complex (Waring and Holder 1968), Woodland and Mississippian ceramic types (Caldwell and Waring 1939), and Early Woodland ceramic types and assemblages (Williams 1968:152-215). The compilation of Waring's work provided by Williams (1968) stands as a major contribution to the study of southeastern prehistory.

Other research in the Savannah River area was conducted during the W.P.A. period on the Irene Mound Site, a Mississippian Period site near Savannah, Georgia. Conducted over the course of several years, the excavations revealed the existence of a long-term occupation associated with a ceremonial center (Caldwell and McCann 1941). The excavations yielded the first comprehensive plan of such a ceremonial complex within the Atlantic Coastal area.

Subsequent research was delayed for almost two decades until the 1960s when renewed interest in the initial ceramic period prompted the work of James Stoltman at Groton Plantation (Stoltman 1974). This research project involved the survey and test excavation of sites within the plantation for purposes of exploring the development of Late Archaic and Woodland cultures in the riverine area of the Coastal Plain. The major outcome of this research was the excavation of two sand mounts, Rabbit Mount and Clear Mount. These contained shell middens associated with some of the earliest known pottery in North America. In addition, sites representative of Archaic, Woodland and Mississippian occupations were located in the survey, and the distribution of these sites suggested to Stoltman (1974:229-244) radical differences in subsistence and settlement practices at various times.

Following Stoltman's research, Drexel Peterson (1971) intensified the survey of the Groton Plantation area in order to refine specific hypotheses regarding ceramic chronology and cultural development. The general result of the study was the discovery that changes in subsistence strategies were not appreciable during the Woodland period, as was thought by Stoltman (1974). Another result was a ceramic chronology that included several additional "phases" during the Early Woodland period and later times. These latter results have yet to be substantiated from other research in the general area.

Concomitant with the latter research was the expansion of study in other areas of the Savannah drainage. This research included survey and excavation at White's Mound (Phelps and Burgess 1964; Phelps 1968), Hollywood Mound (DeBaillou 1965), the Theriault site (Brockington 1971), Mississippian sites along the Savannah River (Ferguson and Widmer 1976), the Augusta area (Ferguson and Widmer 1976), and work at Stallings Island (Bullen and Green 1970). Thomas et al. (1978) provided an updated chronology for the Late Archaic of the lower Savannah River Valley through their work at St. Catherine's Island.

Works by DePratter (1976, 1977, 1979) refined the chronology of the Early Woodland occupation in the Savannah River Valley and Georgia coast, and suggested changes in the subsistence and settlement patterns that occurred within this region during this period. Trinkley (1980, 1981) and Lepionka et al. (1983) made similar contributions toward our understanding of the settlement changes and chronology of the Woodland period in the Coastal Zone of South Carolina.

Other works from outside of the Savannah River Valley have increased our knowledge of the interior Coastal Plain of South Carolina. Trinkley (1974) reported the findings of the Albert Love site. This is one of the few upland Late Archaic sites excavated in the upper Coastal Plain. Excavations at four sites tested for the Southeastern Columbia Beltway Project (Anderson 1979) and at the Cal Smoak site (Anderson et al. 1979) provided data useful in formulating prehistoric chronologies for the upper Coastal Plain of South Carolina. Brooks (1980), Brooks et al. (1982), and Brooks and Canouts (1984) provided both survey and excavation data to suggest Woodland period settlement/subsistence patterns for the interior lower Coastal Plain. Larson (1980) also suggested patterns of late prehistoric subsistence within the interior Coastal Plain. The combined results of these research efforts form the basis for the present understanding of prehistoric development within the Savannah River Valley below the Fall Line. Although a synthetic overview of the prehistory of the area is yet to be written, the initial foundation exists for a general chronological framework (Table 2).

Prehistory in the Coastal Plain of the Savannah River Valley

Paleoindian (10500 - 9500 B.C.). The Paleoindian period of the eastern United States is largely recognizable by the presence of fluted Clovis (or Clovis-like) points and, in the Southeast, by unfluted lanceolate points such as the Quad, Simpson and Suwanee types. Radiocarbon dates from the Debert site in Nova Scotia (MacDonald 1968) and the Shawnee-Minisink site on the Delaware River of Pennsylvania (McNett et al. 1977; Dent

1981) average 8600 B.C. for fluted point forms. Dates from west of the Mississippi suggest earlier occupations for that area beginning at ca. 9500 B.C. (Wormington 1957).

The subsistence resources exploited by Paleoindian populations of the eastern United States are poorly known. Little subsistence data have been recovered from Paleoindian sites east of the Mississippi River. Because of the lack of data, the earliest reconstructions of the subsistence patterns of this period were based upon faunal information borrowed from sites located on the Western Plains. Based on similarities in projectile points and overall similarities in tool assemblages, it is generally assumed that most Paleoindians of North America were similarly adapted to a system focusing on the exploitation of now-extinct, large herbivores (Mason 1962:243).

Recent data from the eastern United States have resulted in questions being raised about the role that the hunting of the megafauna played in the subsistence strategies of these people (Meltzer and Smith 1986). Food remains from Meadowcroft Rockshelter in Pennsylvania included white-tailed deer (Odocoileus virginianus), elk (Cervus canadensis), nuts and chenopod seeds (Adovasio et al. 1977:154). Shawnee-Minisink in Pennsylvania produced hawthorn pits and fish remains (McNett et al. 1977; Dent 1981). These sites suggest that resources other than megafauna may have played a very important role in the Paleoindian diet.

In the Southeast, studies by Williams and Stoltman (1965) and Michie (1977) suggest a strong geological correlation between the several forms of Paleoindian projectile points and the margins of rivers that are often the locations of mastodon fossil recovery. Bullen, Webb, and Waller (1970) also produced evidence of a mastodon vertebra that was apparently cut while the bone was green. More recently (Webb et al. 1984:384-392), portions of a Bison antiquus skull dating to ca. 9000 B.C. and containing a lanceolate biface fragment imbedded in the right fronto-parietal area was recovered from the Wacissa River in northern Florida. These studies suggest that areas suitable for megafauna, such as wide river margins and now-inundated water holes, may be closely correlated with Paleoindian site locations in the Southeast. In addition, workshop and retooling sites are also present in the region, as indicated by the Harney Flats site near Tampa, Florida (Daniel and Wisenbaker 1987).

Evidence for Paleoindian occupation has been recovered from the Coastal Plain of South Carolina (Michie 1977) and from the Theriault Site (Brockington 1971) and dispersed locations throughout the lower Savannah River valley (Charles 1986:18). Although complete assemblages have yet to be found in association with the diagnostic fluted points typical of all of the above localities, the presence of the points would suggest some activity within the region during the latter portions of the Pleistocene. Thus far, evidence for Paleoindian occupations within the Savannah River Site is meager.

Michie (1977) has proposed a general model for the location of Paleoindian sites within the Coastal Plain based on the distribution of fluted points. He concludes that:

> The overall pattern of projectile point distribution seems to involve the larger river systems (of South Carolina) such as the Broad, Savannah, Wateree, Pee Dee, Congaree, and the small

> Edisto Rivers. When these rivers are involved with point distributions and location, the points usually occur at the intersection of creeks and the highest portion of land near that intersection (Michie 1977:92).

Due to geological conditions following this Pleistocene adaptation, the recognition of Paleoindian sites is difficult. Holocene changes in stream hydrology have resulted in the deposition of recent sediments on many locations believed to be favored by these early hunter-gatherers (Michie 1977). These changes may in part account for the scarcity of Paleoindian remains at the Savannah River Site. Given Michie's data, sites may occur at the confluences of major tributaries (Upper Three Runs, Four Mile, Pen Branch, Steel and Lower Three Runs), but their presence is probably obscured by alluvial sediments of great depths. On the other hand, the few (unfluted) lanceolate bifaces on the SRS attributable to Paleoindian times were found at upland locations distant from the Savannah River. These locations suggest that Paleoindian utilization of the upper Coastal Plain was somewhat more complex than Michie's settlement model suggests.

Early Archaic (9500 - 6000 B.C.). Widespread archaeological evidence of the earliest Holocene hunter-gatherers is composed of the presence of the Dalton-Hardaway phase (Coe 1964; Goodyear 1974) throughout the eastern United States. During this period, lanceolate, indented-base Dalton points are gradually replaced by small indented-base, side-notched forms (Hardaway side-notched). Coe (1964:64, 81) suggests these points to be roughly contemporaneous. The Hardaway side-notched points are rare in most parts of South Carolina (Goodyear 1978:79) and do not seem to be present on the Savannah River Site.

Radiocarbon dates for the Dalton phase range between 8480 and 6920 B.C. Lower layers of Graham Cave in Missouri containing Dalton points cluster between 7700 and 7000 B.C. (Crane and Griffin 1968). In contrast, Goodyear (1982:382-395) has argued

Table 2. Prehistoric Chronology in the Coastal Plain Portion of the Savannah River Valley

Date Range	Archaeological Periods	Archaeological Phases	Associated Hafted Bifaces	Associated Ceramic Categories
A. D. 1450				
		Irene	Small Triangular	Irene filfot stamped, incised and burnished ceramics
A. D. 1300	**Mississippian**			
		Savannah II	Small Triangular	Savannah complicated stamped, plain and burnished ceramics
A. D. 1100				
	Late Woodland	Savannah I	Poorly defined Small-medium triangular and stemmed forms	Fine cordmarked, fine check stamped, angular simple stamped, and fabric impressed
A.D. 500				
			Medium to small	Deptford linear check,

		Deptford II	isoceles triangular	cordmarked, zoned punctate, and simple stamped
A. D. 1	**Middle Woodland**			
		Deptford I	Yadkin	Deptford linear check/simple stamped linear check, check stamped, and simple stamped
600 B. C.				
	Early Woodland	Refuge	Medium stemmed and notched forms (Thelma-like)	Refuge simple stamped, dentate stamped, and punctate
1000 B. C.		Thom's Creek		Thom's Creek
		Stallings III	Savannah River	Decorated Fiber tempered
	Late Archaic	Stallings II	Savannah River	Plain Fiber tempered
		Stallings I	Savannah River	(Steatite vessels)
3000 B. C.				
	Middle Archaic	? ? Morrow Mountain	MALA Briar Creek Morrow Mountain	
6000 B. C.				
	Early Archaic	Kirk/Palmer Taylor Hardaway	Kirk Corner Notched Palmer Corner Notched Taylor Side Notched Hardaway Side Notched	
8000 B. C.				
	Paleoindian	Dalton	Dalton Fluted and unfluted lanceolate types	
10500 B. C.				

that the correct temporal position of the Dalton horizon is 8500 - 7900 B.C. Stanfield-Worley Bluff Shelter in northern Alabama contained layers producing both Dalton and side-notched points that were dated at 6920 and 7640 B.C. (DeJarnette et al. 1962). Rogers Shelter in Missouri produced dates of 8,350±330 and 8,480±650 B.C. (Griffin 1974:94; Wood and McMillan 1976).

Associated with this temporal phase and with Paleoindian and later Early Archaic phases is a variety of unifacial blade and flake tools intentionally retouched for the tasks of scraping, cutting, and graving (Goodyear et al. 1979:97). Unique to the Dalton-Hardaway phase of Arkansas and, perhaps, South Carolina, is the presence of bifacial adzes (Morse and Goodyear 1973; Goodyear et al. 1979:96).

Following the Dalton-Hardaway phase, the latter portion of the Early Archaic is represented by a series of corner- and side-notched projectile points. These include the Taylor, Palmer, and Kirk points (Coe 1964; Michie 1971). Taylor points (Michie 1971) are known throughout the Coastal Plain of South Carolina, and Palmer and Kirk points have been recorded throughout South Carolina and adjoining states within the Coastal Plain and Piedmont physiographic province (O'Steen 1983; Anderson and Hanson 1988).

Limited stratigraphic evidence from the Theriault site on Brier Creek in Georgia suggests that Taylor points underlie Palmer points (Brockington 1971). Materials recovered from the nearby Cal Smoak Site in the Edisto drainage (Lee and Parler 1972; Anderson et al. 1979) suggest a clear priority of Palmer occupations to Kirk and Middle Archaic forms.

The Early Archaic represents the initial response of prehistoric inhabitants of the Coastal Plain, and North America in general, to the ameliorating climate conditions of the Holocene. The changes in climate and associated vegetational patterns and faunal populations during the immediate post-Pleistocene provided a much more suitable environment for human population growth. Hunting and gathering resources were more plentiful due to this change from a cooler climate to a milder climate with increases in deciduous nut and seed-bearing vegetation. Although variation occurred in this Holocene climate sequence, the present-day character of the Coastal Plain was beginning to develop at this time.

Floral and faunal remains associated with Dalton sites of the Southeast and Midwest include white-tailed deer, turkeys, cotton-tail rabbits, squirrels, raccoons, fishes, mussels, and wildfowl (McMillan 1972; Wood and McMillan 1976). Locational studies of Dalton sites have been attempted in several areas of the South. The locations of Dalton-Hardaway associations in the Coastal Plain of Georgia have been examined by Fish (1976:22-23), who suggests a strong association between large stream systems and these Early Archaic types. Dalton period occupations in Arkansas, however, are spread both along and between the large stream systems, suggesting the first intensive human occupation of the inter-riverine areas of the southeastern United States (Morse 1973; Goodyear et al. 1979:98).

Cal Smoak (Anderson et al. 1979) and other Palmer components from the Fall Line and Coastal Plain (Michie 1971; Coe 1964) suggest strong associations with large stream systems, although in the Piedmont, House and Ballenger (1976) and Goodyear (1978) indicate an extensive upland, ridgetop association for small Palmer components. These results may indicate a widespread occupation and diffuse land use pattern related to a broad spectrum subsistence base during the latter portions of the Early Archaic. This and any other inference for the period within South Carolina, however, must await evaluation through excavation and more intensive analysis.

The Kirk form includes a variety of corner-notched point types that differ largely from the Palmer in that the Kirk lacks both basal grinding and straight based, serrated variants (Coe 1964). However, Claggett and Cable (1982) argue that these traits are not temporally significant. Radiocarbon 14 dates cluster between 7500 and 7000 B. C. Dates from sites in the Little Tennessee Valley include figures of 7,485±270 B. C., 7400±215 B. C., and 7,225±240 B. C. from Icehouse Bottom; 7,460±290 B. C. from the Patrick site; and 7,160±140 B. C. and 7,380±250 B. C. from Rose Island (Chapman 1977:161-162, 1985). Other dates of 6,570±300 B. C. and 7,900± 500 B. C. from the St. Albans site in West Virginia have been recorded for Kirk corner- and side-notched forms (Broyles 1971).

Kirk tool kits differ from earlier assemblages by the occasional presence of grinding tools. Two metates were reported from Russell Cave in northern Alabama (Griffin 1974:2). Whether these tools represent an intensification of use of nut resources or the first intensive use of small seeds is unclear (Goodyear et al. 1979:103), but their presence suggests an increased exploitation of vegetation when compared to earlier periods. Overall, Kirk corner-notched assemblages represent transitional Early Archaic/Middle Archaic adjustments to a changing environment.

In the Coastal Plain, Dalton-Hardaway, Palmer, and Kirk occupations are evident based on the common occurrence of these projectile point types. Distributional studies (Goodyear 1978; Goodyear et al. 1979; Charles 1986) indicate a wide-ranging land use pattern (cf., O'Steen 1983), which may relate to the exploitation of deer in the uplands and riverine resources in major drainages of the Piedmont. Recent excavations on the Savannah River Site (Hanson and Sassaman 1984) and in the Russell reservoir (Anderson and Schuldenrein 1985) have provided assemblage-level data that, in conjunction with distributional data, formed the basis for an Early Archaic, mixed collector-forager model for the Savannah River Valley (Anderson and Hanson 1988). In terms of the Savannah River Site, Early Archaic components (Dalton and Palmer-Kirk) have been located in geographic contexts ranging from high uplands to the river terraces of the Savannah.

Middle Archaic (6000 - 3000 B. C.). The Middle Archaic period is characterized by a continuance of a generalized hunting and gathering pattern with changes in projectile point morphology. Three projectile point forms are typical of this period: Stanly, Morrow Mountain, and Guilford.

The Kirk forms are succeeded by indented base, stemmed Stanly points. These are radiocarbon-dated at 5,840+215 B. C. at Icehouse Bottom (Chapman 1977, 1985). Changes in tool kits are represented by the disappearance of the well-made "tear drop"

endscrapers found in earlier assemblages and the first appearance of ground stone tools represented by semi-lunate atlatl weights (Coe 1964:Table 2; Chapman 1977, 1985).

More common Middle Archaic types in the study area are the Morrow Mountain and Guilford types. The Morrow Mountain form consists of slightly shouldered points with tapered stems and round to pointed bases. Little is known about associated assemblages. Burial goods from the Stanfield-Worley Rockshelter in northern Alabama suggest the presence of crude unifacial side- and endscrapers (DeJarnette et al. 1962:83). Chapman (1977:106) reports the presence of drills and scrapers in the Little Tennessee Valley. A hearth with associated projectile points from site 38LX5 at the Fall Line of South Carolina dates the Morrow Mountain phase to 3,520+ 170 B. C., although this date is regarded by Anderson as being too late by at least a millennium (Anderson 1979:90). Other dates from Alabama and Tennessee range from 4750 to 4030 B. C. (Chapman 1976:8).

The Guilford point can be described as a leaf shaped or lanceolate point with an excurvate or incurvate base (Coe 1964). Stratigraphic evidence in the North Carolina Piedmont suggests 4000 B. C. as the probable beginning for the Guilford phase. Coe (1964:51) suggests that this phase differs from the preceding Morrow Mountain by the appearance of notched, chipped axes and, perhaps, the disappearance of unifacial tools.

The common distribution and density of these point forms throughout the Coastal Plain and Piedmont would suggest a greater population and extensive pattern of land use (Blanton and Sassaman 1989). In addition to the Lake Spring (Miller 1949), Theriault (Brockington 1971) and Cal Smoak (Lee and Parler 1972; Anderson et al. 1979) sites, a few sites in the area of the Savannah River Site have produced evidence of the Middle Archaic (Blanton and Sassaman 1989; Sassaman 1985a). However, little is known of the Middle Archaic assemblages for the Coastal Plain region aside from the ubiquitous hafted bifaces.

With regard to these hafted bifaces, Stanly and Guilford types, while common in the Piedmont and mountain physiographic provinces, are notable by their near absence in the Coastal Plain (Blanton and Sassaman 1989). Here, Morrow Mountain bifaces appear to be succeeded by the Brier Creek (Michie 1968), and stemmed lanceolate forms referred to as MALA or MALA/Benton (Sassaman 1985b).

Late Archaic (3000 - 1000 B. C.). Within the prehistoric sequence of the Savannah River Valley, the Late Archaic is perhaps the most thoroughly studied Archaic cultural period. Emphasis on the Late Archaic period is due to a combination of technological changes which include the introduction of ceramic vessels and to subsistence changes which include the earliest documented exploitation of shellfish.

The most noticeable change in Late Archaic assemblages from those of the Middle Archaic is the addition of fiber-tempered pottery. Radiocarbon dates from Rabbit Mount suggest that this pottery is among the oldest in North America (Stoltman 1972, 1974). Several sites containing assemblages of fiber-tempered pottery have been excavated in the region. Among the more important of these are Stallings Island (Claflin 1931),

White's Mound (Phelps and Burgess 1964), Rabbit Mount (Stoltman 1974), Bilbo (Williams 1968:152-197), Dulany (Williams 1968), Sapelo Island (Williams 1968), Refuge (Williams 1968:198-208), Daw's Island (Hemmings 1972; Michie 1973, 1974), Lake Spring (Miller 1949), Chester Field (Williams 1968:208), Walthour (Caldwell 1952:314), Meldrim (Williams 1968:182-183), and Oemler (Williams 1968:182-183). Several sites recently investigated in the vicinity of Augusta, Georgia have added to our knowledge of the Late Archaic period (Elliott and Doyon 1981; Ferguson and Widmer 1976; Ledbetter 1988). In addition, recent excavations in the Russell Reservoir area have contributed specifically to our understanding of the Late Archaic in the Piedmont portion of the Savannah River Valley (Tippitt and Marquardt 1984; Anderson and Schuldenrein 1985; Wood et al. 1986).

Both ceramic and pre-ceramic occupations have been recognized at several sites. The presence of fiber-tempered ceramics at sites of the Late Archaic is restricted to what Stoltman (1974:19) refers to as the Stallings II and Stallings III phases. Basically, these two phases are distinguished from each other by the presence of only plain fiber-tempered ware in the Stallings II Phase as opposed to the occurrence of decorated ware in the Stallings III Phase. Dates of 2,750±150 B. C. and 2,500±150 B. C. at Stallings Island were derived from the pre-ceramic occupations (Stallings I). Charcoal from a pit at the bottom of the ceramic horizon of that site dates the beginning of Stallings II at 1,780±150 B. C. Earlier ceramic dates of ca. 2500 B. C. have been recorded at the Rabbit Mount Site (Stoltman 1972).

In its rich formal variability, Late Archaic lithic technology represents a significant deviation from Middle Archaic technology. Large stemmed hafted bifaces referred to as Savannah River Stemmed (Coe 1964) dominate formal tool assemblages, but other classes of tools include expedient unifaces, grinding stones, cruciform drills, large nonhafted bifaces, soapstone "net-sinkers" (cooking stones), chipped adzes, bannerstones, ground axes, and soapstone bowls (Stoltman 1972:46-47). This diverse assemblage of lithic tool types is complemented by various antler, bone and shell tools found at Rabbit Mount, Stallings Island and Bilbo (Claflin 1931; Fairbanks 1942; Stoltman 1972; Waring 1968).

Stallings I has basically the same assemblage as the other two phases except that it lacks pottery. Some changes in projectile point morphology have been proposed between the pre-ceramic and ceramic phases. The large, broad-stemmed points of the pre-ceramic are replaced by smaller, more contracting-stemmed forms in Stallings II (Bullen and Greene 1970: 13; Keel 1976). These smaller forms are referred to Otarre (Keel 1976), or Small Savannah River Stemmed (Coe 1964; Oliver 1985).

In synthesizing available information on the Late Archaic in the Savannah drainage, Stoltman (1972, 1974) suggested a riverine adaptation focused on shellfish with some upland occupation. The numerous features and diverse tool assemblages present at some large riverine sites have been interpreted as indicating relatively sedentary human populations (Hanson 1982:8). More recently, Alterman (1985, 1987) outlined in considerable detail the complex nature of the broad-based, Late Archaic subsistence-settlement system he envisions for the Savannah River Valley.

Based on the distribution of sites for the Late Archaic, there does not appear to be a major distinction in settlement patterns between the three phases; indeed, the phases may be simply taxonomic distinctions based on ceramics without any relevance to settlement or subsistence patterns. As in the other Archaic periods, sites tend to focus on large drainages and are often found within the floodplains of rivers on alluvial rises or mounts. Shellfish were heavily utilized as were mammalian fauna (Stoltman 1974). Excavation of sites has focused on the large shell-bearing locations that may be large riverine base camps, but little information is available for upland Late Archaic sites.

Late Archaic occupation of the SRS area appears to have been relatively intensive. However, there are few sites on the SRS with fiber-tempered pottery, and none which contain an abundance of this ceramic ware. Instead, occupation of the SRS area may have been more intensive during the preceramic phase of the period. Alternatively, use of the SRS area during the ceramic phases may have been characterized by seasonal site occupations which did not include pottery use.

Early Woodland (1000 to 600 B. C.). The Woodland Period has been defined by Willey (1966) as the time during which pottery, burial mounds and agriculture were common; however, this definition is based primarily on artifactual traits, the most widespread of which is pottery. As discussed in the foregoing section, pottery is known from the Savannah River area well before the 1000 B. C. inception of the Early Woodland period. Accordingly, many researchers in the region define the Early Woodland period on the basis of sand-tempered pottery (Stoltman 1974).

Similarities between many of the fiber-tempered and sand-tempered wares make it difficult to cleanly separate the Late Archaic and Early Woodland periods. The major problem arises with the Thom's Creek/Awendaw types, which are sand-tempered wares similar to the fiber-tempered wares in form and some design elements (Griffin 1945; Phelps 1968; Trinkley 1980). Based on stratigraphic evidence from Rabbit Mount, Stoltman (1974) argued that Thom's Creek was transitional between Stallings and later Woodland types. Trinkley (1980) has compiled evidence from many sites in the region to argue instead that Thom's Creek and Stallings have considerable temporal overlap. Argued either way, Thom's Creek pottery appears to persist for a few centuries after fiber-tempered pottery disappears. The Awendaw variety of Thom's Creek is generally argued to be the last phase of the ceramic tradition (Trinkley 1980)

Within the Savannah drainage system, the locations of Thom's Creek and Refuge sites appear to be similar to those of the Late Archaic. Stoltman (1974:215, 216) has mentioned that the Early Woodland ceramics occur in both floodplain-terrace and upland associations. This general pattern would seem a reasonable expectation for the Savannah River Site because of the similar environmental contexts in the two localities.

Beyond the ceramic assemblages, little is really known of the Thom's Creek and Refuge phases, especially in terms of lithic artifacts (Hanson and DePratter 1985); although a fairly diverse, Refuge phase lithic assemblage was recovered from the Second Refuge site (Lepionka et al. 1983). This paucity of information makes any inferences

concerning the initial Early Woodland inconclusive. The overall similarity between Stallings sites and Thom's Creek/Refuge sites may provide some evidence to support a functional similarity. However, using the presence of Thom's Creek and Refuge ceramics as indicators of the Early Woodland, the Early Woodland components recorded for the Savannah River Site suggest an increase over the Late Archaic in the number of sites. A slight increase in the use of the uplands may be indicated as well (Brooks and Hanson 1987).

Middle Woodland (600 B. C. - A. D. 500). Early Middle Woodland Deptford Phase evidence, in contrast to the preceding phases, has been recovered from sites on the Atlantic and Gulf Coastal Plains from North Carolina to Florida to Alabama. Milanich (1973) has provided the most comprehensive examination of the Deptford Phase throughout its geographic range. This study views the Deptford Phase as a non-agricultural economy dependent on intensive hunting and gathering. It is most readily identified in the archaeological record by sand-tempered ceramics with linear check-stamped, simple-stamped, and check-stamped designs (Milanich 1973; Caldwell and Waring 1939; DePratter 1979; Hanson and DePratter 1985; Anderson 1985).

Within the lower Savannah River region, Deptford is well represented by evidence from the Bilbo Site (Williams 1968:152-197), the Deptford Site (Williams 1968:140-151), the Refuge Site (Williams 1968:198-208), White's Mound (Phelps and Burgess 1964), the Groton Plantation sites (Stoltman 1974; Peterson 1971), Lewis Site (Hanson and DePratter 1985), and the St. Catherine's Island Burial Mounds (Thomas and Larsen 1979). The majority of information concerning the Deptford Phase in the Savannah River region is derived from ceramics, with only minimal reference to the associated assemblages. The only general associations present at these sites consist of small triangular projectile points, small-stemmed projectile points, shell and bone ornaments and tools, and assorted flake tools. Milanich (1973), however, suggests that, with the exception of point types, Deptford sites have diverse lithic assemblages similar to those found in the Late Archaic. This limitation in the information base for Deptford assemblages can be traced to a rather single-minded concentration of most investigators on the ceramic development of the Deptford waregroup with little attention to the other characteristics of the assemblage. Milanich (1973) must be credited with one of the only efforts directed at the reconstruction of the entire lifeway associated with the Deptford ceramic pattern; however, much of his information and results are focused on the coastal region and the Gulf sub-region that are far removed from the Savannah River. The available information pertaining to the Early and Middle Woodland periods in the Savannah River Valley has been synthesized recently by Hanson and DePratter (1985).

The spatial distribution of Deptford sites along the Savannah River has been investigated at Groton Plantation, with the conclusion that the Deptford ceramic sample is distributed equally between the floodplain and uplands (Stoltman 1974:273). This pattern of increased use of the uplands is believed to correlate with an increasing dependence on the biotic resources of non-floodplain environments.

The late Middle Woodland phase, as defined here, is basically represented by a continuation of Deptford series ceramics with the addition of heavy cord-marked

ceramics. In the coastal zone of the Savannah drainage, heavy cord marked ceramics are dominated by sherd/grog temper; whereas, such ceramics in the interior portions of the drainage are almost exclusively sand tempered. Although sherd temper is considered to be a major attribute of Wilmington Cord Marked (Caldwell and Waring 1939), Stoltman (1974:25) argues that sand-tempering can be considered within the range of temper variability for the type because all other characteristics of the ceramics found at Groton Plantation fit the description. However, by way of avoiding typological confusion, the term Wilmington Cord Marked is restricted here to those heavy cord marked ceramics containing sherd/grog tempering.

Sites that contain late Middle Woodland ceramics within the Savannah drainage range from the mouth of the river to the Fall Line. These include Oemler, Walthour, Meldrim, Cedar Grove, Deptford Bluff, Greenseed Field, King's New Ground Field, White's Mound, Rabbit Mount, Clear Mount, and several others in Groton Plantation (Williams 1968; Stoltman 1974:24-27). Little is known of the assemblages associated with the ceramics of this phase, but data from the Groton Plantation study allow for some understanding of the general settlement pattern. Stoltman (1974:214-215, 236-241) concludes that since almost 80% of the Wilmington ceramics recovered in the survey were found in the uplands, a concentration on upland resources was the base of the subsistence technology, including some form of slash-and-burn agriculture. Although this is a conjecture based on minimal evidence, the strong association of these ceramics in the non-floodplain environment would indicate a shift in settlement and possible subsistence patterns.

In summary, there is a stylistic change in ceramic design that is correlated with a general change in settlement pattern during the Middle Woodland period. This period is one of a continued transition from the floodplain-oriented subsistence base in the Late Archaic to a more diffuse subsistence base in the Woodland, the sites of the latter period being rather evenly distributed in most environmental contexts. A more diffuse subsistence base during the Woodland period is supported by data from the SRS, which indicates an increased use of the uplands at that time.

Late Woodland and Mississippian (A. D. 500 to 1450). These two general periods have been combined because of a general lack of distinction between the ceramics of the Savannah I and II phases on the SRS. The diagnostic ceramic type of the Savannah I Phase is Savannah Cord Marked (or Savannah Fine Cord Marked) defined by Caldwell and Waring (1939), while Savannah Complicated Stamped, Savannah Check Stamped and Savannah Burnished Plain are considered as diagnostic of the later Savannah II Phase (Stoltman 1974:27-31). The problem arises from the lack of exclusiveness in the two ceramic distributions, i.e., Savannah Cord Marked almost always occurs with the latter types. Thus, from about A. D. 500 to 1300, the Savannah ceramic wares predominate without a great deal of distinction. This exemplifies the problems surrounding Late Woodland and Mississippian period research in the Savannah River Valley, which have received considerable attention in recent years (Wood et al, 1985, 1986: Anderson et al. 1986).

The Savannah phases are documented at sites from the Fall Line to the Atlantic Coast. Hollywood Mound, which was partially excavated by Thomas (1894) and DeBaillou (1965), is located near Augusta, Georgia, on the Savannah floodplain. The site contains all types of Savannah Ware ceramics associated with a large, multi-staged temple mound (DeBaillou 1965:6-10). Although other sites with Savannah ceramics are known from the middle Savannah River, only Lawton Field (Moore 1898) has any published documentation. In the vicinity of Savannah, Georgia, the work of Waring (Williams 1968) and subsequent research during the Works Progress Administration period (Caldwell and McCann 1941) has yielded several sites of the Late Woodland-Early Mississippian period.

Deptford, Haven Home ("Indian King's Tomb"), and Irene are the best documented of these estuary region sites. Due to the rich cultural deposits contained within these sites (e.g., burials, grave goods, whole vessels, mounds, beads, and other exotic material culture), the information base is much better than for earlier periods. The first two sites mentioned, Deptford and Haven Home, contain a limited series of Savannah ceramics and are used by Stoltman (1974:27-29) to characterize the Savannah I Phase. Both sites contain burials and large accumulations of artifactual debris. Only the Savannah Cord Marked and burnished types occur at these sites, in association with earlier Wilmington ceramics. Unlike most earlier sites, Haven Home and Deptford contain numerous burials indicating a more concentrated mortuary practice than was previously known for the Savannah Area. This development appears to be continued and elaborated in the following phases.

Research by Moore (1898) and Caldwell and McCann (1941) has revealed the nature of development in the Mississippian culture at the Irene site. This complex mound center documents the ceramic chronology from Savannah phases through the Irene Phase. Within the eight construction episodes at the Irene temple mound, ceramics of the Savannah phases are present in all levels, being gradually replaced by Irene ceramics in the final stages of the occupation (Caldwell and Waring 1939; Caldwell and McCann 1941:43-46). Associated artifact assemblages for the Savannah phase occupation at Irene are unclear because of the pre-excavation disturbance at the site. Thus, one is faced with only a ceramic type description of the Late Woodland-Early Mississippian time period consisting of the Savannah Ware of complicated stamped and burnished sherds. Because only ceremonial sites have been excavated, any distributional inference would be misleading except to note Stoltman's comment that there was a "trend toward population nucleation (near floodplains)" (1974:243). One may add to this that there was an increased occupation of the estuarine area surrounding the mouth of the Savannah.

The Irene Phase has received greater attention in recent times along the coastal area of Georgia (Pearson 1977; Caldwell 1971). This phase, until most recently, has been defined by ceramics and mound complexes (Caldwell and McCann 1941; Caldwell and Waring 1939). Diagnostic ceramic indicators of this final Mississippian phase in the Savannah region are Irene Filfot Stamped, Irene Plain and Irene Incised (Caldwell and Waring 1939). Associated with these ceramics are mounds, flexed burials, shell ornaments, and some artifacts typical of the Southern Cult, a pan-Southeastern ceremonial complex of late Mississippian times. Irene evidence of subsistence reflects a

reliance on corn, large mammals, fish, shellfish, and avifauna (Caldwell and McCann 1941).

Pearson's study of the coastal Irene settlement-subsistence pattern offers insight into the diverse subsistence base during the late Mississippian on Ossabaw Island (1977). The general results of the study indicates a structured settlement hierarchy composed of four site classes that correlate strongly with access to diverse environmental-resource zones. Smaller sites were associated with areas of less environmental variability while the large sites were located to provide maximal access to multiple resources (Pearson 1977:96-98). Although this study examines an island-estuary situation, the value of the results is that the nature of late Mississippian settlement is more complex than the situation suggested by earlier results.

In the context of the Savannah River drainage, Irene Phase sites must be examined with respect to diverse settlement structure and complex subsistence strategies. Previous work on the Savannah River Site (Hanson et al. 1978) located only five sites of the Mississippian period. Four of these occurred on the terraces of the Savannah River, while only a single site was recorded in the uplands.

History and Archaeology in the Middle Savannah River Valley

Settlement of the Savannah River Valley. The first Europeans to cross the Savannah River into South Carolina were Hernando De Soto and his men about 1541-1542, probably north of present day Augusta. The French in the late 1560s explored the mouth of the Savannah River after the demise of Charlesfort. English traders from Charlestown were exploring and crossing the Savannah River into Creek Indian territory as early as 1680. However, serious settlement from the Edisto River to the Savannah River did not begin until after the Yamassee Indian War, 1715-1718. By the end of the Yamassee War, the English had established Fort Moore and Fort Prince George on the Savannah River and were constructing frontier forts in Georgia along the Ogeechee River as protection against both Indian and Spanish attack.

In 1722, the South Carolina government passed legislation opening up the area beyond the Three Runs (Cooper 1837:126) on the Savannah River for settlement, especially for minor debtors who would not be prosecuted further after settlement. The earliest plats for the area indicate land acquisition began at least by 1737, with the majority of colonial plats recorded in the 1750s-1760s.

Colonial Land Use/Settlement Patterns. The Savannah River Site area was part of the Carolina frontier for an extended period of time. Between 1720 and ca. 1757 the area was largely unsettled and basically inhabited by herdsmen (Brown 1894; Meriwether 1940; and Dunbar 1961). In both 1757 and 1765 (South Carolina *Gazette* April 28, 1757 and May 4, 1765) large herds of cattle were put up for sale: 600 head of cattle and 300 horses; and 1000 head of cattle respectively. The sale of 1757 was from the estate of Alexander Wood, from his land at Point Comfort (38AK228), at the mouth of Upper Three Runs and the Savannah River. The second sale was by Lazarus Brown, who

resided on 350 acres on Lower Three Runs (Meriwether 1940) and who may also have been part owner of 38BR291, the Catherina Brown Cowpen site (Brooks 1987).

It was not until after the Revolutionary War that the area received any real increase in population, although by then the character of the frontier was moving west. The colonial land use of the area was basically cattle raising and subsistence agriculture (Brooks 1981 and 1988). It is possible that the name Pen Branch may have originated with the penning of cattle in the area. The Pen Branch area could have been used to pen cattle between Pen Branch and Indian Grave and between Pen and Steel Creek. Perhaps even between Pen and Four Mile Creek, penning between creeks is not an unknown practice (De Vorsey 1971:95-96). There are several places along Pen Branch where it comes close enough to other streams to make fencing practical. The simplest method of fencing is a line of felled trees between two places. Cattle penned between the fence and the Savannah River, ca. 6 miles to the southwest, would allow for large numbers of cattle to roam over thousands of acres year-round with relatively little management. Grasses and herbs are available year-round to negate the need for supplemental feed on any large scale (Brooks 1988).

The Savannah River Valley area of the South Carolina colony was settled late due to the Stono Rebellion in 1739, the War of Jenkins' Ear between 1739 and 1742, and due to a lack of transportation later in the 1750s for the Savannah River Site region. Settlers there needed the development of Augusta and Savannah and the enlargement of the Charleston market to prosper. They could easily drive cattle overland to market, but other crops were much more difficult to transport.

Revolutionary War in the SRS Area. Perhaps the best known Revolutionary War patriot from the Three Runs Area was Tarlteton Brown, who left his *Memoirs* (1894) before he died in 1845. These *Memoirs* are the best account of the early history of the Three Runs Area available. According to Brown, Tory forces were quite active in the then Barnwell District area during the Revolution. Brown lost his father, at least one brother, a brother-in-law, and his father's house to Tory action. Brown, during one period of the war, raised his own company of 'rangers' and scouted both sides of the Savannah River. He had his headquarters in the Crackerneck Area at a place they called Pinder Town (possibly 38AK195). After withdrawing from his company of 'rangers', Brown joined a company of militia guarding Burton's Ferry. Later, Brown volunteered himself to Captain Joseph Vince, whose headquarters were at the mouth of Steel Creek. During that time, Brown was nearly captured by Tories one night and learned that the Tories were bound for Vince's Fort (probably a fortified house). Brown was able to warn Captain Vince and the Tories captured an empty fort (Brown 1894; McCrady 1901:476).

Four other skirmishes occurred in the vicinity in 1781. Two of these were in Aiken County in May, one at Beech Island, the other at Galphin's Fort, both in conjunction with the American capture of Augusta from the British. A third skirmish occurred in Barnwell County in April at Wiggins' Hill, while the last took place at Matthew's Bluff in Allendale County across from the mouth of Brier Creek.

No pitched battles took place within the Three Runs area, but the actions of the Tories, killings and house burnings, kept the area an armed and unfriendly one until the end of the war. Evidence indicates the possibility that Catherina Brown's Cowpen (38BR291) was burned during one of these skirmishes.

Early National Agricultural Development and Land Use. The frontier nature of the area changed following the Revolutionary War. This change brought more settlers into the region, which diminished the available open range for cattle. The 1780s brought yeoman farmers and roads into the area (Brooks 1981 and Holcomb 1978). The development of the cotton gin and the advance of cotton plantations from the coast pushed the ranching frontier further west and into Tennessee (Lewis 1984:279-281), although the ranching nature of the area probably lingered until the 1840s.

Unfortunately, there are few records available to disclose the nature of agricultural development in the Barnwell District until the 1840 Agriculture Census. In 1810 there are no listed mills of any sort; the only listed manufacturing in the Barnwell District was 16 stills (Coxe 1814). During the Colonial period (to 1787) through the Early Republic period (1787 to 1800) agricultural land-use tended to be livestock raising and subsistence agriculture.

Agricultural Intensification and Over-Production during the Antebellum Period. Although farming practices differed greatly over the landscape, a great number of farmers cultivated large tracts of land with little or no thought to fertilizing or contour farming. The land quickly became worn out through over-production and farmers would either move on to a new farm or open up a new tract of land (Sosin 1967:173).

Farmers learned quickly how to deal with worn out land. John Drayton in 1802 wrote that:

> Hence, all the art of manuring, and rotation of crops, have hitherto been little attended to; and when one piece of land has been exhausted by culture, another has been cleared of woods, for similar purposes (Drayton 1973:22).

Francois Michaux in 1802-1803 wrote:

> The ... (uplands) are not much cultivated; and even those who occupy them are obliged to be perpetually clearing them, in order to obtain more abundant harvests; in consequence of which a great number of the inhabitants emigrate into the western country (Michaux 1973:42).

Large tracts of forest fell to the continual use of the axe by new settlers and slaves. "Land was continuously cleared, farmed with few conservation measures until perceived as exhausted, and then abandoned" (Trimble 1974:41). The *Southern Agriculturalist* in the 1820s and later in the 1850s, as well as other farming publications of the era, was constantly advocating the use of manures, guano, other fertilizers and other soil conservation techniques (e.g., *Southern Agriculturalist* 1853 [1]).

Antebellum Plantation Life. Life on plantations in the upper Coastal Plain of South Carolina was probably very similar to that elsewhere in the South. Work usually began at

sunrise with male and female slaves working side-by-side in the fields (Steward 1969:12; Olmstead 1959:108-110). Field workers were allowed two meals and work continued until daily tasks were completed. Children started in the fields when they were about seven years of age, toting water or picking up stones. At ten or twelve they were given regular field jobs (Bennett 1970:74). On most plantations the slaves worked a six-day week, having Sunday as a day of rest and religion (Olmstead 1959:122; Bennett 1970:80-81).

Frederick Law Olmstead visited antebellum South Carolina and describes a slave quarter in the coastal plain thus:

> It was a very large plantation, and all the buildings were substantial and commodious, except the negro-cabins, which were the smallest I had seen--I thought not more than twelve feet square interiorly. They stood in two rows, with a wide street between them. They were built of logs, with no windows--no openings at all, except the doorway, with no trees about them, or porches, or shades of any kind (Olmstead 1959:108).

Of other dwellings in South Carolina he wrote:

> The large majority of the dwellings were of logs, and even those of the white people were often without glass windows. In the better class of cabins, the roof is usually built with a curve, so as to project eight or ten feet beyond the log-wall; and a part of this space, exterior to the logs, is enclosed with boards, making an additional room--the remainder forms an open porch. The whole cabin is often elevated on four corner-posts, two or three feet from the ground, so that the air may circulate under it. The fireplace is built at the end of the house, of sticks and clay, and the chimney is carried up outside, and often detached from the log walls; but the roof is extended at the gable, until they line with its outer side. The porch has a railing in front, and a wide shelf at the end on which a bucket of water, a gourd, and hand basins, are usually placed. There are chairs, or benches, in the porch ... The logs are usually hewn but little; and of course, as they are laid up, there will be wide interstices between them--which are increased by subsequent shrinking. These very commonly, are not "chinked," or filled up in any way; nor is the wall lined on the outside.
>
> Cabins, of this class, would almost be flanked by two or three negro-huts. The cabins of the poorest class of whites were of a meaner sort--being mere square pens of logs, roofed over with a shed of boards, supported by rough posts, before the door (Olmstead 1959:107-108).

Antebellum Transportation. A network of roads through and near the SRS area between Charleston and Fort Moore/Augusta was in place by the 1730s and continued to expand. However, until the railroad between Hamburg and Charleston was completed, nearly all major transport was by river, either by cotton-boxes, pole-boat or steamboat.

With the invention of the steam-powered cotton gin, transportation of cotton became a major issue to planters. Transport by horse was out of the question, the cotton boats were carrying all they could, and the cotton was still piled high on the Augusta wharfs. Steamboats helped to alleviate the problems, but their deep draft in times of drought caused many others. By 1827, cotton-boxes and pole-boats cut deeply into the steamboat trade. It was not until 1856 that steamboats changed to a broad beam and shallow draft, enabling them to carry more cargo. But by then it was too late, as the era of the railroad had started (Phillips 1908:82).

Charleston businessmen procured a charter in 1827 to construct a railroad from Charleston to Hamburg. When it was completed in 1833, it had 136 miles of track. By 1846 the South Carolina Railroad was carrying 100,000 bales of cotton per year to Charleston. Over 90% of the bales came from the Hamburg depot (*Hunts' Merchants Magazine* Oct. 1847). By 1872 there were two passenger and three freight trains running daily between Augusta and Charleston (*South Carolina Railroad Company Annual Report* 1872).

The railroads effectively killed all river traffic and brought the downfall of many river towns along the Savannah. In return, it brought more development to the interior of the state, and small towns and stations sprang up at almost every crossroad.

Antebellum Agricultural Land Use and Crops Production. Agricultural land use during the Antebellum period changed radically from subsistence to cotton and corn. Journals and diaries, of those people who either lived in the county or traveled through it, have provided helpful information concerning the agricultural land use and development of the area. For example, a passage in the journal of Micjah Adolphus Clark in 1857 related his impressions of the countryside while traveling on the railroad. Clark wrote that after leaving Hamburg:

> In 20 minutes we stopped at a Depot called Basto where there is a large paper steam factory. There we pass a large pond of water which must be four or five miles long and a quarter of a mile wide having a saw mill on it. This is a desperate poor country along here, nothing is planted but corn and it looks like it could not make over 5 B[ushels of] corn per acre, being a white sandy broken country - timber small. Next place was Aiken 17 miles from A[ugusta] desperate poor, this is long leaf pine, Passed Blackville 5 minutes before 12 o'clock, a nice little town, where there is a Temperance Hall, in a very level country. Here we met the mail train. This is Barnes [Barnwell] County or District, which is a low level country - with cyprus and pine slashes and ponds - here is the first cotten I have seen today. The long leaf pine, and cyprus ponds continue to Edisto River which we cross at 20 minutes after one o'clock (Clark 1973).

In 1840, the Agricultural Census indicates that Barnwell's butter production was third in the state and its rice crop was tenth. There is evidence at 38AK268, along Upper Three Runs, of small rice dikes, while at 38BR52 (Four Mile Branch) there are larger dikes. Apparently there are remnants of dikes near Dunbarton on the upper reaches of Meyers Mill at 38BR392 and 38BR190. Some diking was evidenced at 38AK289 (Home Run Plantation), also on Upper Three Runs. However, these dikes may be connected with a hunting lodge known to have been located on the Home Run Plantation. There also appears to be other evidence of rice dikes between Four Mile Branch and Pen Branch.

In 1850, Barnwell ranked first in production of peas and beans. According to the 1850 Agricultural Census, only 17% of Barnwell land was improved. The harvest of 1860 ranked Barnwell first within the state in corn, peas and beans and wine; and second in rye. The 1860 Agricultural Census showed an increase in improved farm land to 28%.

Civil War and Reconstruction 1861-1876. Just how much destruction by Sherman's troops took place on the present SRS property is unknown, and may never be known.

However, portions of Sherman's Army spent a short period of time in Blackville and Williston, before burning both towns. A feint was attempted toward Aiken by General Kilpatrick's Cavalry, to confuse the Confederate forces into thinking that Sherman wanted to destroy Graniteville and Augusta. However, the feint was repulsed by General Wheeler's Cavalry. It would be safe to assume that some part of the SRS land was touched in some way by Sherman's "Foragers" (Brooks 1981).

Following the Civil War came a period that few planters in the south cared for, the period of Presidential and Congressional Reconstruction. In January 1865, General Sherman issued his infamous Field Order 15. With this order, Sherman intended to give each black family forty acres of land and a mule.

By the time the blacks heard of the order, the 1865 crop was, for the most part, planted. With the end of the war and the freeing of the slaves, a considerable number of planters stood to lose their crops come harvest time. Tens of thousands of slaves left the plantations to claim their forty acres. This order, perhaps more than anything else, had a devastating effect on South Carolina agriculture for the next three years.

By 1866 it became clear to the blacks that they would not receive their forty acres. Some blacks turned to their former masters for wage jobs on the plantations. The Freedmen's Bureau had the job of overseeing the contracts between labor and management.

> Most of the freedmen had no concept of the nature of contracts and many, freed from the compulsion that had to be exercised over them during slavery, left the plantations merely to enjoy their freedom (Zeichner 1939:27).

There were three reasons for the failure of the wage system. First, cotton production was not uniformly profitable throughout the South. This was due to the fluctuating price of cotton and soil depletion. Second, the general lack of capital made it difficult for planters to pay money wages. Third, and perhaps most important, was the system's inability to give the planter adequate control of his labor. Wage labor was too mobile; it did not guarantee the planter that he would be able to harvest what he planted (Zeichner 1939:28-29). When planters would not pay blacks for not working, and at times simply not paying them for working, this led to restlessness among the blacks. They began moving to the cities by the thousands, and others started moving west (Brooks 1914:16 and Zeichner 1939:27).

However, peace was still not at hand between blacks and whites. Between 1874 and 1876, there were several riots across South Carolina. Two riots took place near or on the SRS in 1876 during the concluding phases of Reconstruction, one in Hamburg (now North Augusta) and the second in Ellenton (see Brooks 1981 for a complete description of both). There were several killed in both riots, and hundreds were arrested but never brought to trial. This ended Reconstruction and brought about the tenant farm period of 1870-1930.

Tenant Farming. Prunty (1955) wrote that there were several different types of plantation occupancy forms following Reconstruction. Two basic forms of occupancy were the cropper and the tenant renter. "These occupance [*sic*] forms emerged on landholdings that had previously supported the Ante-bellum form, and also developed on new holdings created after Reconstruction" (Prunty 1955:466-467).

The cropper, when the system first began, was treated much as before the Civil War "and thus did not have the complete personal freedom he prized" (Prunty 1955:470). To remedy this situation the land owner granted the things the cropper wanted most:

> his own house adjacent to his own cropland, his cultivating tools nearby instead of in a central shed, a minimum of supervision plus freedom to work where, when, and as he pleased, and he wanted use and control of the mules (Prunty 1955:470).

By about 1900 all these freedoms had been granted:

> but dispersal of the mules among cropper-operated subunits meant that managerial control of the cultivating power was weakened. "Patch" cultivation was the major result; thus dispersal of the cultivating power marks the inception of the fragmented occupance [*sic*] form. Another result was unevenness in the kind and quality of cultivation (Prunty 1955:471).

Unfortunately, most of these various systems of cropper type farming failed. Soon this form of system was given over to a cash-wage system, but the close supervision required by the owner lead to resentment by the workers and was not always successful (Prunty 1955:471-474).

The tenant-renter type of fragmented plantation was somewhat more successful. "A share tenant supplies his own cultivating power (usually mules) and implements and customarily pays two-thirds of seed and fertilizer costs" (Prunty 1955:474). There were several different forms of the tenant-renter system, but most were similar, with the difference lying in the amounts of rent or costs paid.

According to Woofter, *et al*. (1936), a field study of 646 plantations in the Southeast revealed interesting data about black tenant farmers as opposed to white tenants. First, blacks had farmed an average total of three to five years longer than white tenants. Second, black tenants tended to stay an average of four to five years longer on the same plantation than did whites. Third, the average number of farms lived on is less for blacks than whites. Last, the average number of years lived on per farm is greater by 1 to 4 years for blacks than whites (Woofter, *et al*. 1936:110).

Woofter, *et al*. summed up the cotton tenant period in 1934:

> The typical cotton plantation operated by 5 or more families in 1934, included a total of 907 acres, of which 385 were in crops, 63 idle, 162 in pasture, 214 in woods, and 83 in waste land. Approximately 86 percent of the 907 acres was owned by the operating landlord and 14 percent was rented from other owners. Of the crop land harvested, 44 percent was planted to cotton. On the typical plantation the wage hand cultivated 45 crop acres, the cropper 20, the other share tenant 26, and the renter 24...

> The typical plantation was occupied by 14 families, exclusive of the landlord's family, of which 3 were headed by wage hands, 8 by croppers, 2 by other share tenants, and 1 by a renter. Of these families, 2 were White and 12 were Negro. The average family, the head of which was 41 years of age, consisted of about four persons, of whom two to three were employable. The average number of years of residence on the 1934 farm was 8 years for all families, 7 for wage hands, 7 for croppers, 11 for other share tenants, and 13 for renters (Woofter, *et al*. 1936:xxxii-xxxiii).

The difference between the cropper and the tenant types "stems from dispersed control of the cultivating power in the latter" (Prunty 1955:479). Apparently, the tenant farmer, perhaps because of his greater freedoms, was the economic superior of the participants in the two systems.

Since the end of the 1920s, when the era of tenant farming climaxed, the area has been losing its residents as the population of Barnwell County continued to decrease through 1960. Woofter, *et al*. wrote that:

> The number and proportion of large holdings in the South have decreased and the number and proportion of small holdings have increased, reflecting the increasing division of land ownership. The disintegration of large tracts was steady from the Civil War to about 1910. At present there is a tendency to hold large tracts together, especially since so much worn-out land has been dropped from cultivation (Woofter, *et al*. 1936:xxi).

The land that had been dropped from cultivation was allowed, in many cases, to revert back to forest land through old field succession (Odum 1960). Once land owners realized that the pines in their fields could be a valuable commodity that paper and lumber companies would pay for, large tracts of land became pine plantation.

Agricultural Land Use and Crop Production. The year 1870 was Barnwell's banner year in production. It ranked first in the state in horses, milk cows, other cattle and swine in sheer numbers, total livestock value, wheat, corn, sweet potatoes, peas and beans, and wine. Barnwell ranked second in bales of cotton and fifth in rice production within the state. Barnwell's production of rice in 1870 was greater than each of six other rice-producing states, as South Carolina ranked first in rice production in the United States, with greater than 40% of the total harvest. South Carolina was the number one producer of rice in the United States until 1890 when Louisiana took over. Not only was 1870 a banner year in crop production, but the total improved land increased to 34%.

The year 1880 was another good year for Barnwell County as it ranked first in rye and second in swine, corn, and peas and beans; other livestock ranked in the top four. Acres in production in 1880 was 38% of the farm land.

The year 1890 was also a good year for Barnwell County. It ranked first in corn, acres of cotton, and in swine produced. Barnwell ranked second in rye and ginned cotton. The production of rye for 1890 was only a third of some previous years and 1/5 the harvest of 1860. Actually, most of these figures, with the exception of cotton, are down from previous years, due mainly to the loss of land resulting from the formation of Aiken County. Improved acres in 1890 rose to 55% of the farm land.

In Barnwell, in the year 1900, only corn, swine and ginned cotton were ranked in the top five. From being one of the top wine producing counties in the state in the 1860s and 1870s, Barnwell County by 1920 only harvested 5 pounds of grapes. The year 1910 marks an enormous drop in the production of rice for both Barnwell County and the state. Mechanization of rice culture brought an end to the production of rice in South Carolina.

Truck crops played a relatively large part in the Barnwell County harvest, but ca. 1930 marks a turning point in truck acreage. One third the total state acres and dollar value of asparagus was in Barnwell County, as were the acres devoted to cucumbers. In 1950, the asparagus crop dwindled to 81 acres, while land in truck crops increased to 29,000 acres.

The year 1920 marked the highest improved or in-production crop land with 68% being improved land. By the 1930 census the percentage dropped to 40 and rose some in 1940 to 53% of the farm land improved. Actual acreage dropped in 1900; the cause of the drop was due to the formation of Bamberg and Allendale Counties, and in the 1930s to the Depression. The corn production of 1930 was down from 1920 due to the decrease in tilled acreage. On the other hand, the acreage increased in 1940, to above that of 1920, but yield was lower due to decreased rainfall in the crucial months of May and June (Plummer 1983).

From the 1850s onward the vast majority of land use in the Savannah River Site region was to agriculture. Other land-use included development for town use, mill ponds, homesteads, road networks, and manufacturing. Rarely did land in agricultural production exceed 50% of the total land area of the county. The Corps of Engineers maps of the area in the 1940s appear to indicate that only ridgetop land was cultivated. Of course, there were exceptions, depending on the location of the property. There must not have been much arable land left unimproved in the county by 1950. Aerial photographs of the region show that almost all ridgetop land was cultivated and that the area left uncultivated was generally along the stream bottoms.

CHAPTER III

RESOURCE MODELING

Kenneth E. Sassaman

INTRODUCTION

Site locational data are used to generate a map of archaeological resource sensitivity for the SRS. The purpose of such a map is to provide individuals concerned with site use on the SRS with a planning document that provides: (1) the locations of known archaeological sites; (2) an assessment of the adequacy of information needed to assess the potential of a site for nomination to the National Register of Historic Places; and (3) the projected occurrence of prehistoric archaeological sites.

Prehistoric sites constitute the majority of archaeological resources on the SRS. Regularities between the content of these sites and their locations relative to certain environmental features make it feasible to generalize about site locational variability and from this establish levels of archaeological sensitivity for the SRS. Historic period sites are not as conducive to such generalization. Instead, documentary sources allow for more precise empirical control over site locational variability. For this and other reasons discussed in this chapter, historic sites are excluded from the analysis of archaeological sensitivity. The degree to which historic sites are captured by the sensitivity map is, however, discussed at length, and some provisions for future management of historic sites are offered.

PREHISTORIC SITES

Summary of the Results of Locational Analysis of Prehistoric Archaeological Resources on the SRS

The technical synthesis of prehistoric archaeological resources on the SRS (Sassaman et al. 1989) includes an analysis of SRS site survey data for the purpose of defining regularities and variation in the distribution of sites across the study area. The SRS survey was designed as a 40% stratified random sample of watersheds employing quadrants of Patrol Index Units (PIU) as sampling units. The SRS contains a total of 2165 PIU quadrants. As of July 1988, 1309 quadrants have been surveyed using one or more of five different methods. The total includes quadrants surveyed for special projects, yielding a realized sample fraction of over 60 percent. The survey effort has resulted in the discovery and documentation of 853 archaeological sites. Seven hundred fifty-five of the sites contain prehistoric components.

In the technical synthesis, a series of environmental variables was used to characterize the location of sites in their local and regional contexts. Locational data on a series of random points were compared to data for all prehistoric sites to delineate nonrandom locational tendencies. The results corroborated existing models of SRS land-use (e.g.

Hanson et al. 1981b) which suggest that archaeological sites have biased locations with respect to fluvial features and topography. The locational biases presumably relate to economic, social, political and cultural reasons why prehistoric peoples choose to settle or utilize particular places in the landscape. If locations in the study area were utilized for different purposes, properties of the assemblages recovered from sites should exhibit patterned variation, and hence be useful for developing predictive models of site functional variability.

However, in addition to behavioral and environmental determinants of site location and assemblage variability, survey and testing methods have to be considered as biases of broader patterns. Survey biases were discussed in the synthesis, but their effect on locational patterning will not be completely understood until additional survey is conducted. The problem of site testing or sampling bias was also addressed through a comparison of assemblage samples from each stage of testing at sites having undergone extensive investigation. The result is that samples consisting of surface collections from exposures in excess of 25 percent and/or assemblages from secondary testing yield estimates of artifact density, diversity and components present that are usually 73-85 percent correct. These results were applied to the SRS-wide survey sample to derive a statistical subsample of sites (n=470) for locational analysis.

Analyses of the statistical subsample were conducted to determine the assemblage variability and temporal variability of site locations. Artifact density, assemblage diversity and richness were found to correlate strongly with the number of components at a site. Multicomponent sites represent locations that remained desirable or necessary to prehistoric peoples over long periods of time. It follows that such locations provided access to significant resources, both locally and at a larger spatial scale. Locational analysis of assemblage properties showed that dense, diverse, multicomponent sites are usually on tributary terraces or floodplains of Rank 3 and 4 streams within 400 m of running water, at elevations below 80 m, at relative elevation less than 30 m, and within 5 km of a major confluence. Considerable variation in the location of these sites was noted, particularly with respect to locations of intensive lithic production and to upland tributary divides.

Temporal variability in site location was examined through comparisons of sites by period and phase. Patterns of component co-occurrence reflect marked shifts in settlement in the Late Archaic and Mississippian periods. The Late Archaic period marks the beginning of settlement expansion into the Aiken Plateau. The expansion apparently continued through the Woodland period with fluctuations in the spatial clustering of sites and in the importance of Savannah terrace locations at the mouths of tributaries. The trend terminates in the Mississippian period when site counts decrease markedly and abrupt shifts in locational patterning are evident. The changes are no doubt a reflection of dramatic changes in settlement and political organization that characterized the region at the time.

Locational Patterns of Site Functional Variability

At face value, the distribution of archaeological resources on the SRS is widespread. Yet, taking assemblage content and degree of reoccupation into account, sites are not

evenly distributed across the study area, and it is the locational variability of these assemblage properties that is of relevance to models of prehistoric settlement. From a management perspective, settlement models are used to evaluate the research significance and potential of prehistoric sites. Such models can be deduced from anthropological and ecological reasoning, induced from empirical observations of the archaeological record, or, as is usually the case, derived from a combination of theory and empirical generalization. For instance, past efforts at settlement modeling on the SRS (e.g. Hanson et al. 1981b) were built upon the functional distinction between base camps and extractive locations evident among many ethnographic hunter-gatherer populations (Binford and Binford 1966). Logical links between this type of settlement organization and the ecology of the Upper Coastal Plain environment were then deduced to generate predictions of site location. The locations of base camps were predicted to be along the mesic terraces of the Savannah River and its tributaries. Extractive sites were argued to have a more widespread, seemingly random distribution across the landscape, including upland sandhills locations assumed to be ill-suited to long-term human occupation.

In the years since this basic settlement model was developed, the empirical experience of SRARP archaeologists has grown, relevant research questions have changed, and we are now in a position to evaluate site significance and research potential from a number of different stances. For example, the recognition that sites with a few diagnostic components are locationally distinct from those with many components or from those lacking diagnostic artifacts suggests that the simple base camp-extractive site dichotomy is no longer tenable. Through better control over temporal variation in settlement, we now recognize a trend for increased long-term utilization of upland locations beginning in the Late Archaic period. Such sites tend to extend deep into the uplands, but remain distinct from nondiagnostic lithic and ceramic scatters in their proximity to water and appreciable floodplain bottoms. Their probable function as basecamps is distinct from the mesic terrace sites not so much in kind, but in degree. Compared to multicomponent mesic terrace sites, upland camps were probably occupied by smaller groups over shorter periods of time. They nonetheless remain functionally distinct from the so-called extractive locations, and they represent important archaeological resources for examining the economic and social organization of local, small-scale prehistoric communities.

Thus, our current understanding of site functional variability recognizes three distinct types of prehistoric sites: (1) long-term multicomponent sites serving primarily base camp functions; (2) short-term multicomponent and single component sites serving primarily as base camps from the Late Archaic period forward; and (3) small, nondiagnostic sites serving primarily as extractive loci. From the perspective of assemblage composition, the site types are distinguished from one another primarily by the density and diversity of material remains present. These assemblage properties, in turn, covary with certain environmental variables, making possible locational models of site functional variability.

To implement a locational model of site functional variability, the total number of diagnostic components at a site were compared to environmental variables to arrive at a meaningful division of site types on the basis of location and composition. As noted earlier, the number of components at a site covaries positively with artifact density and

assemblage diversity, so this variable can be used to characterize site type according to the typology outlined above. Accordingly, various permutations of the component typology were compared to environmental data on site location. Nonrandom variation among the permutations was observed for distance to stream, stream rank, elevation, and relative elevation, with the greatest discrimination between sites achieved by a tripartite classification consisting of sites with four or more components, sites with 1-3 components, and sites lacking diagnostic components. Relating these classes to the observed site types described above, long-term multicomponent base-camps (Type 1) are equated with sites containing 4 or more diagnostic components; other base camps (Type 2) are equated with sites containing 1-3 diagnostic components (excluding isolated hafted biface finds); and extractive loci (Type 3) are equated with sites lacking diagnostic artifacts.

Descriptive statistics for continuous locational variables are summarized by site type and by stream rank class in Table 3. Note that the division of cases into two stream rank classes corresponds to the division used in previous locational models (e.g. Hanson et al. 1981b) and in the measurement of relative elevation used in the synthesis (Sassaman et al. 1989). To recapitulate, locations along streams ranked 1 or 2 are considered to be inadequate to support long-term human occupation unless they are in close proximity to larger stream stems.

Table 3. Summary Statistics for Distance to Water, Elevation and Relative Elevation by Site Type and Stream Rank Class.

		Rank of Nearest Stream	
TYPE 1 - SITES WITH >3 COMPONENTS		1-2	3-5
Distance to Stream (m)	n	41	38
	mean	96.34	123.42
	s.d.	91.71	122.67
	min	20	5
	max	450	400
Elevation (m amsl)	n	41	38
	mean	60.68	44.77
	s.d.	14.09	14.45
	min	30.49	27.44
	max	82.32	79.27
Relative Elevation (m)	n	41	38
	mean	12.72	5.62
	s.d.	7.82	3.87
	min	3.05	1.52
	max	30.49	18.29

		Rank of Nearest Stream	
TYPE 2 - SITES WITH 1-3 COMPONENTS		1-2	3-5
Distance to Stream (m)	n	119	71
	mean	215.50	281.06
	s.d.	221.92	220.37
	min	5	15
	max	1050	1150
Elevation (m amsl)	n	119	71
	mean	69.65	52.07
	s.d.	19.95	14.85
	min	30.40	27.44
	max	121.95	76.22
Relative Elevation (m)	n	119	71
	mean	18.73	10.37
	s.d.	12.69	6.70
	min	3.05	1.52
	max	70.12	30.49

		Rank of Nearest Stream	
TYPE 3 - NONDIAGNOSTIC SITES		1-2	3-5
Distance to Stream (m)	n	140	61
	mean	341.93	303.85
	s.d.	323.77	213.81
	min	10	10
	max	1700	950
Elevation (m amsl)	n	140	61
	mean	67.76	52.26
	s.d.	21.49	14.34
	min	27.44	27.44
	max	115.85	76.22
Relative Elevation (m)	n	140	61
	mean	21.91	11.90
	s.d.	14.91	8.11
	min	1.52	76.22
	max	76.22	39.63

Discrimination of site types on the basis of environmental variables can be summarized as follows:

Type 1 (>3 components). All sites of this type (n=79) are within 450 m of running water, are at elevations not exceeding 83 m amsl, and have relative elevations less than 31 m. Sites are almost evenly divided between stream rank classes, but all sites located on small stems (Ranks 1 and 2) are within 400 m of a larger stem, and usually within 100 m of a larger stem.

Type 2 (1-3 components). All sites of this type (n=190) are within 1150 m of running water, and at a wide range of elevations and relative elevations. Most of the sites of this type (62.6%) are on small stream stems, usually within 250 m of these water sources. Sites on large stems are on average farther from water than small stem sites, though only two cases (2.8%) exceed 800 m, and only 14 (19.7%) exceed 400 m.

Type 3 (nondiagnostic). Sites of this type (n=201) have mean values for elevation and relative elevation which cannot be discriminated from values for a sample of random points. Similarly, the proportion of sites by stream rank groups is nearly identical for Type 3 and random locations. The range of distance to stream is also similar between the two groups (10-1700 m), although Type 3 sites have a lower mean value than random locations.

In essence, locational discrimination between site types hinges on the locational specificity of each type. Being restricted to terraces and floodplains of large rank streams, Type 1 sites have the most specific distribution. Type 2 sites are also found in the vicinity of Type 1 sites, but they extend deep into the tributaries of the Aiken Plateau, and are situated along both large and small stream stems. Type 3 sites have a nonspecific, seemingly random distribution which encompasses the interfluvial and sandhills areas lacking Type 1 and 2 sites.

Summarized another way, site types have locational patterns that are partly exclusive, but largely overlapping (Figure 3). In this sense, Type 1 and 2 sites are subsets of Type 3 locations. Type 1 and 2 site locations are characterized by environmental conditions which were conducive to human habitation. Type 1 locations were capable of supporting long-term occupations or reoccupations, while Type 2 sites supported more limited occupations. Not all locations capable of supporting long-term occupations did so, however, as many of these contain sites with only 1-3 components. Conversely, many of the locations with histories of relatively short-term occupation (Type 2) were probably not conducive to long-term occupation.

Variations in the resource potential of locations, in the size and complexity of regional populations, and in the organization of human settlement are among the many factors which account for locational patterning among sites. From a management perspective these issues are critical for assessing the research significance of sites. However, irrespective of the research questions being posed, the locational patterns evident among site types are useful for future site use planning on the SRS. Toward this goal, the patterns documented here are used in the following section to develop an archaeological sensitivity map and preservation plan for the SRS.

Archaeological Sensitivity Map of the SRS

The behavioral significance of the site typology presented above corresponds to the management and preservation of archaeological resources on the SRS in at least two ways. First, research significance and hence eligibility for nomination to the National Register of Historic Places will theoretically covary in a positive fashion with the number of components at a site. This is generally the case because the length of occupation,

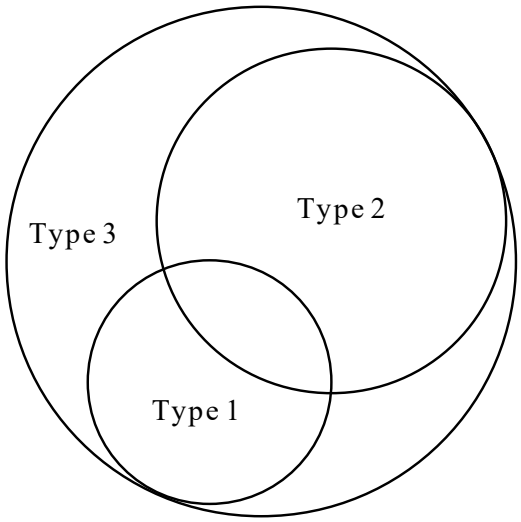

Figure 3. Schematic diagram of the locational relationships among site types.

assemblage diversity, and artifact density of sites increases with the number of components. It follows that large, dense, and diverse multicomponent sites will contain materials and contexts suited to a wider range of research topics than will lesser sites. This is not to say that single component or nondiagnostic sites lack research significance, only that, all else being equal, the potential for addressing a wide variety of research issues generally increases with the number of components at a site.

A second, largely independent consideration of site management is the cost of mitigating the adverse effects of impact to archaeological resources. All else being equal, the cost of excavating a site will generally increase with the number of components present. Site size and depth are important aspects of this assertion, meaning that multicomponent sites tend to be larger and deeper than other sites[1]. Thus, even though the research potential of sites is sometimes difficult to define and obviously subject to

[1] Site size (i.e. area) will increase with increases in number of components primarily because site occupations are not always spatially isomorphic. Site depth will also be greater for multicomponent sites than for other sites, because sites of long-term occupation and reoccupation tend to be located in depositional environments, primarily along alluvial landforms.

change, the relative costs of mitigating impact to sites can be related to component content and site location for the purpose of effective site use planning.

Following the component typology employed above, three levels of archaeological sensitivity are proposed for site use planning of SRS archaeological resources. *Sensitivity Zone I* is proposed to encompass all area in which Type 1 sites are located, as well as all projected locations of similar sites. *Sensitivity Zone II* is proposed to encompass all area in which Type 2 sites are located, as well as all projected locations of similar sites. *Sensitivity Zone III* is proposed to encompass all remaining area of the SRS except for restricted access areas and locations of indeterminate sensitivity.

Based on the locational patterns of site types described above, Archaeological Sensitivity Zones of the SRS are defined as follows:

Sensitivity Zone I. All area within 400 m of stream stems Rank 3 or greater, less than 83 m amsl, and less than 31 m above the nearest stream stem Rank 3 or greater.

Sensitivity Zone II. All area within 400 m of Rank 1 and 2 stream stems, and within 401-800 m of stream stems Rank 3 or greater.

Sensitivity Zone III. All area of the SRS not contained within Sensitivity Zones I and II, excluding restricted access areas, inundated bottomlands, and swamps.

Indeterminate Sensitivity Areas. Swamps of the Savannah River floodplain and tributary floodplains in which no archaeological survey has been conducted.

Actual mapping of Sensitivity Zones was accomplished on a 1:48,000 scale map of the SRS (1987). In implementing the criteria outlined above, several adjustments had to be made. First, all wetlands within floodplains and terraces of the Savannah and its tributaries were coded for *Indeterminate Sensitivity*, so any fluvial or topographic features otherwise specified in the sensitivity criteria were ignored. The only exception to this rule is Stave Island in the Savannah River swamp. This relict sandbody contains at least one multicomponent site, and is coded accordingly. Similar sandbodies in the Savannah River swamp are likely to contain sites, but until survey of these features is conducted, their archaeological sensitivity remains indeterminate.

Second, because of the breadth of the Savannah River, Upper Three Runs and Lower Three Runs floodplains, measurements of distance to water were made from the active floodplain margins. This resulted in wide sensitivity zones in many portions of the SRS. Although these may appear to be overly liberal, streams shift position within active floodplains, making it difficult to pinpoint the location of active channels at specific points in time. Our estimates of the archaeological sensitivity of these alluvial features can only be refined through detailed geoarchaeological work.

Finally, because of the complex ridge and swale topography of the Savannah River terrace T_1, all dry land not encompassed by Sensitivity Zone I was coded as Sensitivity Zone II. Included also is a 400 m strip of the toe of the highest terrace, T_2. Although

alluviation of T_1 was severely curtailed after the formation of the modern floodplain around 4000 B.P. (Stevenson 1982), periods of heavy rainfall and consequent flooding caused the swales of T_1 to remain attractive features of human exploitation. Also, data presented in the synthesis on the density of lithic debris indicates that chert outcrops may be buried in the swales of T_1. In any event, this entire landform contains important archaeological resources, and great potential for elucidating the relationship between human land-use and the depositional history of the Savannah River.

The resultant map of archaeological sensitivity represents an empirically sound model of site location and component variability. With a few exceptions, the mapped areas encompass sites of the respective component classes from the statistical sample. Inasmuch as this sample is an accurate reflection of the total population of sites on the SRS, the zonal distributions generated from the sample will be an accurate prediction of this population. Exceptions to this rule are discussed in a section below.

Thus, for the purposes of site use planning and cultural resource preservation, the map of archaeological sensitivity can be interpreted as follows:

Sensitivity Zone I. Defined as area containing all but a few of the known sites with four or more prehistoric components in the statistical subsample, and projected to contain sites of similar composition, as well as lesser sites. The area is also considered to be the zone of highest archaeological site density. Land use activities in the zone have a high probability of encountering archaeological sites, and a high probability of encountering large sites with dense and diverse artifact assemblages. Because of the combination of rich content and generally good preservation potential (i.e. depositional setting), many sites in the zone have substantial research potential and are considered eligible for nomination to the National Register of Historic Places. The costs of mitigating potential impact to sites in this zone, in terms of time and money, will generally be high.

Sensitivity Zone II. Defined as area containing sites with zero to three diagnostic components in the statistical subsample, and projected to contain sites of similar composition. The area is also considered to be the zone of moderate archaeological site density. Land use activities in the zone have a moderate probability of encountering archaeological sites, but a low probability of encountering large sites with more than three prehistoric components. Sites on alluvial landforms in the zone, particularly those of the Savannah River terraces, have good preservation potential and a high probability of containing multiple components. Nonalluvial landforms in this zone have less preservation potential, although locations of colluvial deposition have been observed, and these conditions increase the potential for site preservation. Detailed information on colluvial deposits is not available. Until such information is available, all area within the zone is considered to be conducive to site preservation. Sites characterized by a combination of rich content and good preservation will be considered eligible for nomination to the National Register of Historic Places. Because little is known about sites in this zone, small sites with limited content but with good preservation are also considered to have research potential. The costs of mitigating potential impact to sites in this zone, in terms of time and money, will generally be moderate.

Sensitivity Zone III. Defined as area containing sites lacking diagnostic prehistoric components in the statistical subsample, and projected to contain sites of similar composition. Also considered to be the zone of low archaeological site density. Land use activities in the zone have a low probability of encountering archaeological sites, and virtually no chance of encountering large sites with more than three prehistoric components. Geologic deposition in the zone is generally limited to minor colluviation, so the potential for site preservation under these conditions is low. Many sites in the zone will be surficial, lacking any subsurface context. Exceptions to the meager content and poor preservation of sites in the zone have been observed, so there is some potential for encountering sites that would be considered eligible for nomination to the National Register of Historic Places. The costs of mitigating potential impact to sites in this zone, in terms of time and money, will generally be low.

The major exceptions to zonal sensitivity described above are as follows:

Exception 1 - Lithic Quarries and Workshops. Possible locations of lithic raw material exploitation on the SRS have been postulated on the basis of the density and size of lithic debris at certain sites. The sensitivity zones are based largely on the observed patterned relationship between sites and fluvial features in the study area. Inasmuch as lithic outcrops coincide with large, fluvial features (e.g. swales of the Savannah terrace, or the floodplains of major tributary stems), sites occupied for the purpose of lithic production will not deviate from the projections based upon long-term site occupation. If lithic resources and fluvial features do not coincide, patterns of lithic raw material exploitation

may have resulted in archaeological site distributions which cannot be accounted for by the proposed sensitivity zones. Either way, quarry locations and nearby workshops will contain artifact assemblages with densities that may not covary with the number of components. That is, a single component lithic production site may contain deposits that are as dense as those of a multicomponent site lacking primary lithic production debris. Quarry sites and associated workshops, if preserved, are considered significant archaeological resources and therefore considered eligible for nomination to the National Register of Historic Places. Such sites contain the baseline information for calibrating the tool and debitage variability used to interpret the functions of all other lithic assemblages. Locations of intensive lithic quarrying have not yet been discovered on the SRS, but the search for buried quarries will be a research priority for the future.

Exception 2 - Multicomponent Sites at Tributary Divides. A few sites within Sensitivity Zones 2 and 3 contain exceptionally rich artifact assemblages and multiple components. Site 38BR231 exemplifies this anomaly. The site is situated along the tributary divide of Upper and Lower Three Runs, as far removed from significant bottomland as is possible on the SRS. Yet the site contains diagnostic artifacts from nearly every prehistoric period/phase, as well as a number of exotic artifacts made from nonlocal raw materials. Because of its remote location, it appears obvious that 38BR231 was not occupied for its potential to sustain long-term human occupation. Rather, reasons other than environmental must account for this exceptional site use. One possibility is that tributary divides served as points of social interaction for groups occupying adjacent watersheds. If so, these locations may have been occupied for ceremonial purposes; this would help to explain the unusual number of exotic items recovered from the site. In any event, sites such as 38BR231 represent important anomalies to the overall patterns of site location and function. Unfortunately, the preservation potential of such sites is not great. Because of a lack of significant deposition, vertical separation of components is not expected in most cases. The sites are extensive, however, so horizontal stratification is possible. We are currently unable to predict the locations of sites like 38BR231 on the basis of environmental variables, except to say that major tributary divides will be sensitive if our assumptions about social interaction are correct.

Exception 3 - Carolina Bays. Small wetland areas throughout the Aiken Plateau referred to as Carolina bays (Schalles et al. 1989) may have been important water and food sources to prehistoric peoples in the area. Intensive utilization of sites adjacent to bays has been documented elsewhere in the region (e.g. Trinkley 1974), but we know very little about the use of bays on the SRS. Because the age of bays and their resource potential is also not well understood, we cannot speculate on the potential these features have for archaeological resources. Future work on the SRS must seek to assess the archaeological potential of bays, both in terms of site presence and paleoenvironmental reconstruction. For now, we caution that bays within the area of Sensitivity Zones 2 and 3 may have supported long-term human occupation in the Aiken Plateau, so the existence of well-preserved multicomponent sites adjacent to these features is not unexpected.

Exception 4 - Sand Bodies in the Savannah River Swamp - Except for Stave Island, as noted above, the relict sand bodies of the Savannah River swamp are coded as *Indeterminate Sensitivity*. These features are older than the swamp itself, which post-dates 4000 B.P., and thus have great potential for containing multicomponent sites. Being possible remnants of the terrace T_1, the sand bodies can rightly be coded as *Sensitivity Zone I*. But because survey of these features has never been attempted, we are reluctant to commit them to a specific zone. We recognize that potential impacts to these landforms are limited to nonexistent, so the ambiguity of their archaeological sensitivity is not a problem. Future research on the SRS aims to rectify the lack of survey on these sand bodies with the hopes of improving our assessment of these features and to obtain more information on the depositional history of the Savannah River.

HISTORIC SITES

The analysis of historic site locational variability requires a different set of assumptions and procedures than does that of prehistoric sites. This is true for several reasons. First, historic documentation such as aerial photographs, maps and descriptive accounts offer direct, absolute data on historic site location. Many of the documented historic sites on the SRS were first located on photographs and maps, then ground truthed and sampled through archaeological survey. Thus, historic site locations cannot be accounted for within the sampling and probability parameters of the SRS survey design; they cannot be reduced to straightforward observations of nonrandom tendencies.

Even if all historic sites were discovered through survey sampling, there is little reason to believe that historic site locations will exhibit the same nonrandom tendencies as prehistoric sites. Certain technologies made the locational constraints of prehistoric habitation inconsequential to historic site occupation. Well technology is a particularly relevant example. Similarly, the subsistence bases of prehistoric and historic populations were significantly different. Being largely based on the production of subsistence or commercial crops and related commodities, the economies of the historic period required arable land. Variation in the quality and scale of arable land is of course expected among historic holdings on the SRS, and this may be potentially related to socioeconomic, technological, political and chronological variation among historic farmers and herders.

Finally, the functional variability of settlement systems used to define locational tendencies of prehistoric sites is without parallel in the historic site inventory. The basic prehistoric dichotomy between habitations and limited-activity sites indeed has historical equivalents, but the latter have not usually been recorded as historic sites. Unlike prehistoric sites, small scatters of historic artifacts lacking evidence of structural remains have not been assigned site numbers. At least a tenfold increase in site count would result with the addition of "historic scatters." Rather, the historic site *inventory* (i.e. recorded sites) of the SRS consists almost exclusively of locations of habitation, with a minor fraction of special activities locations such as mill dams, churches, schools and stores. Cemeteries constitute a separate and independent inventory of historic sites (Hanson et al. 1981b). Thus, inasmuch as recorded historic sites on the SRS are dominated by habitations and attendant activity areas (largely argriculture-related), most site locational variation will not be explicable in functional terms.

Having stated the factors which make locational patterns of historic sites potentially distinct from those of the prehistoric period, a comprehensive and independent analysis of historic site locations is in order. This, however, is beyond the scope of this project. Instead, the objective of the remainder of this chapter is to determine what and how much of the historic site inventory is captured by the archaeological sensitivity map generated from prehistoric sites data.

To begin, the co-occurrence of prehistoric and historic components at sites requires documentation. Of the historic sites that have been sampled for collections (n=287), 81.5 percent (n=234) also contain prehistoric components. This is obviously a high degree of co-occurrence, one which suggests considerable continuity in site distribution between

the two eras. In terms of prehistoric site types, as defined for number of components, historic site distributions do not exhibit nonrandom tendencies of co-occurrence. Using the statistical subsample of prehistoric sites to demonstrate this point (Table 4), the breakdown of sites by component classes among sites with historic components is not significantly different than that of sites lacking historic components.

Because of the lack of significant deviation in the occurrence of historic components across component classes, the proportions of historic sites across classes can be related directly to fractions of sites captured by the sensitivity zones. Accordingly, 20.8 percent of all historic sites should be contained within Sensitivity Zone I, and an additional 42.3 percent are projected within Sensitivity Zone II. The distribution of remaining sites

Table 4. Crosstabulation of Prehistoric Site Component Types and Presence-absence of Historic Component.

	Number of Diagnostic Prehistoric Components			
Historic Component	0	1-3	>3	Total
Present	55	63	31	149
Absent	146	127	48	321
Total	201	190	79	470

x^2=4.00071 with 2 degrees of freedom; not significant at .05 level.

crosscuts all zones, and includes an as yet indeterminate fraction of sites in Sensitivity Zone III.

Returning to the sample of all historic sites, what is the actual congruence between the sensitivity zones and historic site locations? Table 5 documents summary statistics of the relevant environmental variables by total historic sites, those with prehistoric components, and those lacking prehistoric components. An initial review of these data shows that the average historic site meets the locational criteria of Sensitivity Zone I, although the maximum values for each of the variables exceeds the limits of this zone. Interestingly, it is the small subset of sites lacking prehistoric components that exhibits the greatest average values for the variables. The deviations from prehistoric locational tendencies are especially acute among (exclusively) historic sites located on Rank 1 and 2 streams. Not only are the mean values for distance to water, elevation and relative elevation extraordinarily high for this group, but the relative proportion it represents (63 percent) is exceeded only by that observed among nondiagnostic prehistoric sites. Thus, a significant number of historic sites are located well outside the limits of Sensitivity Zones I and II, have stream rank distributions which compare favorably with nondiagnostic prehistoric sites, but have averages for distance to water, elevation and relative elevation that exceed those of prehistoric sites within Sensitivity Zone III. It follows that the sensitivity ratings may potentially fail to identify important historic

resources; it remains to be determined what types of resources are not included in the high and medium sensitivity zones.

Historic sites on the SRS have been analyzed for temporally diagnostic artifacts, primarily pottery, to ascertain the type and number of historic components represented[2]. Four components are recognized for the area: Colonial, Revolutionary, Antebellum and Postbellum/Modern. Using these to examine temporal variation in site location, some changes in locational patterns are evident (Table 5). An expansion of settlement into the Aiken Plateau similar to that observed among prehistoric sites is suggested by an increase in the average elevation and relative elevation of locations through time. Further support is found in the increasing proportion of sites on small rank streams through time. These combined lines of evidence are especially strong among Postbellum/Modern sites. As indicated by other studies from the SRS (Brooks 1987; Brooks et al. 1989b), a postbellum expansion of small yeoman and tenant farm communities into the upland sandhills of the Aiken Plateau resulted in an in-filling of these relatively marginal agricultural lands.

Many of the interfluvial ridges of the Aiken Plateau were occupied for the first time during or just prior to the postbellum era. The patterns of component co-occurrence support this conclusion. Of the 64 Colonial sites, only 25 percent were reoccupied during the Revolutionary period, despite a documented site increase of 50 percent. Expansion at this time, however, was directed along the major tributary bottomland and terraces of the study area. Newly occupied sites of the Revolutionary period are all within 550 m of a stream and have low average values for elevation and relative elevation. Nearly 60 percent of the subsequent Antebellum sites reflect continuity in occupation. New sites (n=34) of this era reflect the beginning expansion of occupation into the upland sandhills. This trend catalyzed after the Civil War. Only 21.8 percent of Postbellum/Modern occupations were retained on Antebellum sites, while a 120 percent increase in site frequency is noted. Most of these new sites (62.5 percent) are situated near Rank 1 and 2 streams, often at great distance (maximum=1700 m). These are the highest, driest and most remote historic period habitation sites on the SRS; these late, generally single component sites comprise the vast majority of sites located in Sensitivity Zone III.

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[2] The problem of sampling bias among prehistoric site collections has potentially similar consequences for historic sites. The small number of excavated historic sites on the SRS precluded a thorough analysis of bias and establishment of sample criteria like those generated from prehistoric site excavations. However, a simple test of the adequacy of surface collection biases was preformed for historic sites by comparing the presence or absence of ceramic sherds in a collection against the surface exposure at a site. If difference in surface exposure was exerting a strong bias in the recovery of ceramic sherds, then surface collections lacking ceramic sherds (n=23) would be associated more often with poor surface exposure than would collections containing sherds (n=262). A statistical test of the associations showed this not to be the case (x^2=3.8955 with 4 degrees of freedom). Thus, the sampling bias of surface collections noted among prehistoric sites apparently does not have an equivalent effect on historic sites, or the historic components of sites. Being recent and relatively shallow, historic assemblages are perhaps more effectively sampled through surface collecting than are prehistoric assemblages. Add to this the facts that historic remains are often obtrusive (e.g. above-ground remnants of structure, wells) and usually associated with land modifying activity (e.g. plowing), it is not surprising that surface collection represents an effective means of assemblage sampling. Because each of the historic sites in the sample includes a surface collection, all of the sites may be included in the analysis of component content and co-occurrence. More rigorous evaluation of the adequacy of these samples must await further excavation of historic sites on the SRS and vicinity.

To summarize, the majority of documented historic sites on the SRS (63.1%) are contained within Sensitivity Zone I and II as defined on the basis of prehistoric site distributions. Sites located outside these zones are dominated by single component Postbellum/Modern sites. Although these sites are not the functional equivalent of the nondiagnostic prehistoric sites which characterize Sensitivity Zone III, their abundance and limited co-occurrence with earlier historic components does not warrant revision of the sensitivity criteria. This is not to say that these resources are not significant, only that from a management perspective, their significance is limited compared to multicomponent sites in locations affording better site preservation and depositional integrity.

As argued for prehistoric sites, historic site locations that were regularly reoccupied represent resources that have great potential for addressing numerous research issues, and they constitute resources that are the most labor-intensive and time-consuming to mitigate. Taking this into consideration, the locational tendencies of historic sites by number of components shows that the Sensitivity Zones of prehistoric sites ultimately characterizes the distribution of multicomponent historic sites as well (Table 6). It must be stressed however, that the congruence between prehistoric and historic site sensitivity is far from perfect. But rather than refine the sensitivity zones to accommodate historic site distributions, it would be more prudent to seek additional documentary information (maps, photographs, accounts) available on historic sites and apply this to a reconstruction of the actual historic landscape. In this sense, the sensitivity map of archaeological sites should not be considered an accurate predictor of historic site locations. Known sites can be evaluated on their own terms, and locations of additional sites should be attempted from

Table 5. Summary Statistics for Distance to Water, Elevation and Relative Elevation by Historic Site Subsets and Stream Rank Class.

		Rank of Nearest Stream	
ALL HISTORIC SITES		1-2	3-5
Distance to Stream (m)	n	149	138
	mean	333.83	302.07
	s.d.	338.53	227.04
	min	5	10
	max	1700	1100
Elevation (m amsl)	n	149	138
	mean	64.52	51.61
	s.d.	22.25	14.81
	min	30.49	27.44
	max	112.78	94.49
Relative Elevation (m)	n	149	138
	mean	19.77	10.44
	s.d.	13.44	7.66
	min	1.52	1.52
	max	76.20	42.67

		Rank of Nearest Stream	
HISTORIC SITES WITH PREHISTORIC COMP.		1-2	3-5
Distance to Stream (m)	n	115	119
	mean	304.13	292.10
	s.d.	353.03	233.92
	min	10	10
	max	1700	1100
Elevation (m amsl)	n	115	119
	mean	62.27	50.06
	s.d.	22.02	14.89
	min	30.49	27.44
	max	106.68	85.34
Relative Elevation (m)	n	115	119
	mean	18.73	9.75
	s.d.	13.68	7.33
	min	3.05	1.52
	max	76.20	39.62

		Rank of Nearest Stream	
HISTORIC SITES WITHOUT PREHISTORIC COMP.		1-2	3-5
Distance to Stream (m)	n	33	19
	mean	446.82	364.47
	s.d.	258.15	169.83
	min	5	50
	max	950	600
Elevation (m amsl)	n	33	19
	mean	73.11	61.28
	s.d.	21.17	10.05
	min	32.00	51.82
	max	112.78	94.49
Relative Elevation (m)	n	33	19
	mean	23.74	14.76
	s.d.	12.08	8.49
	min	1.52	3.05
	max	54.86	42.67

Table 6. Summary Statistics for Distance to Water, Elevation and Relative Elevation by Number of Historic Components.

		Number of Components			
		1	2	3	4
Distance to Stream (m)	n	202	44	25	16
	mean	304.38	337.50	389.60	334.38
	s.d.	277.86	307.34	339.34	323.07
	min	5	10	50	25
	max	1700	1500	1400	1300
Elevation (m amsl)	n	202	44	25	16
	mean	58.84	60.79	55.05	49.91
	s.d.	20.29	20.89	20.02	12.62
	min	27.43	30.48	30.48	30.48
	max	112.78	103.63	106.68	76.20
Relative Elevation (m)	n	202	44	25	16
	mean	15.16	17.60	13.17	13.72
	s.d.	12.50	12.35	8.64	7.65
	min	1.52	3.05	3.05	3.05
	max	76.20	42.67	33.53	30.48

documentary sources, not projected from mathematical relationships of sites and environmental variables.

CONCLUSIONS

Site Use Grid Maps of Archaeological Sensitivity and Site Location

Zones of archaeological sensitivity and site locations have been transferred to Site Use Grid Maps (SUGM) for purposes of site use planning by DOE and its contractors (Appendix B). Each of 31 SUGMs contains as many as 25 PIUs. Contours lines corresponding to the four zones of archaeological sensitivity (including indeterminate) were copied from the master map onto SUGMs. Documented site locations were also transferred from a master site inventory map (Figure 4; Attachment A). Sites included in the prehistoric statistical subsample (solid triangle) have yielded assemblage samples sufficient to make a preliminary assessment of potential for nomination to the National Register of Historic Places. Sites excluded from the statistical subsample (open triangle) have not been adequately sampled, and will require additional field work to obtain information to assess potential for nomination to the National Register of Historic Places.

The maps of archaeological sensitivity and site location are to be used as planning sources for any and all parties concerned with land use on the SRS. These sources are not intended to be substitutes for or short-cuts of the normal SRS Site Use application or to the procedures of compliance pertaining to federal protection of cultural resources. Used in the stages of early land use planning, the map sources will provide an initial assessment of (1) the location of documented archaeological resources; (2) whether or not

enough information about a site has been collected to assess its potential for nomination to the National Register of Historic Places; and (3) the projected occurrence of prehistoric archaeological sites.

Future Goals

Two improvements in the management of archaeological resources of the SRS are envisioned for the future.

First, staff of the SRARP will coordinate with SRS personnel to integrate site locational data into a Geographic Information System (GIS). With GIS, multivariate site locational data can be generated to make precise estimates of the probability of the occurrence of particular site types, as well as to better manage the preservation of known sites. GIS will also provide a valuable analytical tool to the SRARP by enhancing research capabilities, thereby improving the process of assessing site research potential. Many of the time-consuming geographic measures used to generate locational data for this document will be circumvented with a comprehensive GIS program.

The second goal of future resource management is to make a thorough review of all available documentation on the locations of historic period sites on the SRS. In particular, aerial photographs and historic maps will be used to obtain absolute locational data. This information can then be transfer to a GIS program to provide a thorough record of historic site locations. Ultimately, it should be possible to reconstruct the historic landscape from a combination of archaeological survey data, historic documentation and statistical projections based on the analysis of survey and document data.

CHAPTER IV

LAND USE AND ARCHAEOLOGICAL IMPACTS

Richard D. Brooks, Glen T. Hanson and George S. Lewis

This chapter details past cooperative efforts to protect the cultural resources of the SRS and is presented in three sections. The first section presents a short history of land use activities on the SRS. The second and third sections describe the major land use activities on the plant and contain discussions of SRARP perceptions of potential adverse effects on cultural resources resulting from forest management activities and the construction and maintenance of facilities.

LAND USE ACTIVITIES 1973-1987

Introduction

Specific information on land use activities classified by major land use categories is presented in Table 7. These data, derived for Federal FY1973 through FY1987, were tabulated from the computer based, Automated Site Use System for the SRS. This system was partially developed and maintained by the SRARP, SCIAA. Each tabulated land use activity represents an operation ranging from a small ecological research plot, to a large timber sale, to the construction of a 1,000 acre cooling lake. While all land use activity does not represent a potential effect on archaeological resources, most of the more areally extensive activities in the borrow pit, construction, forest management, plant operations and utilities categories require a level of archaeological consultation. This consultation may constitute a simple review of known archaeological sites in the area of proposed activity, or may involve the initiation of a full-scale intensive survey. During the 14 year period presented in Table 7, an average of 63 site use permits per year were reviewed for potential effect on archaeological resources. Figure 5 is a graphic representation of Table 7.

Table 7. Savannah River Site Major Land Use Categories FY1973-FY1987

Land Use Category	Number	Percentage	Average Number per Year
Aquatic Research	98	11.18%	7.00
Borrow Pits	43	4.91%	3.07
Construction	130	14.84%	9.29
Forest Management	88	10.05%	6.29
Forest Research	69	7.88%	4.93
Plant Operations	131	14.95%	9.36
Special Activities	23	2.63%	1.64
Terrestrial Research	125	14.27%	8.93
Timber Sales	121	13.81%	8.64

Utilities	48	5.48%	3.43
TOTALS	876	100.00%	62.58

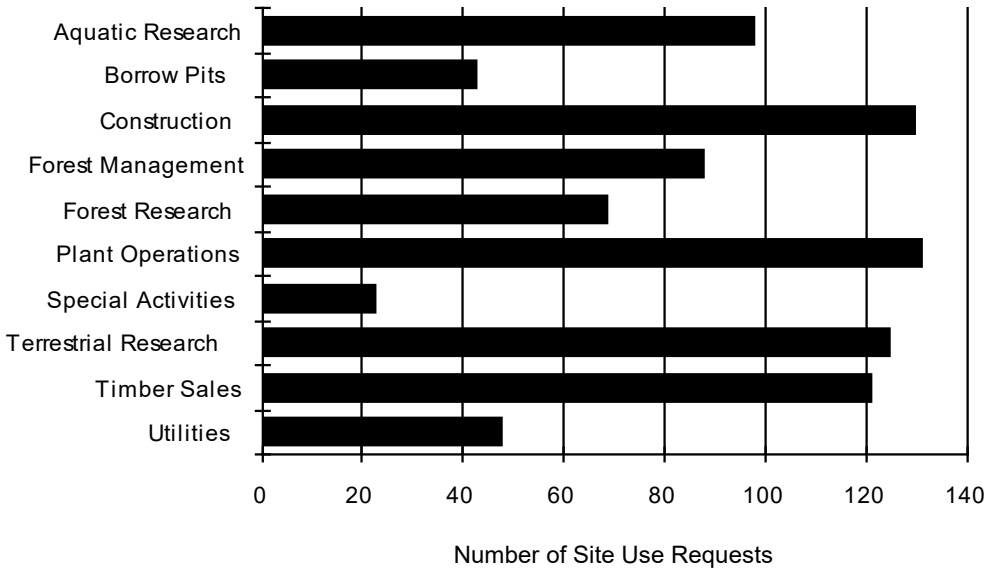

Figure 5. SRS Major Land Use Activity by number of Site Use Requests FY1973-FY1987.

Land Use Activities

SRS Operations and Construction. The SRS serves as a primary facility for production of nuclear materials for defense and research. Activities associated with this primary mission range from facilities improvements within secured areas to construction of secondary facilities (e.g., cooling ponds, canals, access roads, and utility lines). While much of the major construction associated with the SRS has been completed over the past 36 years, recent projects have included the Defense Waste Processing Facility, L-Dam and Lake, the Saltcrete Area of the Defense Waste Processing Facility, proposed K-Cooling Tower, proposed expansions to the Burial Ground Facility, Ground Water Protection and Waste Management Project, new Mixed Waste Storage Facilities, and numerous small construction projects. In most cases, these projects have involved intensive archaeological survey and testing programs required under the Archaeological and Historical Preservation Act of 1974. In several instances (i.e., L-Dam and Lake, and the Ground Water Protection and Waste Management Project), archaeological surveys were required on an urgent basis in order to meet the program requirements of DOE. The SRARP conducted these surveys in a timely manner without delays in project scheduling. In cases where avoidance of significant archaeological sites was not possible as a mitigation strategy, data recovery through excavation was conducted under approved Memoranda of Agreement with the South Carolina State Historic Preservation Office and the National Advisory Council on Historic Preservation. A review of the archaeological work conducted under the special surveys component of the existing contractual agreement indicates that all archaeological fieldwork and reports were submitted within DOE schedule requirements.

Over the past 14 years, 261 land use applications have been reviewed in the plant operations (n=131) and construction (n=130) categories (Table 7 and Figure 5). Most of these activities required some level of archaeological consultation, because they usually involved the modification of ground surfaces. Given the annual average of more than 18 applications in these two categories in recent years and the proposed activities scheduled for SRS, archaeological consultation on operations and construction projects will continue to be an essential part of SRS' compliance needs.

Forest Management Activities. The activities of the Savannah River Forest Station, United States Forest Service, are certainly the most extensive on the SRS, involving management of forest lands representing approximately 80.5% (154,793 acres) of the property. Forest management encompasses a cycle of land use activities that utilize heavy equipment. These activities include site preparation, tree planting, controlled burning, stand improvement, and tree harvesting (see below). While the majority of land currently under timber management was cleared and cultivated prior to acquisition by the Federal government, contemporary mechanized timber management practices have the potential for further disturbing archaeological sites.

Each timber compartment prescription has been reviewed during the planning stage for the occurrence of known archaeological sites, and, when present, archaeological sites are avoided by heavy equipment. Given the number of forest management (n=88) and timber sale (n=121) activities over 14 years (annual average of 15) and the large acreage involved, a continued archaeological involvement will be necessary. Although formal coordination and review has resulted in the relative protection through avoidance of known archaeological sites, it does not ensure the protection of sites not located through the 50% survey of the SRS to date.

Borrow Pit Activities. Soil borrowing has been required for various construction and operation activities on the SRS (e.g., waste site closure, road maintenance, and construction). Since 1973 a total of 43 land use applications (annual average of 3) associated with borrow pit activities have been reviewed. Given the destructive effect of borrow pit excavation on archaeological resources, each proposed location requires intensive survey prior to approval.

Utilities. Construction, improvement and maintenance of utility (i.e. electrical, water and communication) rights-of-way have accounted for 48 separate land use applications during the FY73-FY87 period (annual average of 3). Most of these activities have involved small scale utility lines associated with new facilities and construction projects, but several have involved extensive clearing of new corridors for transmission lines (e.g., the Vogtle-Savannah River Plant 230 kv line). Construction of new utility corridors usually incorporates the use of heavy equipment for clearing, grubbing, grading and tower placement, all of which can adversely effect archaeological sites.

Ecological and Forest Research. As a National Environmental Research Park (NERP), the SRS hosts a broad spectrum of research activities relating to the physical and biotic components of the Site. Research activities account for 33% (n=293) of all land use applications (annual average of 21) since FY73, including aquatic research (n=98),

forest research (n=69), and terrestrial research (n=125). Overall, research activities do not usually constitute a potential adverse effect with respect to archaeological resources because of the nature of scientific data gathering associated with the projects. However, projects that incorporate logistical support facilities result in land alteration (e.g., research site preparation, access roads, and research trailer sites).

Special Activities. This category of land use incorporates diverse activities ranging from deer hunts and wild turkey management to employee exercise areas and archaeological research investigations. Accounting for only 23 applications (2.63%) over the past 14 years, special activities have only limited potential for affecting archaeological sites.

This brief review of land use activities on the SRS since 1973 has demonstrated the extent and form of potential effects associated with archaeological resource management. Since the establishment of a full-time archaeological facility at the SRS, land use activities have been monitored closely to ensure the avoidance of known sites. Future management of these resources will require continued archaeological consultation, review and field study, especially in locations not investigated through the 50% archaeological survey of the SRS. Based on distributional patterns of the known sample of 850 archaeological sites, predictive models of site location are presented in Chapter III. This should enable land use reviewers and planners to have access to information regarding the relative probability of archaeological resources occurring within the potential project areas. The use of these data and models will permit a priori consideration of archaeological site patterns along with hydrological, geological, sedimentological, and biological data within the project site selection and environmental review processes.

FORESTRY EFFECTS ON CULTURAL RESOURCES

The Southeastern Forest Experimental Station has produced a General Technical Report (McKee et al. 1985) entitled *A Loblolly Pine Management Guide: Managing Site Damage from Logging* that contains well conceived concepts. Whether or not they can be applied is another issue.

One real problem that cannot be anticipated with any accuracy is that immediate market demand often does more of the planning than do the foresters and loggers. When the weather is good and timber prices are up, logs arrive at the mill on a continuous basis. If demand is suddenly increased and/or the weather turns bad (e. g., prolonged rain), then planning becomes impossible. In such cases, actions can result that could adversely effect cultural resources.

One such case took place during wet weather in the summer of 1986 on the Snelling side of Lower Three Runs Creek. Topographically, the impacted area was on high ground with a high clay content to the soil. Unfortunately, loggers operated right through the wet spell, even though the soil was saturated. When our survey team arrived, the area was badly rutted. Normally, if the loggers had not been allowed to log during wet

weather, little damage would have occurred. Generally, the SRFS has coordinated well with the SRARP to avoid known cultural resources and minimize adverse impacts.

Figure 6 graphically depicts the relationship between potential soil penetration by various types of standard logging equipment measured against the wet-season water table for a variety of soil types. Adherence to such guidelines would serve to reduce adverse impacts from timber harvesting.

Table 8 presents an "Outline of Standard Forest Management/Protection Practices and Perceived Effects on Cultural Resources." The table describes various forestry practices, not all necessarily used on the SRS, and the types of equipment used to produce the impact. The table then shows the impacted zone and the effect produced on both historic and prehistoric sites, posed against impacts resulting from agricultural activities, as a familiar norm.

The discussion following Table 8 shows, through the use of photographs, various impacts resulting from forestry management practices on the SRS. In addition to any other adverse impacts described below, all activities expose artifacts to a greater or lesser degree.

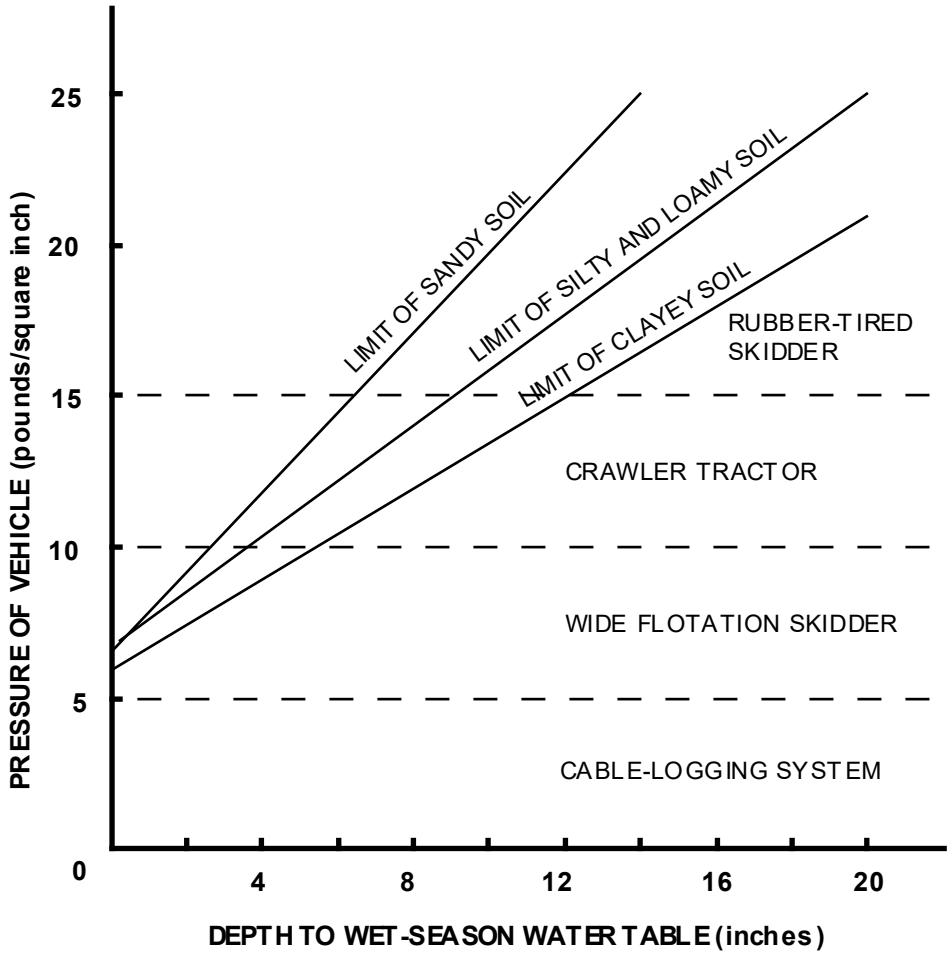

Figure 6. Graphic depiction of the relationship between potential soil penetration and standard logging equipment (McKee et al. 1985).

Table 8. Outline of Standard Forest Management/Protection Practices and Perceived Effects on Cultural Resources

ACTIVITY	IMPACTING AGENT	IMPACTED ZONE	HISTORIC SITES AND ARTIFACTS	PREHISTORIC SITES AND ARTIFACTS	IMPACT AS VS. AGRICULTURE
Timber Harvesting					
Felling					
Manual (chain saw)	Stem and crown fall	Surface	Crush, distort, scramble	Crush, scramble	Much less
Mechanical	Stem and crown fall plus tractor	Surface and to 10 cm	Crush, distort, scramble, compact context, destroy	Crush, scramble, compact context	Less to same
Skidding					
Tree length with crown	Stem and crown drag	Surface and to 10 cm	Crush, distort, translocate	Crush, scramble, translocate	Less
	Skidder tractor	Surface and to 10 cm (dry)	Crush, distort compact	Crush, compact	Less to same
		Surface and to 60 cm (wet)	Crush, distort compact and scramble context, destroy	Crush, compact and scramble context, destroy	Same to much worse
Tree length without crown (single and multiple stems)	Stem drag and gouging	Surface and to 20 cm (dry) destroy	Crush, distort compact and scramble context, translocate, locate	Crush, compact and scramble context, trans-	Less to worse
		Surface and to 60 cm (wet)	Same	Same to destroy	Same to much worse
Log length	Same as previous	Same as previous	Same as previous	Same as previous	Same to much worse
Pulpwood sticks and other short bolts handled with "Bobcats"	Bobcat maneuvering	Surface to 10 cm	Crush, distort, scramble	Crush, surface scramble	Less
Loading					
Knuckle-boom loader	Site clearing, tree uprooting tractor move-ment, truck movement, terrain alteration, cut and fill and equipment maintenance (fuel and lube spill)	Surface and to to 100 cm	Crush, distort, scramble, stain, compact context	Crush, scramble compact context, to destroy	Less to much worse, but localized

Table 8. (continued)

ACTIVITY	IMPACTING AGENT	IMPACTED ZONE	HISTORIC SITES AND ARTIFACTS	PREHISTORIC SITES AND ARTIFACTS	IMPACT AS VS. AGRICULTURE
Large fork lift	Same as above with more loader move-ment	Same as previous	Same as previous	Same as previous	Same as previous
Bobcat type loader (pulp-wood and short bolts)	Loader and truck move-ment	Surface and to 10 cm	Crush, distort, scramble, compact	Crush, scramble, compact context	Less and it is localized
Product transport					
Truck and truck-tractor with trailer	Road const-ruction and maintenance, tree uprooting, terrain alter-ation, cut and fill, drainage	Surface and to 100 cm	Crush, distort, scramble, compact context, translocate, to destroy	Crush, scramble compact context, translocate to destroy	Same to much worse
Other Forest Products					
Resinous pine stumps					
Extraction	Heavy full-tracked tractor with stump blade; maneuv-ering to access stumps	Same as previous	Same as previous	Same as previous	Worse, but less extensive
	Uprooting stumps with stump blade; filling hole	Same as previous	Same as previous	Same as previous	Worse, but very localized
Hauling to loading site	Heavy full-tracked tractor with grapple loader; pulling tracked hopper trailer	Same as	Same as previous	Same as previous	Same as previous
Loading	Full-tracked tractor maneu-vering to load	Surface and to 20-30 cm	Crush, scramble distort, compact context	Crush, scramble compact context	Much less
Product trans-port from forest	Large truck or truck-tractor with trailer	Surface and to 5 cm or less	Probably little or none	Probably little or none	Much less
Pine straw					
Raking (manual)	Personnel and small trucks	Surface	None, little, to exposure	Probably none, to exposure	Very much less

Table 8. (continued)

ACTIVITY	IMPACTING AGENT	IMPACTED ZONE	HISTORIC SITES AND ARTIFACTS	PREHISTORIC SITES AND ARTIFACTS	IMPACT AS VS. AGRICULTURE
Raking (mechanical)	Small tractor and farm-type hay rake	Surface and to 5-10 cm (tractor)	Very little, to exposure and possible crushing or dislocation	Probably none, to exposure	Same as previous
Baling	Small tractor and towed hay baler	Surface and to 5-10 cm (tractor)	Probably none; in same locus as above but localized	Probably none	Same as previous
Product transport from forest	Medium truck with rack to truck-tractor with van trailer	None; use only existing roads; usually hand loaded	None	None	Very much less
Reforestation					
Site preparation					
Blading (shearing) and and windrowing	Equipment movement and action; stem/stump uprooting	Surface and to 100 cm	Crush, distort, compact context, translocate, to destroy	Crush, compact context, translocate to destroy	Same to much worse
Previous plus bedding	Same as previous plus terrain alteration	Same as previous impact	Same as previous plus inversion of context	Same as previous plus inversion of context	Same as previous
Roller drum chopping	Equipment movement and action	Surface and to 20 cm (for the drum chopper)	Crush, distort, compact context, minor translocation	Crush, compact context, minor translocation	Less to same
Burning	Firebreaks, heat, equipment	Surface to 5-10 cm	Invert context, crush, distort, consume, melt, fuse	Invert near-surface context, crush, discolor (false thermal alteration of chert)	Much less and localized
Herbicide and burning	Firebreaks, and equipment movement if tractor-applied	Same as previous	Same as previous, plus kills large-crowned homesite recognition trees	Same as previous	Much less
Tree planting					
Manual	Dibble penetration	To 20 cm at grid intersections (varies with tree spacing)	Crush, dislocate (shove down)	Crush, dislocate (shove down)	Much less
Mechanical (wheeled	Tractor movement, machine	Tractor to 5 cm planter to	Crush, compact context, distort	Crush, compact context	Less

tractor, open and old fields)	action	20 cm			

Table 8. (continued)

ACTIVITY	IMPACTING AGENT	IMPACTED ZONE	HISTORIC SITES AND ARTIFACTS	PREHISTORIC SITES AND ARTIFACTS	IMPACT AS VS. AGRICULTURE
Mechanical (heavy tractor, full-tracked and wheeled, with V blade)	Tractor movement, machine action, surface alteration	Tractor and blade to 30 cm planter to 20 cm	Same as previous	Same as previous plus translocation	Less to same

Timber Harvesting

The effects of timber harvesting on cultural resources vary in accordance with species, stem diameter, crown density, slope, soil type and soil moisture. Skidding impact varies with stem diameter, soil type, soil moisture, slope, and, in the case of hardwoods, whether bottomland or upland. Bottomland logging impact is especially heavy where skidding routes cross the mesic terrace ecotone, which has a high probability of containing prehistoric sites. If skidding is done with cable tower, this particular impact is localized because skidding tractors bunch the logs out in the bottom and the haul cable drags them to the "hill"; in effect a ditch is gouged across the topographic contour and through any site on the edge of the bottomland. As long as logs are elevated and tight against the skidding tractor, the effects of log length skidding are about on a par with tree length with no crown. Extremely large logs have to be dropped and quite often winched flat, and unless the nose is protected with a cone or shoe, it gouges severely. Loading impact varies in severity with product size, soil type, soil moisture, and slope. Loading impact is especially severe for bottomland hardwood operations. The loading areas are typically located on high ground or on the mesic terraces adjoining the bottomland.

Not only does timber harvesting impact archaeological resources, but it also causes erosion in areas of high topographic relief. If timber harvesting does not impact cultural resources, the subsequent erosion of ground surfaces certainly can. Figures 7, 8 and 9 show various impacts on land surfaces during and after timber harvest.

Other Forest Products

The extraction of resinous pine stumps can also adversely effect cultural resources. Although the impacts are comparatively worse than those of timber harvesting, they are more localized. Loading areas for resinous pine stumps are normally very small areas along established roads. Normally, no special roads or loading sites are cleared or constructed for stumping and adverse impact is confined to artifact contexts immediately adjacent to existing roads, which in many cases have already received maximum impact. Raking and baling of pine straw, by the very nature of the operation and product, does little to impact archaeological sites.

Reforestation and Site Preparation

Current SRS areas of pine plantation were formerly agricultural fields. Consequently, ground surface disturbance by reforestation activity is not usually a critical factor. The opposite is true in areas of hardwood conversion, where there may not have been historic agricultural activity. Figures 10, 11 and 12 show the degree of impact from three recent (1987) site preparation activities.

Figure 7. A log skidder of the type generally used on SRS. The size of the tires and depth of tread determines, in part, the degree of disturbance to archaeological sites. The placement of loading areas away from known site locations is critical.

Figure 8. Area off SRS Road C-4 at 38AK155, view looking south. Note the ground surface disturbance following clearcutting and burning activities.

Figure 9. Timber Compartment 30 near Reedy Branch, showing disturbance from active logging in an upland setting. The ground surface disturbance is minimal, except in areas of loading. As noted above, this activity is planned in advance with the Forest Service, and archaeological sites are marked and avoided prior to timber harvesting.

Prescription Burning

Generally, prescription burning activities have little impact on archaeological sites except to give greater surface visibility. However, combined with clearcutting activities, the potential for archaeological site disturbance, especially on hill slopes or on friable sand, increases.

Timber Stand Improvement

This includes: Kudzu eradication; weed tree control; fertilization; and prescription silviculture burning. These activities incorporate various elements of the above described activities, and will adversely impact accordingly (see Table 8).

Thinning

The level of disturbance from this activity to archaeological sites is normally minimal as depicted in Figure 13.

Fire protection

The only impact upon cultural resources from forest fire protection (action against going fire) is the plowing of firebreaks (Figure 14). This impacts cultural resources in the same manner as plowing firebreaks for prescription burning. Although the disturbance to archaeological sites is not great, the depth of plowing can disturb subsurface features.

Figure 10. SRS Road A-13.2 between archaeological sites 38AK557 and 38AK333. The degree of disturbance to the ground surface following drum chopping is depicted.

Figure 11. SRS Road 2-1 near gate 14, view looking north. Note the extent of upland site preparation.

Figure 12. Area off SRS Road 2, approximately 1/2 mile north of the junction with S.C. 125. Recent site preparation following drum chopping is depicted.

Figure 13. Area off powerline/road right-of-way SRS E-2.1 near the junction with E-2. View looking south, depicting recent thinning activities.

Figure 14. Road E-2 near the junction of a jeep trail to the east. Note the firebreak around an area to be burned.

CONSTRUCTION EFFECTS ON CULTURAL RESOURCES

It is imperative that construction planning and design take into consideration the archaeological resources of the SRS and the legal mandates that protect those resources. Once a construction site has been chosen, an intensive archaeological survey of the area must be undertaken. The survey will help identify those cultural resources that may be adversely impacted. Before construction can begin, the area first has to be cleared of trees and clearcut debris. At this point, all but buried archaeological resources will be destroyed. With the subsequent use of heavy construction equipment, even buried sites will be adversely impacted.

Utilities (i.e., water, electrical and steam lines) construction, separately and in conjunction with new construction site locations, can adversely impact archaeological sites. This is especially true when utilities cross drainages. As Chapters II and III demonstrate, a large number of potentially significant archaeological sites are located within 400 meters of water. The sites are generally located on the terrace edges of streams, where crossing supports also have to be located. In some instances, the crossing supports can be relocated. However, this is not always an option and archaeological sites will be adversely impacted.

New road construction and road widening projects can variously impact archaeological sites. In gently rolling areas characterized by deep sandy soil, little disturbance to sites is expected. The potential for impacting archaeological sites is great where doubling to quadrupling of the width of existing road rights-of-way takes place. These activities should be considered under the Site Use System, rather than normal road maintenance. Archaeological sites located within existing rights-of-way are already considered disturbed. The following figures depict various road projects that have taken place over the past few years and their potential to impact cultural resources.

Figure 15. Road 2-1, view looking east from the bridge over Upper Three Runs Creek. The results of road improvement completed in 1987 are shown. The width of the road right-of-way went from approximately 15 meters, to 75, to 100 meters, with accompanying grading, gravelling and rip-rapping to deter erosion.

Figure 16. Road widening on Roads 8-4 and 8-8, from Road 2-1 into Timber Compartment 53 to SRS Road E. Roads 8-4 and 8-8 prior to widening were approximately five meters wide. This road widening should have been approved through the Site Use System. Such obvious abuses of the Site Use system should be eliminated.

CONCLUSIONS

The South Carolina Institute of Archaeology and Anthropology, University of South Carolina, through the SRARP, has maintained a strong research and service commitment to the archaeological resources of the United States Department of Energy's Savannah River Site since 1973, when an initial contractual agreement was established to implement an inventory of significant archaeological sites. Since this initial involvement began, the SRARP has located and recorded 850 archaeological sites. This has provided scientifically valuable information for all periods of human occupation in the Savannah River Valley, beginning with the Paleoindian Period (circa 12000 B.P.) and ending with the acquisition of the SRS property by the United States Government in the early 1950s. This wealth of documented archaeological resources within a discrete, physically protected setting offers a relatively unique opportunity for DOE and SCIAA to establish an archaeological resource management program which meets the requirements of Federal historic preservation legislation, while providing for ongoing research aimed at enhancing our understanding of past human systems in the region.

Archaeological resources represent the non-renewable record of past human experiences which, for the most part, can be understood only through meticulous field and laboratory investigations. Because archaeological resources exist within the topmost soil strata, usually within 1.5 meters of the surface, they are vulnerable to numerous land use activities. The archaeological record of the SRS has been documented through published reports and articles (see Chapter 1) prepared under the sponsorship of DOE. This forms the foundation for the Archaeological Resource Management Plan (see below) aimed at protecting the archaeological record from inadvertent disturbance resulting from new construction and ongoing land use activities. While previous efforts have assured some protection of cultural resources, this plan and set of procedures for continued conservation and preservation is necessary.

CHAPTER V

ARCHAEOLOGICAL RESOURCE MANAGEMENT PLAN

Richard D. Brooks and Mark J. Brooks

The SRARP has cooperated and coordinated with on-site organizations to actively locate and protect significant and potentially significant cultural resources since 1978. This chapter details future cooperative efforts to protect the cultural resources of the SRS. The first section presents a short discussion of the SR-88 Land Use Site Review process and the Natural Resources Management Plan (NRMP). The second section summarizes the advantages of the PMOA for cultural resource management planning on the SRS. The final section presents the Archaeological Resource Management Plan with reference to archaeological compliance procedures, the use of sensitivity maps for planning purposes, and major land use activities. The section also contains discussions of SRARP plans to avoid adverse effects on cultural resources from timber management practices, other land users, and proposed construction of facilities.

LAND USE REVIEW PROCESSES

SR-88 Process

All land use activities that occur on the general site are subject to review by the Savannah River Land Use Committee through the SR-88 process. The Savannah River Site Coordinator is appointed by the Committee and is the daily contact for the Savannah River Site Land Use Program. Individual land use requests are reviewed by Designated Coordinating Land Users, a group of DOE and contractor representatives. These representatives cover a broad range of interests and varying responsibilities on the SRS. The SRARP is one of the Designated Coordinating Land Users.

This process conforms to the goals of the *Savannah River Plant Land Use Plan* (1975). The Land Use Plan facilitates the prime mission of the SRS while also taking into account other aspects of land use. These include: forest management; wildlife management; energy, ecological, environmental, and archaeological research; natural and cultural resource protection; and public education. Goal 6 of the plan incorporates the cooperation of land users into the conduct of historical, archaeological, geological, and nature study programs. The plan states that archaeological survey is anticipated to lead to the identification of sites of sufficient importance to warrant physical marking and setting them aside for possible future exploration.

The SR-88 (*Savannah River Operations Office Order SR 430X.1*, 1983) process helps to coordinate land use and to avoid areas of conflict. Activities that occur outside of nuclear production areas are subject to the SR-88 review process. The review process controls, to some extent, land modification. All primary land users are involved with the review, and consideration must be given to natural as well as cultural resource protection. The SRARP role in the review is to ensure the protection of archaeological sites. If terrain alteration is to occur, an archaeological investigation of the area is undertaken to

avoid adversely impacting cultural resources. Generally, the process incorporates sufficient lead-time to allow archaeological review and work to reach conclusion before construction begins.

Natural Resources Management Plan

In August 1988, the DOE Savannah River Operations Office (SROO) Manager issued a directive recommending the development of a Natural Resource Management Plan. The plan was to be developed by the Savannah River Forest Station (SRFS) with the assistance of the DOE Environmental Division. The plan will give the SRFS added responsibilities in the area of natural resource protection, research, and timber management.

The preparation and implementation of this plan are now (1989) underway. When completed, it will consolidate Natural Resource Management (including cultural resources) under one committee/organization that will be given increased responsibilities to coordinate activities at a strategy, but not operating level. It is up to each of the individual member organizations to operationalize their portion of the plan. It defines the roles of various land users and their role in the plan. The plan is designed to assure compliance with applicable federal and state statutes and regulations, and with DOE orders, policies and plans. It also establishes the Natural Resources Coordinating Committee to advise DOE on natural resources management and research issues. The SRARP is a designated party to the development of the management and operational plans, as well as a member of the committee. Being a member of this committee will allow the SRARP to enhance its ability to operate under the PMOA.

ADVANTAGES OF THE PMOA

The Programmatic Memorandum of Agreement (PMOA-Appendix C) between the DOE, the South Carolina State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation allows the DOE to proceed with their operational plans involving landscape alteration without a case-by-case review process, thus satisfying the DOE Section 106 responsibilities. This does not, however, negate the need for archaeological compliance activities. Rather, the PMOA simplifies the process of routine management activities, while strictly complying on specific projects. Because the operation of the SRS is a long-term situation, it presents unique circumstances within the realm of mandated mechanisms of archaeological compliance procedures for federally owned property. The PMOA is tailored to the DOE SROO management and operations needs by formally streamlining the compliance review process for the SRS. Most important, the PMOA will provide a stronger basis for land use management planning, allowing the DOE to better manage the Cultural Resources of the SRS. In order to accomplish the objectives of the PMOA, the DOE places the SRARP/SCIAA in a position of responsibility to manage the cultural resources of the SRS.

ARCHAEOLOGICAL RESOURCE MANAGEMENT PLAN

Archaeological Compliance Procedures

Early Planning Stages. The SRARP should be involved with the earliest possible planning phases of projects, in accordance with PMOA Guidelines and Stipulations, in order to understand the needs of the project and to advise on matters of DOE compliance with Cultural and Archaeological Laws and Regulations. The reference by planners to the archaeological sensitivity maps (Appendix B) alone is not sufficient to avoid impacting archaeological sites. The entire SRS has not been archaeologically surveyed, nor have all known sites been tested to the degree necessary to assess their significance. At varying levels of intensity, only 60% of the SRS has been archaeologically surveyed. However, reference to the archaeological sensitivity maps will enable planners to obtain an idea of the extent and density of archaeological sites within proposed construction areas. The sensitivity maps show locations of known archaeological resources and can be used to make projections about numbers and types of unknown sites.

Sensitivity Area Definition. Chapter III examined the locational tendencies of prehistoric sites in conjunction with components present at each site. This, in turn, formed the basis for determining areas of archaeological sensitivity. Three major areas of archaeological resource sensitivity were determined, all with a direct relationship to distance to water and relative elevation. From the definitions of these areas, a sensitivity map was drawn (Figure 18; Attachment B). The three Sensitivity Zones, defined in Chapter III, were created for the sole purpose of cultural resource management.

Three groups of prehistoric sites were discriminated on the basis of environmental variables (locational analysis) and number of components present (see Chapter III). Type 1 sites are those that have more than three prehistoric components. The Type 2 sites are those with one to three prehistoric components. The Type 3 sites are those prehistoric sites that are temporally non-diagnostic.

The Sensitivity Zones from highest to lowest archaeological sensitivity are:

> Sensitivity Zone I. All areas within 400 m of stream stems of Rank 3 or greater. The more complex and potentially most significant Type 1 sites are restricted to this zone, which may also contain Types 2 and 3 sites as well.
>
> Sensitivity Zone II. All areas within 400 m of Rank 1 and 2 stream stems, and within 401-800 m of stream stems Rank 3 or greater. Type 2 sites will be encountered in this zone, which may also contain Type 3 sites.
>
> Sensitivity Zone III. All areas of the SRS not contained within Sensitivity Zones I and II, excluding restricted access areas, inundated bottomlands, and swamps. Type 3 sites may be encountered in any zone, but are generally the only site types expected in Sensitivity Zone III.

Historic sites exhibit different locational tendencies due to advanced technologies. In effect, there are no locational constraints exhibited by historic sites across the landscape. For example, intensive occupation of the upland sandhills is more apparent during the late nineteenth and twentieth centuries because of advanced hydrological technology (i.e. wells). On the other hand, there is a high degree of co-occurrence of prehistoric and historic components (81.5% of historic sites have prehistoric components). This suggests

considerable continuity in site distribution between the prehistoric and historic periods. However, site location does not appear, at this time, to be a critical factor in assessing the research significance of historic sites; although site location does appear to contribute to the historic occupants place in the local socio-economic hierarchy. Historic issues critical for assessing research significance lie rather in the site's ability for detailed examination of its societal role.

The majority of documented historic sites are captured within Sensitivity Zones I and II. These historic sites are generally multi-component and are most likely to contain pre-Civil War components. The historic sites that are congruent with Sensitivity Zone III are most likely to be Postbellum/Modern single component sites. This is due to the areal expansion of the population following the Civil War and to the fact that the best agricultural land was already occupied.

Thus, as a generalization, Sensitivity Zones I and II capture the majority of the prehistoric and historic archaeological record that contains the most complex archaeological sites; while Sensitivity Zone III captures the least complex, single component sites.

The information on the sensitivity maps (Appendix B) provides site use planners with the locations of all known archaeological sites and an assessment of the adequacy of information of each site needed to assess its potential for nomination to the National Register of Historic Places. Further, the maps were constructed in such a manner that they can be cautiously used to project the occurrence of similar site types within the three Sensitivity Zones.

It must be strongly stressed that these maps (Appendix B) are for general planning purposes only, and are not absolutes. Once an area has been chosen for landscape alteration, within the SR-88 Site Use Review System, an intensive archaeological survey and testing project should be initiated prior to construction and other terrain alteration activities. This must take place in order to discover and evaluate all archaeological manifestations within that area according to the PMOA and its Stipulations (Appendix C).

Archaeological Survey. Sufficient lead time is necessary to intensively survey new land use activity areas. Once an activity site has been chosen, it must be cleared of trees and debris before the project can continue. At this point, all but buried archaeological resources will be destroyed. With the subsequent use of heavy construction equipment, even buried sites will be adversely impacted. Intensive survey will identify most archaeological resources that will be impacted by terrain alteration activities.

In addition to actual construction sites, areas for connecting utilities must be intensively archaeologically surveyed. These utilities include road and railroad access, water (both domestic and cooling), sewage treatment, power, steamlines, parking, and cooling ponds and/or towers.

Once archaeological survey and site testing have identified the cultural resources of a proposed construction/utility area, the site data are then analyzed to determine their significance and eligibility for nomination to the National Register of Historic Places (NRHP).

Criteria of Archaeological Site Significance. As mandated by the National Historic Preservation Act of 1966 (amended in 1980, 36CFR63 and 36CFR800), the significance of archaeological resources is to be assessed using the eligibility criteria for inclusion of sites to the NRHP (36CFR60.4). The criteria are as follows:

> The quality of significance in American history, architecture, archaeology and culture is present in districts, sites, buildings, structures and objects of State and local importance 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; or
>
> b) That are associated with the lives of persons significant in our past; or
>
> 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 (38CFR60.4) of the region.

Due to the archaeological nature of most sites on the SRS, it should be clearly stated that eligibility does not specifically nominate a property to the NRHP, but instead identifies the property as significant and worthy of protection from adverse effects. Significance in this regard is determined by the potential a site has for providing information about specific research problems deemed scientifically or anthropologically relevant by the professional archaeological community (Criterion d, above). Potential is also determined by a combination of site content and integrity.

Archaeological Reports and Mitigation of Adverse Effects. A report of the archaeological investigations is generated and outlines a plan to mitigate the adverse effects on those sites that are deemed significant. The DOE then transmits this report to the South Carolina State Historic Preservation Officer requesting his concurrence with the report and its plans. Once this is approved and implemented, the adverse effects on sites deemed significant are then mitigated. Mitigation of adverse effects on archaeological resources can be achieved by preservation. Preservation can be achieved by two methods: 1) actual preservation in place through non-disturbance; and 2) by data recovery of the archaeological record.

Data recovery can be both time consuming and expensive, depending on the site(s) location and components (see Chapter III). However, these steps must be taken in order

to comply with the PMOA and federal laws and regulations governing archaeological properties (Appendix A).

With all these aspects of a major project to consider, in order that cultural resources can be sufficiently treated in compliance with legal and regulatory mandates, the SRARP should be involved in the early planning stage that demarcates the new facility location and its alternative areas. Figures 18-21, below, show some of the projects that the SRARP has been involved with at the early planning stages, all of which were successfully completed within specified time frames.

Major Land Users on the SRS and Archaeological Resource Management

The SRARP's concern in archaeological resource management is the protection of resources as mandated by federal laws (Appendix A). This section details the appropriate archaeological responses to the land use practices of the Forest Service (outlined in the first draft of the NRMP), construction, Savannah River Ecology Laboratory, various waste management groups, and the SC Department of Wildlife and Marine Resources.

Savannah River Forest Station. The following presents the SRARP general plan to continue coordination with the Savannah River Forest Station in order to protect the SRS

Figure 18. A portion of the Vogtle-SRP 230KV Powerline at 38BR578 in the SCE&G powerline right-of-way, view looking northeast. The entire powerline right-of-way was surveyed and sites tested for subsurface deposits. Currently, because the right-of-way is stabilized by weeds and grasses, there is minimal erosion. At 38BR578, artifacts recovered from the right-of-way were in a disturbed, plow zone context. Outside the right-of-way, there was little top soil and shovel testing produced no artifacts (Brooks, Hanson and Brooks, 1985).

cultural resources. The archaeological investigations resulting from this coordinated effort will be documented in the Annual Report as per the PMOA. In terms of potential impact on cultural resources (see Chapter IV), the Forest Service is by far the most extensive land user on the SRS. The SRFS plans include a large variety of cyclic operations in many different areas of the plant each year. The use of heavy equipment in many forest management practices adversely impacts cultural resources to varying degrees (Table 8). In order to avoid impacting cultural resources, the SRARP coordinates with the SRFS timber prescription specialists regarding planned operations that involve land modification, as described below. The SRARP and the SRFS have cooperated at all levels over the past ten years and we anticipate that this will continue in the future.

Timber Harvesting, Site Preparation and Reforestation: Prescription planning involves consulting with the Forest Service at least one year prior to their field operations in order to locate archaeological sites. Archaeological surveys and site testing will be conducted within timber stands prior to harvesting. Known archaeological sites will be marked for avoidance and monitored during clearcutting and loading, operations associated with mechanical site preparation and reforestation. Following timber harvesting and site

Figure 19. Below L-Lake Dam near 38BR417 to the right of the photograph. The area depicted was part of the L-Lake Intensive Survey Phase I (Brooks 1984).

Figure 20. Steamline construction near SRS Road 3 and Cassels Fire Tower. Note the steamline and road that were constructed in the early 1980s. This type of construction has the potential to greatly disturb archaeological sites. The route of the steamline was surveyed and no eligible archaeological sites were located. This type of activity is closely monitored and areas surveyed as the need arises.

Figure 21. SR-88 well drilling monitoring off SRS Road 2, approximately 1/2 mile north of the junction with S.C. 125. This photograph shows the impact of well drilling at the edge of a recent clearcut. Generally, the impact on archaeological sites from well drilling is minimal. The SRARP is in contact with the Well Drilling Safety Officer and project engineers and, should archaeological sites be located at well sites, the program is notified and monitoring takes place.

preparation for reforestation, the areas will be surveyed again to locate additional sites. Finally, as per the PMOA, survey and testing results will be presented in the Annual Report.

The prospective locations of timber loading points will be planned during meetings with the Forest Service. Monitoring will take place when loading locations are near archaeological sites.

Thinning: The degree of disturbance to archaeological sites from this activity is normally minimal. Consequently, no survey or monitoring is planned for this activity except planning for location of loading points.

Fire protection: This activity involves primarily the maintenance of existing firebreaks. The SRARP will monitor this activity in all archaeological sensitivity areas.

Other Land Use Planning

The SRARP will continue to coordinate its activities with the DOE Contracts and Services Branch on proposed construction of facilities. The SRARP will provide the DOE with timely technical reports on intensively surveyed areas of proposed construction. Our involvement in early planning stages will allow DOE to progress unobstructed with their schedules.

Rights-of-Way Planning. The SRARP has encountered problems with the prime contractor's rights-of-way planning. Road upgrading and new road construction activities have not been successfully coordinated with the SRARP. This lack of coordination, in the recent past, resulted in the disturbance of several known and previously unknown cultural resources. New road rights-of-way will need to be surveyed and archaeological sites tested. The road right-of-way is considered to be the width of the road corridor from tree line to tree line. Sites located in new road rights-of-way should be mitigated through preservation to avoid loss of their informational content. If preservation through road relocation is not feasible, data recovery through excavation will be required.

The SRFS, in the NRMP, has been tasked with the maintenance of secondary roads. Our coordination with the SFRS will extend to secondary road maintenance to avoid known cultural resources. Archaeological surveys will be conducted in areas of proposed road widening.

Construction Planning. The SRARP has in the past been involved with the planning stages of several major construction projects, and has met deadlines to survey, test, mitigate and report archaeological sites that would be adversely impacted (see federal compliance guidelines in Appendix A). It should be noted that this archaeological resource management plan does not designate archaeologically cleared areas for future construction. Such areas must be cleared on a case-by-case basis.

If construction is proposed for an area, an intensive archaeological survey should be undertaken to determine the presence or absence of archaeological sites. If sites are

present, they must be evaluated through testing for NRHP eligibility. The SRARP intensive survey planning process will take into account (per PMOA Guidelines) not only the designated construction areas, but also utilities, security areas, and other areas of secondary impact. Also, according to PMOA Guidelines, monitoring for deeply buried sites should be undertaken during initial construction activities . If buried sites are located, construction may have to be temporarily halted in order to make eligibility determinations. However, with proper advanced planning, this should not be a problem.

Savannah River Ecology Laboratory (SREL). Ecological research on the SRS generally is not land extensive, but rather locality-specific. The 29 SREL set-aside areas dovetail nicely with some areas that the SRARP considers archaeologically sensitive. SREL research projects are subject to SR-88 Site Use approval and are monitored only when land alteration is a factor.

South Carolina Department of Wildlife and Marine Resources. The projects undertaken by the SCDWMR generally do not impact archaeological resources. Their agricultural practices are monitored and have helped the SRARP to locate new sites and expand our knowledge of known archaeological resources. The SRARP and the SCDWMR have cooperated in the past and will continue to do so in the future.

Waste Management and Site Cleanup. The SRS manages certain waste materials which are regulated under the Resource Conservation and Recovery Act and other federal and state laws and regulations. These activities are subject to SR-88 Site Use approval and are closely monitored to avoid impacting archaeological sites. There has been a marked increase in SRARP involvement with various teams and task forces devoted to cleaning up the SRS environment. This coordinated effort helps to ensure that cultural resources are not inadvertently destroyed or removed through cleanup activities.

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APPENDIX A

SUMMARY OF FEDERAL CULTURAL RESOURCE MANAGEMENT LAWS AND REGULATIONS

APPENDIX A

SUMMARY OF FEDERAL CULTURAL RESOURCE MANAGEMENT LAWS AND REGULATIONS

This Appendix presents an outline summary of the pertinent federal laws and regulations governing Federal agency compliance.

ANTIQUITIES ACT (1906)

An Act For the Preservation of American Antiquities, Approved June 8 1906 (Public Law 59-209; 34 STAT. 225; 16 U. S. C. 431-433)

Sets regulation of historic, prehistoric and objects on government owned land and gives authority to government department that owns the land to grant permits for examination and excavation of same for the benefit of reputable institutions. Directs that the Secretaries of Departments publish uniform rules and regulations for the purpose of carrying out provisions of the Act.

HISTORIC SITES, BUILDINGS, AND ANTIQUITIES ACT (1935)

An Act to Provide for the Preservation of Historic American Sites, Buildings, Objects, and Antiquities of National Significance, and for Other Purposes, Approved August 21, 1935 (Public Law 74-292; 49 STAT. 666; 16 U. S. C. 461-467)

National policy to preserve for public use historic sites, buildings and objects of national significance for inspiration and benefit of the people of the United States. It names the Secretary of Interior through the NPS to effect the policy giving the following duties and functions:

1) Secure, collate, and preserve drawings, plans, photographs and other data of historic and archaeological sites, buildings and objects.

2) Make a survey of historic and archaeological sites, buildings, and objects for the purpose of determining which possess exceptional value illustrating the history of the United States.

3) Investigate and research in the US relating to particular sites, buildings or objects to obtain true and accurate history and archaeological facts about the same.

4) Acquire title to those sites or objects without obligating general funds from the Treasury unless Congress appropriates money for same.

5) Make cooperative agreements with states, municipalities, corporations, associations, or individuals to protect, preserve, maintain or operate any historic or archaeological site, building, object or property for public use without obligating general funds from the Treasury unless Congress appropriates money for same.

6) Restore and maintain prehistoric and historic sites of national or archaeological significance, and where necessary establish museums.

7) Operate and manage same for benefit of public.

8) Develop educational programs to inform public.

9) "Perform any and all acts, and make such rules and regulations not inconsistent with this act as may be necessary and proper to carry out the provisions thereof."

10) Establish National Park System Advisory Board to advise Secretary on matters relating to National Park System and administration of this act, in existence until 1990.

11) Establish technical advisory committees to act in an advisory capacity in connection with the restoration or reconstruction of any historic or prehistoric building or structure.

12) "The provisions of this Act shall control if any of them are in conflict with any other act or acts relating to the same subject matter."

ARCHAEOLOGICAL RECOVERY ACT (1960)

An Act To provide for the preservation of historical and archaeological data (including relics and specimens) which might otherwise be lost as a result of the construction of a dam, Approved June 27, 1960 (Public Law 86-523, 16 U. S. C. 469 et seq.; *as amended* by Public Law 93-291; Public Law 95-625; 96-205; and Public Law 96-515).

". . . to further the policy set forth" in 1935 Act " by specifically providing for the preservation of historical and archaeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed."

Section 2. Before construction of any dam, over 5,000 acres for floodwater control and 40 acres for any other dam, the agency shall inform the Secretary of Interior and provisions of Act apply only when evidence of historic or archaeological materials exist within the area.

Section 3. "Any appropriate historic or archaeological authority" may inform the agency in regards to any Federal construction project that may cause irreparable damage of significant scientific, prehistoric, historic or archaeological data, must provide the Secretary in writing with appropriate information. "Such agency may request the Secretary to undertake recovery, protection and preservation of such data (including preliminary survey, or other investigation as needed, and analysis and publication of reports resulting from such investigation) or it may . . . undertake such activity."

Section 4. The Secretary after notification in writing by any Federal, State or appropriate historical or archaeological authority that archaeological data is being lost may initiate recovery and preservation "which, in his opinion, are not being, but should be, recovered and preserved in the public interest." No survey or recovery work during emergencies. The Secretary shall initiate survey within 60 days.

Section 5. The Secretary shall notify the agency of the progress of work so as not to impede construction and work shall terminate at agreed date unless mutually extended. The Secretary shall consult with Federal and State agencies in regard to ownership or curation.

Section 7. Not more than 1 per cent of total project budget for archaeology work, unless the budget for work is under $50,000.

NATIONAL HISTORIC PRESERVATION ACT OF 1966,
AS AMENDED (1981)

An Act to Establish a Program for the Preservation of Additional Historic Properties throughout the Nation, and for Other Purposes, Approved October 15, 1966 (Public Law 89-665; 80 STAT. 915; 16 U. S. C. 470 *as amended* by Public Law 91-243, Public Law 93-54, Public Law 94-422, and Public Law 94-458, Public Law 96-199, Public Law 96-244, and Public Law 96-515).

Section 1. Purpose of the Act

Section 2. Declaration of policy

TITLE I

Section 101. National Register of Historic Places (NRHP) expansion and maintenance, State Historic Preservation Programs, State Historic Preservation Officer (SHPO) responsibilities, Grants to States, Guidelines for Federal agency responsibilities.

SHPO responsibilities

(a)(3)(A) in cooperation with Federal and State agencies, local governments, and private organizations and individuals, direct and conduct a comprehensive statewide survey of historic properties and maintain inventories of properties;

B) identify and nominate eligible properties

C) prepare and implement a comprehensive statewide historic preservation plan;

E) advise and assist, as appropriate, Federal and State agencies and local governments in carrying out their historic preservation responsibilities;

F) cooperate with the Secretary, Advisory Council on Historic Preservation (ACHP), and other Federal and State agencies, local governments, and organizations and individuals to ensure that historic properties are taken into consideration at all levels of planning and development;

Guidelines for Federal agency responsibilities; Preservation standards for federally owned properties

Section 103: Apportionment of survey, planning, project and program grants;

Section 104: Loans for National Register Property

Section 105: Record keeping for loans

Section 106: "The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the

head of any Federal department or independent agency having authority to license any undertaking shall prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The head of any such Federal agency shall afford the Advisory Council on Historic Preservation established under TITLE II of this Act a reasonable opportunity to comment with regard to such undertaking."

Section 107: Exemption of White House, Supreme Court, and Capitol

Section 108: Establishment of Historic Preservation Fund; authorization for appropriations

Section 109: Donations

Section 110: Federal agencies responsibilities

(a)(2) With the advise of the Secretary and in cooperation with the SHPO for the State involved, each Federal agency shall establish a program to locate, inventory, and nominate to the Secretary all properties under the agency's ownership or control by the agency, that appear for inclusion on the NRHP in accordance with the regulations promulgated under section 101 (a)(2)(A). Each Federal agency shall exercise caution to assure that any such property that might qualify for inclusion is not inadvertently transferred , sold, demolished, substantially altered, or allowed to deteriorate significantly.

(b) Each Federal agency shall initiate measures to assure that where, as a result of Federal action or assistance carried out by such agency, an historic property is to be substantially altered or demolished, timely steps are taken to make or have made appropriate records, and that such records then be deposited, in accordance with section 101 (a), in the Library of Congress or with such other appropriate agency as may be designated by the Secretary, for future use and reference.

(g) Each Federal agency may include the costs of preservation activities of such agency under this Act as eligible project costs in all undertakings of such agency or assisted by such agency. The eligible project costs may include amounts paid by a Federal agency to any State to be used under this Act, and reasonable costs may be charged to Federal licensees and permitees as a condition to the issuance of such license or permit.

(i) Nothing in this Act shall be construed to require the preparation of an environmental impact statement where such a statement would not otherwise be required under the National Environmental Policy Act of 1969, and nothing in this Act shall be construed to provide any exemption from any requirement respecting the preparation of such a statement under such Act.

(j) The Secretary shall promulgate regulations under which the requirements of this section may be waived in whole or in part in the event of a major natural disaster or an imminent threat to the national security.

Section 111

(c) The head of any Federal agency having responsibility for the management of any historic property may, after consultation with the ACHP, enter into contracts for the management of such property. Any such contract shall contain such terms and conditions as the head of such agency deems necessary or appropriate to protect the interests of the United States and insure adequate preservation of historic property.

TITLE II

Advisory Council membership and duties

TITLE III

Section 301: Definitions

(5) "Historic property" or "Historic resource" means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register; such term includes artifacts, records, and remains which are related to such a district, site, building, structure, or object.

(8) "Preservation" or "historic preservation" includes identification, evaluation, recordation, documentation, curation, acquisition, protection, management, rehabilitation, restoration, stabilization, maintenance and reconstruction, or any combination of the foregoing activities.

(9) "Cultural Park" means a definable urban area which is distinguished by historic resources and land related to such resources and which constitutes an interpretive, educational, and recreational resource for the public at large.

(10) "Historic conservation district" means an urban area of one or more neighborhoods and which contains (A) historic properties, (B) buildings having similar or related architectural characteristics, (C) cultural cohesiveness, or (D) any combination of the foregoing.

Section 302: Authority to expend funds for this Act

Section 303: Donations

Section 304: Confidentiality of the location of sensitive historic resources

Section 305: Attorneys' fees

Section 306: National Center for the Building Arts

Section 307: Transmittal of regulations to Congressional committees

EXECUTIVE ORDER 11593 (May 13, 1971)

In furtherance of the purposes and policies of the National Environmental Policy Act of 1969 (83 STAT. 852, 42 U. S. C. 4321 et seq.), the National Historic Preservation Act of 1966 (80 STAT. 915, 16 U. S. C. 470 et seq.), the Historic Sites Act of 1935 (49 STAT. 666, 16 U. S. C. 461 et seq.), and the Antiquities Act of 1906 (34 STAT. 225, 16 U. S. C. 431 et seq.), it is ordered as follows:

The Federal government shall provide leadership in preserving, restoring and maintaining the historic and cultural environment of the nation.

Federal agencies shall:

1) Administer the cultural properties under their control.

2) Initiate measures necessary to direct their policies, plans, and programs in such a way that federally owned sites, structures, and objects of historical, architectural, or archaeological significance are preserved, restored and maintained.

3) In consultation with ACHP institute procedures to assure that Federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures and objects of history, architectural or archaeological significance.

Section 2. Federal agencies shall:

a) In cooperation with SHPO locate, inventory and nominate to Secretary all sites, buildings, districts and objects under their jurisdiction that appear to qualify for listing in NRHP.

b) Exercise caution not to inadvertently transfer, sell or demolish or substantially alter property that might be eligible. Consult with SHPO in arriving at his opinion. Federal agency will not act on property until the ACHP shall have been provided an opportunity to comment on his proposal.

c) Initiate measures to insure where as a result of Federal action or assistance a listed property is to be altered, timely steps be taken to make records.

d) Initiate measures to provide for maintenance through preservation, rehabilitation or restoration of Federally owned property.

Section 3. Secretary of Interior shall:

a) Encourage State and local preservation Officers to evaluate and survey Federal owned historic properties and where appropriate nominate to NRHP.

b) Develop criteria and procedures with Federal agencies for reviews and nominations.

c) Expedite actions for nominations to NRHP on property to be sold or altered.

d) Encourage SHPO to furnish information to Federal agencies regarding their properties which have been evaluated with respect to historic, architectural or archaeological significance and which as a result of such evaluation have not been found suitable for listing.

e) Develop and make available to Federal agencies, State and local governments information concerning professional methods and techniques for preserving, improving, restoring and maintaining historic properties.

f) Advise Federal agencies in the evaluation of properties.

g) Review and evaluate plans to assure that character of properties transferred is preserved.

h) Review and comment upon Federal agency procedures submitted.

ARCHAEOLOGICAL RESOURCES PROTECTION ACT OF 1979

An Act To protect archaeological resources on public lands and Indian lands, and for other purposes (16 U. S. C. 470aa-470ll), as set forth herein, consists of Public Law 96-95 (Oct. 31, 1979) including amendments made in 1988.

Section 1 Title

Section 2 Findings and purpose

Section 3 Definitions
1 "archaeological resource"
2 "Federal land manager"
3 "public lands"

Section 4 Excavation and removal
(a) permitting
(b) permit regulations
1 qualified person
2 activity undertaken for the purpose of furthering archaeological knowledge in the public interest
3 archaeological resources remain property of the U. S. and will be preserved by a suitable institution
(c) notification to Indian tribe by Federal land manager
(d) permit must meet regulations of this Act
(e) permit must identify individual responsible
(f) suspension of permit
(g) permits on Indian lands
(h - j) permit regulation and past laws

Section 5 Custody of resources

Section 6 Prohibited acts and criminal penalties

Section 7 Civil penalties

Section 8 Rewards and forfeiture

Section 9 Confidentiality and site location

Section 10 Regulations; Intergovernmental cooperation

(c) "Each Federal land manager shall establish a program to increase public awareness of the significance of the archaeological resources located on public lands and Indian lands and the need to protect such resources. Each such land manager shall submit an annual report to the Committee on Interior and Insular Affairs of the United States House of Representatives and to the Committee on Energy and Natural Resources of the United States Senate regarding the actions taken under such program."

Section 11 Cooperation with private individuals

Section 12 Savings provisions

Section 13 Reports by Secretary of Interior

36 CFR 60 NATIONAL REGISTER OF HISTORIC PLACES

Establishes the National Register of Historic Places and presents the criteria for listings, most of which is at the instigation and with the cooperation of the SHPO. However, the regulation also states the the Federal agency Preservation Officer may also nominate, thereby by-passing the SHPO's involvement (see below for regulations). Authority: National Historic Preservation Act of 1966, as amended. 16 U. S. C. 470 et seq., and E. O. 11593.

60.1 Authorization and expansion of the National Register

(b) Properties are added to the NRHP through the following process

5 Nominations of Federal properties prepared by Federal agencies, submitted by the Federal Preservation Officer and approved by NPS.

60.2 Effects of listing under Federal Law

60.3 Definitions

60.4 Criteria for evaluation

National Register criteria for evaluation: 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 that (a) are associated with events that have made significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that posses high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction; or (d) that have yielded or may be likely to yield information important in history or prehistory.

60.5 Nomination forms and information collection

60.6 Nominations by the SHPO under approved State Historic Preservation programs

60.9 Nominations by Federal agencies

(a) FPO in cooperation with SHPO

(c) Completed nomination forms are submitted to the appropriate SHPO for review and comment regarding the adequacy of the nomination, significance and eligibility for the NRHP. The chief elected local official of the county in which the property is located are notified and given 45 days in which to comment. The SHPO signs block 12 of the nomination form with his/her recommendation.

(d) After receiving the comments of the SHPO, and chief elected local official, or if there has been no response within 45 days, the FPO may approve the nomination and forward it to the Keeper of the NRHP. . . .

(f) The comments of the SHPO and chief local official are appended to the nomination, or, if there are no comments from the SHPO an explanation is attached.

60.10 Concurrent State and Federal nominations

60.11 Requests for nominations

60.12 Nomination appeals

60.13 Publication in the "Federal Register" and other NPS notification

60.14 Changes and revisions to properties listed in the NRHP

60.15 Removing properties from the NRHP

36 CFR 63 DETERMINATIONS OF ELIGIBILITY FOR INCLUSION IN THE NATIONAL REGISTER OF HISTORIC PLACES

Describes the procedures used by DOI to make determinations; they also help the FPO identify and evaluate properties. Authority Sec. 2(k), Historic Sites Act of 1935, 16 U. S. C. 462(k) (1970 ed.) Sec. 101(a)(1). National Historic Preservation Act of 1966, as amended. 16 U. S. C. 470(a)(1) (1970 ed). Secs. 3(b) and 4(f), E. O. 11593: Sec. 2 of Reorganization Plan No. 3 of 1950 (34 STAT. 1262).

63.1 Purpose and authorities

63.2 Determination of eligibility process

63.3 Procedures to be applied when the Agency and the SHPO agree a property is eligible

63.4 Other properties on which determinations of eligibility may be made by the Sec Interior

63.5 Federal Register publication of properties determined eligible

63.6 Review and nomination of properties determined eligible.

36 CFR Part 79 CURATION OF FEDERALLY-OWNED AND ADMINISTERED ARCHAEOLOGICAL COLLECTIONS; PROPOSED RULE

Basically this Proposed Rule sets forth the duties of the individual agencies to maintain the archaeological resources under their protection and responsibility. This includes not only the environmental maintenance of the physical collections of material resources but long term capability to store the collection, the records of their collection and documenting investigations. Repository needs include: dedicated facilities and management of collections; written curation policies and procedures; collection security from theft, fire, and environmental hazards; periodic inspection of collections by the agency representative; availability and use of the resources to scholars; and to make and store separately copies of the records.

36 CFR 800 PROTECTION OF HISTORIC AND CULTURAL PROPERTIES

ACHP procedures for complying with Section 106 of the National Historic Preservation Act and E. O. 11593 which establish the process for reviewing Federal actions that may affect properties listed or eligible for listing. The process requires each Federal agency that proposes a project or program to evaluate the impacts of the proposal on historic properties, consult with SHPO, and comply with the review process of the ACHP if adverse impacts are expected. The process is designed to ensure that proposed activities and alternates are thoroughly reviewed so that adverse impacts can be avoided or mitigated. Authority: Public Law 89-665. 80 STAT. 915 (16 U. S. C. 470), as amended, 84 STAT. 204 (1970), 87 STAT. 139 (1973), 90 STAT. 1320 (1976), 92 STAT. 3467 (1978): E. O. 11593, 3 CFR 1971 Comp, p. 154: Precedents Memorandum on Environmental Quality and Water Resources Management, July 12, 1978.

800.1 Purpose and authorities

800.2 Definitions

(o) "Area of the undertaking's potential environmental impact" means that geographical area within which direct and indirect effects generated by the undertaking could reasonably be expected to occur and thus cause a change in the historical, architectural, archaeological, or cultural qualities possessed by a NRHP or eligible property. The boundaries of such area should be determined by the Agency Official in consultation with the SHPO as early as possible in the planning of the undertaking.

800.3 Criteria of effect and adverse effect

800.4 Federal agency responsibilities

(a) Identification of NRHP and eligible properties
(b) Determination of effect
(c) Determination of no adverse effect
(d) Adverse effect determination

800.5 SHPO responsibilities

800.6 Council comments

(a) Response to determinations of no adverse effect

(b) Consultation process

(c) Memorandum of Agreement- (1) Preparation of MOA (rule temporarily suspended)

2 Review of MOA

3 Effect of MOA

4 Amendment of a MOA

5 Report on MOA

(d) Council meetings

1 Response to recommendation for consideration at council meeting

2 Decision to consider the undertaking

3 Meeting notice

4 Statements to the council

5 Comments of the council

Review of panel decision

7 Agency action in response to council comments

8 Continuing review jurisdiction

800.7 Resources discovered during construction

(a) Federal agency responsibilities

(b) Council comments

800.8 Programmatic Memorandum of Agreement

(a) Application: PMOA may be used in the following types of situations

1 Non-site-specific undertakings, including Federal approval of State plans pursuant to Federal legislation, development of comprehensive or area-wide plans, agency recommendations for legislation, and the establishment or modification of regulations and planning guidelines

2 Undertakings that are repetitive in nature and have essentially the same effect on NRHP or eligible properties

3 Programs that are designed to further the preservation and enhancement of NRHP or eligible properties

4 Programs with statutory time limits for project application and approval that would not permit compliance with these regulations in the normal manner

(b) Consultation process

(c) Preparation of the Agreement

(d) Execution of the Agreement

(e) Chairman's review

(f) Effect of Agreement

(g) Notice

(h) Term

800.9 Coordination with agency requirements under the National Environmental Policy Act

800.10 Coordination with the Presidential Memorandum on Environmental Quality and Water Resources Management

800.11 Counterpart regulations

800.12 Investigation of threats to NRHP and eligible properties

800.13 Reports to the Council

800.14 Supplementary guidance

800.15 Public participation

PROGRAMMATIC AGREEMENTS

Rather than a case-by-case review process [Sections 800.4 through 800.6] agencies may choose to develop a Programmatic Agreement with the Council, thus completing Section 106 and 110 review for a whole range of related Federal actions at once. [Section 800.13]

This is developed between the agency, the Council, and, when appropriate, the SHPO.

Programmatic Agreements are appropriate for projects or programs such as these:

1. When effects on historic properties are similar and repetitive

2. When effects on historic properties cannot be fully determined prior to approval of the undertaking (for example, when a large oil exploration program must be approved before surveys, would identify specific properties subject to impacts by roads and well pads, have been done) [Section 800.13(a)(2)]

3. When undertakings involve regional or land-management plans (for example, National Forest plans, plans for multiple-use management of public lands, or coastal zone management plans) [Section 800.13(a)(4)]

4. When undertakings involve routine management activities at Federal installations (for example, the operation of a military base or training facility) [Section 800.13(a)(5)]

The agency and Council consult to develop a Programmatic Agreement. When the proposed Federal action would affect only one State, the SHPO is invited to be a consulting party. The agency and Council may also invite other Federal agencies or other parties to participate in consultation, as appropriate. [Section 800.13(b)]

Once the agreement is signed, the Council publishes notice of the Programmatic Agreement in the Federal Register and makes copies available to the public. [Section 800.13(f)] A Programmatic Agreement satisfies agency Section 106 responsibilities for

any undertaking carried out under its terms. It remains in force until it expires or is terminated. [Section 800.13(e)]

The agreement must take into account as yet undiscovered properties or other problems which may arise.

Section 106 REGULATIONS (from ACHP Oct. 1986)

The Section 106 review process includes steps for identifying and evaluation historic properties, assessing the effects of the agency's proposed action on the historic properties, and, if there is a harmful (adverse) effect, prescribes consultation (with the agency and SHPO) about ways to avoid, reduce, or mitigate that harm.

Section 106 does not require preservation in every instance.

Another 106 principle has to do with timing. It is important that consideration of historic properties occur in the early stages of project planning so that preservation concerns can receive thorough consideration as a project is planned. Early preservation review also permits modifications to a project while they are relatively easy to accomplish and reduces the potential for conflict and delay.

Because Section 106 extends not only to NRHP-listed properties but to eligible unlisted (and especially in the case of archaeology, often undiscovered) properties as well, it is essential to understand what qualifies a property for NRHP listing.

[See 36 CFR 60.4]

Consideration of the effects of Federal undertakings on historic properties under Section 106 consists of five basic steps: identification and evaluation of the historic properties; assessment of the undertaking's effects; consultation to avoid, reduce, or minimize adverse effects; council comment; and the final agency decision about whether and how to proceed.

Step 1: Identify and evaluate historic properties

After determining that its action constitutes an undertaking and establishing the area of potential effects, the agency begins the first task involved in identification, which is assessing what information it needs in order to identify historic properties. [Section 800.4(a)] This involves review of all available information that can help in determining whether there might be historic properties in the area of potential effects.

The agency must also request the SHPO's views about whether further actions are needed to identify historic properties -- for example, field surveys or additional background research. [Section 800.4(a)(1)(ii)] Based on its review of available information and the advice of the SHPO, the agency then decides whether any further information gathering will be necessary to identify historic properties. Typical further actions include field surveys and the use of predictive models, which are discussed below. [Section 800.4(a)(2)]

Surveys should follow consultation with the SHPO and should be consistent with the Secretary of Interior's "Standards and Guidelines for Archaeology and Historic Preservation," Standards and Guidelines for Preservation Planning" (48 CFR 44716-44720 and the "Standards and Guidelines for Identification" (48 CFR 44720-44723). See also "Guidelines for Local Surveys: A Basis for Preservation Planning" and The Archaeological Survey: Methods and Uses."

When properties are found that may be historic but have never actually been evaluated, it is the agency's responsibility to complete the final task, which is to ascertain whether the properties are eligible for the NRHP. The regulations require that agencies follow the Secretary of the Interior's "Standard and Guidelines for Evaluation," 48 CFR 44723-44726. [Section 800.4(c)(1)] In addition the regulations require that the agency's determination be made in consultation with the SHPO, but if the SHPO does not provide views as to the eligibility of properties, the SHPO is presumed to agree with the agency's determination. [Section 800.4(c)(5)]

If the agency finds one or more historic properties that its undertaking could affect, the agency proceeds to step 2 in the Section 106 process, assessing effects. [Section 800.4(e)]

Step 2: Assess Effects

Once the agency has identified historic properties, it then determines whether its proposed activity could affect the properties in any way. Again the agency consults with the SHPO to decide this and takes into account the views of any interested persons. [Section 800.5(a)] The agency's judgement about whether there could be an effect and adverse effect, which are found in the council's regulations. [See Section 800.9]

If there is adverse effect, the agency proceeds to Step 3 of the Section 106 process, consultation. [Section 800.5(e)]

Step 3: Consultation

At a minimum, consultation takes place between the agency and the SHPO. The agency notifies the Council that consultation is beginning. The Council may participate in the consultation if either the SHPO or the agency so requests, and may also decide to do so without an invitation to join. [Section 800.5(e)]

Interested persons must be invited to join the consultation under some circumstances, and may be invited to do so in other cases at the discretion of the agency, the SHPO, and the council, if participating. Interested persons who must be invited to consult are the following:

1. The head of a local government [Section 800.5(e)(i); see also 800.1(c)(2)(i)]

2. Applicants for and holders of grants, permits, or licenses involved in the undertaking [Section 800.5(e)(1)(iii); see also 800.1(c)(2)(ii)]

3. Other interested persons, when the agency official, SHPO, and the council (if the latter is a consulting party) jointly deem it appropriate [Section 800.5(e)(1)(iv)]

The regulations specifically identify traditional cultural leaders . . . The regulations more generally identify "the public" as interested persons. [Section 800.1(c)(2)(iv)] Members of the public who often participate in consultation include local historical, historic preservation, and archaeological organizations.

The purpose of the consultation is to consider ways to avoid, reduce, or mitigate the adverse effects. Consultation typically gives first consideration to alternative ways of accomplishing the agency's goals without unacceptably damaging historic properties.

Typical mitigation measures include: Limiting the undertaking, modifying through redesign, repair, rehabilitation, or restoration of an affected property, preservation and maintenance, documentation, relocation of historic properties, and salvage.

There are instances in which no alternatives or mitigation are possible and the undertaking's benefits in relation to the significance of the property justify damage - - or even destruction -- as an acceptable loss.

The agency official provides each consulting party with specific documentation for use during consultation. [Section 800.5(e)(2)] The documentation requirements are spelled out in the council regulations at Section 800.8(b):

1. Description of the undertaking (photos, maps , and drawings).
2. Description of the efforts to identify historic properties.
3. Description of the affected historic properties, using materials already compiled during evaluation of significance, as appropriate
4. Description of the undertaking's effects on the historic properties.

The public may also be involved [Section 800.5(e)(3); see also 800.1(c)(2)(iv)].

The result of the consultation is usually an MOA that contains stipulations specifying how the undertaking will be carried out in order to avoid or mitigate adverse effects or accepting such effects. See the Council's "Manual of Mitigation Measures (MOMM)."

If the Council is a consulting party, its execution of the MOA concludes the Section 106 process. If the Council is not a consulting party, the agency submits a signed MOA for Council review, [Section 800.5(e)(4)].

APPENDIX B

Revisions to Original Archaeology Resource Management Plan (1989)

The Archaeological Resource Management Plan (ARMP) was drafted in 1989 by the Savannah River Archaeological Research Program (SRARP) as a means of formally streamlining the Cultural Resources Management (CRM) compliance review process for the Department of Energy (DOE) at the Savannah River Site (SRS). In conjunction with the broader ARMP, specific guidelines and procedures were developed by the SRARP to systematize archaeological responses to Site Use Applications and to United States Forest Service-Savannah River (USFS-SR) Timber Compartment Prescription Planning (SRARP 1990:7-17). These procedures were designed in February 1990 and implemented in March 1990 (SRARP 1990:17). Aspects of both the ARMP and the "Guidelines and Procedures" have evolved over the course of the last 23 years due in part to technological developments, requests from the South Carolina State Historic Preservation Office (SCSHPO) as a state regulatory agency, and changing USFS-SR land management practices. The following list includes all primary modifications to the archaeological process as outlined in the ARMP (1989a:71-79) and specified in the "Guidelines and Procedures" (SRARP 1990:7-17) to CRM by the SRARP on the SRS.

1). Limited site testing.

A minimum of one 1x2 m test unit is required at every site that needs to be evaluated for significance. This procedure was implemented in March 1990 (SRARP 1990:15). Later that same fiscal year, this procedure was restricted to only those sites under threat of destruction (SRARP 1990:23).

2). Clearcut survey.

The procedures for clearcut survey were specified in 1990 (SRARP 1990:17-18, 19). Clearcut survey was to be conducted when there were no site use or timber compartment survey projects (SRARP 1998:25). Originally, clearcut surveys were conducted for monitoring USFS-SR activities (SRARP 1989b:7). In FY92, USFS-SR modified its land preparation practices following timbering activities, primarily by ceasing raking and shearing of debris and deep-bedding for planting. These modifications effected efforts on the part of the SRARP during clearcut survey, in that there was less surface visibility in clearcut areas thereby making it more difficult to conduct reliable surveys (SRARP 1992:7-9).

3). Carolina bay surveys.

In FY94, the SRARP began perimeter surveys of Carolina bays (SRARP 1994:8-9) as a result of research conducted in FY93 by the SRARP (Brooks et al. 1993:27-37).

4). Implemented GIS operations.

Beginning in 1995, the SRARP developed an archaeological Geographic Information System (GIS) database to manage, maintain, and analyze the bulk of data that had accumulated since archaeological survey began on the SRS in 1973 (1995:15; 1998:19; 2003a:1, 3). At this time, the SRARP discontinued portions of the "Guidelines and Procedures" for archaeological response to SRS Site Use Applications and USFS-SR prescriptions (SRARP 1995:15-16). The SRARP converted to a more streamlined version applying ArcGIS, etc. and moved away from the Patrol Index Unit (PIU) quadrant database formulations (as specified in SRARP 1989a) to prioritize areas specified for annual survey (SRARP 1998:4). Finally, the conversion to ArcGIS databases eliminated the need for two SRARP Excel file databases, namely the *PIU-Q Survey Values* and the *Site Use Response* (SRARP 1990:12). Additionally, a third Excel file database *Survey Loci Record* (SRARP 1990:12) was discontinued and replaced during FY05 by a space-

oriented ArcGIS file entitled the *SRARP Survey Database* (SRARP 2004:28; 2005:18-20).

The ArcGIS database was prepared for the coming conversion to the new ArcGIS 8 GeoDatabase (GeoDB) product from ESRI (see SRARP 2001:25; 2002:29). This datebase was actually converted in FY03 (SRARP 2003b:37). Before this, the SRARP was using Apple McIntosh-based Aldus Filemaker 2.0 which was upgraded to Microsoft Windows 98/NT-based Access in anticipation of the ESRI merge (2001:25). Transitioned from ArcGIS 8.3 to ArcGIS 9.1 (SRARP 2006:26). Transitioned from ArcGIS 9.1 to ArcGIS 9.2 (SRARP 2007:28; 2008:39). Transitioned from ArcGIS 9.2 to ArcGIS 9.3.1 (SRARP 2010:46).

According to Gillam (1998:2), the SRARP implemented the use of GPS data collection of all new and revisited site locations, as well as the locations of all transects and occurrences in FY97. The SRARP began collecting GPS point data to verify specific positions of these locations with a Trimble Pathfinder ProXL receiver, base station data, and processing programs for mission planning differential correction courtesy of the USFS-SR. In 2004, the SRARP implemented the use of Garmin GPSMAP 76S handheld units for data collection of transect shovel test pit locations. The Trimble Pathfinder ProXL continued to be used in maintaining the accuracy of georeferenced data for all site datums. In FY06, the SRARP upgraded from Garmin GPSMAP 76S handheld units to more accurate Trimble GeoXH handheld GPS units, and retired the aging Trimble Pathfinder ProXR unit (SRARP 2006:27).

5). Full coverage survey.

Full coverage, or Intensive, survey was implemented to evaluate the predictive locational model (SRARP 1998:15; see also SRARP 2001:2 for letter citations from SCSHPO to DOE regarding request that the SRARP employ full-coverage survey methods to evaluate efficacy of the locational model). Also, to test the model, at least 10% of the Timber Compartment acreage is randomly chosen for intensive survey (SRARP 2002:15). Full coverage survey continued in FY99 to evaluate the predictive locational model (SRARP 1999:2). A SCSHPO regulatory requirement mandated that beginning in FY2000 and continuing over the next four years full coverage survey would be conducted by SRARP personnel (SRARP 2000:42-43). Specifically, the SRARP will conduct full coverage survey on all non-USFS-SR Site Use Applications; conduct clearcut surveys; and 20% full coverage survey on all USFS-SR timber compartment prescriptions (SRARP 2004:38-39). The SRARP terminated the testing of the locational model in March of 2002 (SRARP 2002:20; but see SRARP 2004:34; SRARP 2005:2-3). In FY05, the SRARP explicitly listed a set of survey strategies, which are to be reviewed annually, based on the results and evaluation of the previous years of testing the predictive locational model as follows (SRARP 2005:25-26):

A). Section 106 Survey
- 1). Site Use Applications: Intensive 30-m interval grid system STP survey.
- 2). Timber Harvesting:
  - a). One transect with STPs at 30-m intervals at the topographic break above water in High and Moderate Probability Zones. In the case of streams, a second transect of shovel tests focusing on specific topographic features will be excavated 250 to 300 m from the stream. Note: This second transect of shovel tests has been

suspended because survey results did not provide additional information regarding the location of new sites beyond that predicted by the locational model.
b). Locate and define historic period sites indicated by historic maps of project areas.

B). Section 110 Survey
1. Site inventories will be conducted through systematic walkover surveys of clearcut areas when time and resources allow.

In 2005, Gillam provided a discussion of his revised Predictive Model (SRARP 2005:21-23). He stated that compliance survey strategies are being modified based on his revised Predictive Model (SRARP 2005:25-26). In actuality, specified modifications to compliance survey strategies are pending based on the results of Gillam's dissertation.
6). Artifact Occurrence or Isolated Find.
According to the ARMP (1989a) and the "Guidelines and Procedures" (1990), there is neither a formal definition of an "artifact occurrence" nor any standard practice for the systematic recovery or curation of isolated artifacts. In 1997, the SRARP began to georeference the location of all artifact occurrences with GPS point data (Gillam 1998:2). According to the SRARP archaeological site classification standards, an "artifact occurrence" is a location that contains evidence for only one behavioral activity as evidenced by the presence of only one artifact class type (Cabak et al. 1996:40). In 2000, the South Carolina "Standards and Guidelines" for CRM archaeological work conducted in South Carolina formally defined an "artifact occurrence" or "isolated find" as no more than two artifacts recovered within a 30-m radius (SCSHPO 2000:2). At this time, the SRARP shifted its classification standard for an "artifact occurrence" to comply with the recommended definition as put forth by the SCSHPO.
7). Modified Grid for Site Testing and Delineation.
SCSHPO recommended employing a modified grid approach rather than a cruciform pattern of STPs for site delineations per letter from Chuck Cantley to Mark Brooks dated July 22, 2009. Complying with SCSHPO recommendations, the SRARP implemented a modified grid approach to site delineations during FY10 (SRARP 2009:3). This has become a standard procedure in the SRARP survey strategy.
8). Log Deck survey.
In response to the FY03 Annual Report, the SCSHPO requested clarification regarding the impact of timbering activities on historic resources at the SRS (Chad Long 2003, elec. comm.). In response, the SRARP noted that "the creation and use of log loading docks and transport roads are the only practices that are likely to expose historic properties to impacts greater than what they have already experienced due to over a century of farming. As outlined in the Archaeological Resource Management Plan and in the Annual Report, the locations of loading docks and roads are planned, through site marking and coordination with Forest Service personnel, to avoid impacts to sites that have not been designated as ineligible for listing in the National Register" (SRARP 2003, elec. comm.). In the context of the ongoing discussion between SCSHPO and the SRARP regarding the evaluation of the predictive locational model through full coverage survey, the SRARP noted in FY04 that "…it is not possible for the SRARP to meet this requirement for systematic survey (10% to 20% intensive survey coverage) and continue to meet the yearly archaeological survey needs of DOE-SR and its contractors" (SRARP 2004:39).

Ensuing discussion with the SCSHPO continued during FY05 regarding evaluation of the predictive locational model through systematic survey. Through verbal conversation with the SCSHPO, the SRARP recommended initiating full coverage survey on all proposed log decks as these are considered areas of direct impact to historic resources. Survey of these areas serves to satisfy the minimum requirements of systematic survey as stipulated in a letter from Chad C. Long to Dennis Ryan dated January 26, 2005. The SRARP initiated survey of all proposed Log Decks in FY06 (SRARP 2006:16). This has become a standard procedure in the SRARP survey strategy.

9). Methodology for Log Deck Survey.

The US Forest Service conducts timber management and harvesting on the Savannah River Site (SRS). Among the impacts created by these activities are the establishment and use of log decks. Log decks are cleared areas approximately 30 by 30 m in extent and used to load harvested trees onto trucks for transport. In creating log decks, timber harvesters clear vegetation and may level the ground surface. Experience with log decks on the SRS demonstrates that any ground disturbance created typically does not extend more than 30 cm below the ground surface. Because of the potential to directly impact cultural resources through ground disturbance, the SRARP conducts shovel test surveys across the proposed log deck locations at the prescribed 30-m survey interval.

Currently, when any cultural resources are recorded in those surveys, regardless of time period or artifact density, they are avoided by relocating the log deck. There are, however, instances where very large archaeological sites cover entire timber stands. Under these circumstances, it is not possible to relocate log deck locations to avoid cultural materials. While these circumstances are rare, the SRARP proposes the following procedure for dealing with such instances.

As is the current practice, SRARP staff will conduct standard full-coverage survey on all log deck locations. Based on the results of that survey, the following actions will be taken:

1). The log deck location will be moved if

a). temporally diagnostic artifacts are recovered.

b). two or more different artifact classes are recovered within 50 cm of the ground surface.

c). standing architecture or visible architectural remains are recorded.

2). The log deck location will not be moved, and the cultural resources within it will be considered as not contributing to the potential eligibility of the site recorded if

a). lithic debitage is the only artifact category recovered, and it is found at densities of 5 artifacts per shovel test or less.

b). additional artifact classes are only encountered at depths greater than 50 cm below the ground surface.

As is already standard, log deck survey results and the decisions resulting from the protocol above will be reported in the SRARP Annual Report each year.

References Cited

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APPENDIX C

PROGRAMMATIC MEMORANDUM OF AGREEMENT

PROGRAMMATIC MEMORANDUM OF AGREEMENT

AMONG

THE SAVANNAH RIVER OPERATIONS OFFICE,

UNITED STATES DEPARTMENT OF ENERGY,

THE SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICER

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATON

CONCERNING THE MANAGEMENT OF ARCHAEOLOGICAL SITES

ON THE SAVANNAH RIVER SITE, AIKEN, ALLENDALE AND BARNWELL COUNTIES,

SOUTH CAROLINA

PROGRAMMATIC MEMORANDUM OF AGREEMENT
AMONG
THE SAVANNAH RIVER OPERATIONS OFFICE,
UNITED STATES DEPARTMENT OF ENERGY,
THE SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICER
AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
CONCERNING THE MANAGEMENT OF ARCHAEOLOGICAL SITES
ON THE SAVANNAH RIVER SITE, AIKEN, ALLENDALE AND BARNWELL COUNTIES,
SOUTH CAROLINA

WHEREAS, the United States Department of Energy (herein referred to as DOE), Savannah River Operations Office (herein referred to as SROO) proposes to maintain and operate the Savannah River Site (herein referred to as SRS) in Aiken, Allendale and Barnwell Counties, South Carolina; and,

WHEREAS, the DOE SROO, in consultation with the South Carolina State Historic Preservation Officer (herein referred to as SHPO), has determined that some DOE activities on the SRS may adversely affect archaeological sites included in or eligible for nomination to the National Register of Historic Places (herein referred to as National Register); and,

WHEREAS, the DOE SROO has requested the comments of the Advisory Council on Historic Preservation (herein referred to as Council) pursuant to Section 106 and Section 110 of the National Historic Preservation Act (16 U.S.C. 470), as amended, and its implementing regulations, e.g., "Protection of Historic Properties" (36 CFR Part 800); and,

WHEREAS, it has been determined that appropriate measures to inventory, evaluate, protect and enhance archaeological sites on the SRS may best be accomplished by a Programmatic Memorandum of Agreement (herein referred to as PMOA) that sets forth a process by which the DOE SROO will develop and implement a comprehensive historic preservation plan that includes mechanisms for inventorying, evaluating, protecting and enhancing archaeological sites affected by activities and programs administered and carried out by the DOE SROO on the SRS;

NOW, THEREFORE, the DOE SROO, the SHPO, and the Council agree that this program shall be implemented in accordance with the following stipulations in order to take into account the effect of DOE SROO activities on archaeological sites.

STIPULATIONS

The DOE SROO will ensure that the following measures are carried out, except where another party to this Agreement is specifically named.

I. IDENTIFICATION OF ARCHAEOLOGICAL SITES:

In accordance with Executive Order 11593, the DOE SROO has completed a 40 percent sample of the SRS. An additional 20 percent of the SRS has been archaeologically surveyed in accordance with Section 106 procedures. The DOE SROO will continue to identify archaeological sites on the SRS in South Carolina in a manner consistent with Section 110 (a) (2) of the National Historic Preservation Act, the Department of the Interior's Guidelines for Federal Agency Responsibilities under Section 110 of the National Historic Preservation Act, as amended 53 FR 4727, February 17, 1988 (Section 110 Guidelines), the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation 48 FR 44716, September 29, 1983, and applicable DOE standards. The DOE SROO shall accomplish this by:

A. Maintaining a current database, including locations of archaeological sites, descriptive data, assessments of significance as necessary, sensitivity to damage, and predictions of the distributions of unrecorded archaeological sites on the Savannah River Site based on ethnographic, historical, archaeological and geoarchaeological information. Information on the extent, nature, and status of identification activities conducted or underway, as well as other relevant information, shall also be maintained in the database;

B. Establishing mechanisms for seeking information and advice from local governments, public and private organizations, and other interested persons likely to have knowledge of, or concerns with, archaeological sites on the SRS, and incorporating such information into identification and evaluation efforts (36 CFR 800.1[c]);

C. Maintaining an archaeological presence on the SRS to identify, evaluate, and manage archaeological sites on the SRS;

D. Developing and testing predictive models through the identification of: (1) areas of low archaeological site occurrence probability; and (2) areas of moderate to high archaeological site occurrence probability in which to focus future intensive archaeological surveys. These models will provide the basis for depicting zones of archaeological sensitivity on USGS quadrangles (or a computerized Geographic Information System [GIS]) for the SRS. The Archaeological Resource Management Plan that accompanies this PMOA constitutes the first comprehensive effort to identify those areas;

E. Conducting, or causing to be conducted, systematic archaeological site inventories whenever an undertaking proposed by the DOE SROO, or

by another party under DOE SROO jurisdiction, may affect: (1) an area in which archaeological sites are known, or deemed likely to exist, but have not been sufficiently documented to permit Stipulation IV to be complied with; (2) an area where archaeological sites are deemed likely to exist, including but not limited to areas of predicted high and moderate archaeological sensitivity; or (3) an area where the nature and distribution of archaeological sites are poorly understood;

F. Providing archaeological reports, as outlined in Stipulation VII. A, B and C, to the SHPO for review and comment. The DOE SROO shall respond to such comments in the same manner as that outlined in Stipulation VII.C;

G. Implementing, in consultation with the SHPO, the accompanying Archaeological Resource Management Plan that includes provisions for site identification, evaluation, protection, mitigation, management, enhancement and coordination as set forth in the remainder of this Agreement. The Archaeological Resource Management Plan, which will be reviewed concurrently with the PMOA by the SHPO, is intended by DOE SROO to assist planning managers in the SRS Site Use Coordination and Approval process (Stipulation II).

II. PROJECT REVIEW:

The DOE SROO shall continue to maintain and update, as needed, the SR Site Development and Facilities Use Plan and the Site Use Coordination and Approval process (Order SR 430X.1, SR-88), administered by the Savannah River Land Use Committee. The Natural Resource Management Plan helps provide assistance to DOE SROO in determining land management policies for DOE SROO activities and for all activities of others under DOE SROO jurisdiction.

The DOE SROO shall review all terrain modifying activities to determine their potential for adversely affecting archaeological sites. The accompanying Archaeological Resource Management Plan (Chapter V) contains the process by which the DOE SROO has and shall continue to monitor daily land use activities on the SRS.

Terrain modifying activities can be divided into two SR-88 Site Use Application Review categories: (1) small-scale, routine construction activities and on-going maintenance of, but not limited to, roads, rights-of-way and forest management activities ; and (2) future large-scale construction activities. The first review category will be reported yearly by DOE SROO to the SHPO using Stipulation VII (REPORTING) A guidelines. The second review category is basically an as-needed review for project-specific activities using Stipulation VII (REPORTING) B guidelines.

These reviews will employ all appropriate archaeological site information at the SRS or on file with the South Carolina Institute of Archaeology and Anthropology and the SHPO. The review will incorporate or reference any existing predictive models and preservation plans.

III. EVALUATION OF ARCHAEOLOGICAL SITES:

The DOE SROO shall evaluate, in consultation with the SHPO, the significance of archaeological sites on the SRS on an as-needed, project-specific basis. Evaluations of significance will be in view of SRS archaeological research designs/contexts, which are derived from the SRS Historic and Prehistoric Syntheses. The evaluations shall be conducted in accordance with 36 CFR 800.4(c) and pertinent National Register guidelines. The DOE SROO shall accomplish this by:

A. Providing archaeological site evaluation reports, including opinions on eligibility with reference to the National Register criteria (36 CFR 60.4), to the SHPO for review and comment prior to taking a final action on activities involving identified sites. Within 20 working days of receipt of a completed evaluation, the SHPO shall respond that an evaluated site:

1. is not considered to be eligible for listing in the National Register; or

2. may be eligible for listing in the National Register, but requires additional evaluation to make a final determination. In this case, the site will be treated as if it is eligible until demonstrated otherwise through appropriate testing and/or other documentation; or

3. is considered eligible for inclusion in the National Register, has already been determined eligible for listing and/or is listed in the National Register.

In the event site inventory and evaluation are conducted simultaneously, a single combined report may be submitted for SHPO review and comment.

If by the end of 20 working days, the SHPO has not responded to the DOE SROO findings or requested a reasonable time extension within which to respond, the DOE SROO may assume SHPO concurrence with the DOE SROO opinion.

B. Nominating to the National Register sites evaluated as being eligible for listing in the National Register which retain that eligibility following individual project activities. By way of meeting agency responsibilities under Section 110(a)(2) of the National Historic

Preservation Act, the DOE SROO shall accomplish this in accordance with the procedures contained in 36 CFR Part 60.

IV. PROTECTION AND MANAGEMENT OF ARCHAEOLOGICAL SITES:

The DOE SROO, in consultation with the SHPO, shall implement a process to assure the protection of potentially significant and significant archaeological sites on the SRS. The DOE SROO shall accomplish this by:

A. Conducting no activities that might affect archaeological sites until site inventories and evaluations have been conducted;

B. Consulting with SRS project planners, resulting in a determination that there is no feasible or prudent alternative to the proposed action; DOE SROO shall not proceed with the proposed activity until appropriate mitigative measures have been developed in consultation with the SHPO, Council and other interested persons (36 CFR 800.1(c)), and executed by DOE SROO;

C. Assuring that all research and development/technical work at archaeological sites is conducted in accordance with an acceptable research rationale;

D. Providing site monitoring and protection for identified sites in order to prevent site destruction and vandalism;

E. Providing monitoring during terrain alteration to prevent the unintentional destruction of previously unidentified sites.

V. MITIGATIVE GUIDELINES:

The DOE SROO, pursuant to 36 CFR 800.4(c) and in consultation with the SHPO, shall implement a plan for mitigating the adverse effects of activities upon significant archaeological sites on the SRS. The DOE SROO shall accomplish this by:

A. Adhering to the following guidelines:

1. wherever feasible, archaeological sites will be preserved in place, and subject to the protection and management considerations of this Agreement;

2. where not feasible to establish appropriate preservation measures, the DOE SROO shall propose mitigative measures to the SHPO. If the SHPO concurs, the DOE SROO shall proceed as planned. If the SHPO objects, the DOE SROO shall notify the Council in accordance with Stipulation VIII.D for resolution in accordance with 36 CFR 800.5(d)(1)(ii);

3. mitigation measures may include, as appropriate, data recovery, curation, and recordation and shall take into account guidelines for such measures provided by the Council, the SHPO, appropriate DOE regulations, the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation and Section 110 Guidelines of the National Historic Preservation Act;

4. where human burials are involved, appropriate DOE, state and federal laws and guidelines (e.g., ACHP Memorandum "Treatment of Human Remains and Grave Goods" and the American Indian Religious Freedom Act) will be followed. The DOE SROO stance on the treatment of human remains follows closely the Society for American Archaeology's "Statement Concerning the Treatment of Human Remains" (Bulletin of the Society for American Archaeology 1989: 7(6):1-2). In essence this statement advocates the treatment of human remains on a case by case basis. The statement also acknowledges, as does the DOE SROO, the dignity and respect due human remains. Accordingly, human remains inadvertently discovered on the SRS will be re-covered and left in situ whenever possible. However, where disturbance of burials is unavoidable, those human remains will be removed for appropriate disposition. Regarding the disposition of human remains, the DOE SROO will, in consultation with the SHPO and in compliance with applicable federal, state and local laws, regulations and guidelines, make every effort to contact an individuals' descendants. If no individual or group claims particular human remains and there exists no option for leaving the remains in situ, the final disposition of the remains will be at a designated area on the SRS.

B. Providing the Council with copies of agreements and plans for mitigation prior to conducting the work. Should the Council not object within 10 working days after receipt of an adequately documented agreement or plan, the proposed work shall be implemented; should the Council raise a timely objection, the DOE SROO, the SHPO and the Council shall consult to resolve the objection.

VI. ENHANCEMENT OF ARCHAEOLOGICAL RESOURCES:

The DOE SROO, in consultation with the SHPO, shall enhance archaeological sites on the SRS. The DOE SROO shall accomplish this by:

A. Distributing educational brochures, pamphlets, monographs, and other works of a popular and technical nature. The works shall emphasize the relevance, fragility and other values of such sites to the public and

appropriate DOE SROO staff in order to ensure archaeological site awareness in implementing land management plans, particularly as it relates to environment-altering management decisions;

B. Releasing information concerning the locations of archaeological sites only for research and preservation purposes to qualified experts;

C. Coordinating the accompanying Archaeological Resource Management Plan with other activity planning efforts through the SR Site Development and Facility Use Plan and the SR-88 Site Use Review Coordination process (Order SR 430X.1). An integral part of the activity planning effort shall be the stabilization and preservation of significant archaeological sites;

D. Continuing, within DOE SROO security regulations, the development and coordination of a public volunteer program for archaeological research and other aspects of archaeological management on the SRS. The volunteers will be supervised professionally and drawn from locally chartered South Carolina and Georgia archaeological societies;

E. Recognizing the value that research plays in evaluating archaeological sites and shall continue to support and develop archaeological research on the SRS. In attempting to comply not only with the letter but with the spirit of the laws governing cultural resources, the DOE SROO proposes to consider the SRS as a National Archaeological Research Park similar to the National Environmental Research Park already established at the SRS. The DOE SROO, at such time as is appropriate, shall form a Technical Advisory Board to help assure acceptable research rationale and to meet archaeological resource management needs;

F. Ensuring that archaeological resource materials and records receive proper conservation and curation and are preserved in accordance with 36 CFR Part 79 and state regulations.

VII. REPORTING:

A. Annual Review of Cultural Resource Investigations: Beginning October 1, 1991, unless a revised schedule is developed in consultation with the SHPO, the DOE SROO shall prepare and submit to the SHPO and the Council an Annual Cultural Resources Investigation Review (Annual Review) for maintenance activities, completed projects, and research abstracts. Each report shall contain in summary and tabular form: descriptions, analyses, and discussions of all archaeological investigations conducted on the SRS during the previous fiscal year. The format for the presentation of the Annual Review will be of the DOE SROO's choosing, but shall generally contain the following:

1. management summary;

2. references to appropriate documents concerning the archaeological background, environmental background and field and laboratory methods;

3. descriptions of other methods used that are not apparent in referenced documents;

4. summaries and tables of small scale SR-88 surveys conducted;

5. summaries and tables of archaeological sites and other pertinent information collected during routine SR-88 investigations;

6. summary conclusions regarding the recent investigations;

7. abstracts of other research conducted during the previous fiscal year.

B. Project Reports: Upon completion of field investigations of specific projects, the DOE SROO shall prepare and submit to the SHPO a Project Report containing, at a minimum, the following:

1. project name or other specific identifier,

2. a summary of the field methods employed during the project, including the specific locations of shovel tests and other areas of intensive investigation;

3. a listing of the archaeological sites identified and investigated (if any);

4. maps clearly locating the project area(s), area(s) investigated and resource(s) identified;

5. summary evaluations of the significance of all identified archaeological sites;

6. assessments of the probable or potential impacts to identified resources by DOE SROO actions or actions under DOE SROO jurisdiction, as applicable;

7. recommendations.

C. Report Submission and Review Schedule:

1. Project Reports: DOE SROO shall prepare and submit to the SHPO Project Reports in a timely manner following completion of project-specific archaeological fieldwork on the SRS.

   The SHPO shall have 20 working days to review the reports and return comments to the DOE SROO. The SHPO's comments will indicate whether the report is adequate or inadequate to evaluate the significance of recorded resources and, if determined inadequate, why and how the determination was reached.

   The DOE SROO shall respond within 20 working days of receipt of any comments or questions from the SHPO and, as necessary and appropriate, revise the report to incorporate additional information or correct problems.

2. Annual Reviews: DOE SROO shall prepare, and submit by 31 October to the SHPO and the Council, an Annual Review of Cultural Resource Investigations conducted during the previous fiscal year.

VIII. ADDITIONAL PROVISIONS:

A. The DOE SROO shall assure that archaeological site inventory, evaluation, and documentation activities are conducted under the professional supervision and oversight of individuals professionally trained as an archaeologist, historian, historic architect, or anthropologist and meeting the standards set forth in Archaeological and Historical Preservation: the Secretary of the Interior's Standards and Guidelines. It is understood that the described activities conducted by such professionals shall be within their areas of professional expertise;

B. The DOE SROO shall consult, as needed, with the SHPO to refine the inventory, evaluation, protection and general historic preservation planning strategies in order to assure consistency with South Carolina's Comprehensive Historic Preservation Plan and shall evaluate specific sites and/or groups of sites for potential eligibility for the National Register. The principal documentation for determinations of eligibility for nomination to the National Register shall include synthetic overviews, special studies, site records, and other materials held by the DOE SROO, and other agencies and institutions;

C. Subject to the Freedom of Information Act (5 U.S.C. 552), decisions on disclosure of information to the public regarding activities implemented under the PMOA will be made following consultation between DOE SROO, SHPO, and the Council. The DOE SROO shall give interested members of the public the opportunity to comment (36 CFR 800.1(c), 800.5(e)(3), and 800.14) on major DOE undertakings. These comments may be from any interested persons. Following 36 CFR 800.14(d), concerning the use of established agency processes for implementing public involvement, the DOE SROO will continue to employ National Environmental Protection Act (NEPA)-mandated public hearings. Public concerns may be expressed through both the NEPA-mandated Scoping Hearings and Review Hearings. On routine archaeological matters the SHPO will act on the public's behalf;

D. If, in any of the above activities and consultations, the DOE SROO, SHPO, and Council are unable to reach a mutually agreeable solution, the problem will be referred to the Council for resolution in accordance with the provisions of 36 CFR 800.5 or 800.6, as appropriate;

E. At the end of each fiscal year, the DOE SROO, the SHPO, and the Council may, if necessary, consult to determine whether modifications, alterations, additions or deletions to the terms of this Agreement are appropriate and necessary;

F. If any signatory to the Agreement determines that any of the terms of this Agreement cannot be met, or believes a change is necessary, that signatory shall request the consulting parties to consider an amendment or addendum to this Agreement. Such an amendment or addendum will be executed in the same manner as the original Agreement. This PMOA may be terminated by mutual agreement of DOE SROO, SHPO, and the Council or by any signatory upon 90 day written notice to the others.

Execution of this Programmatic Agreement by the DOE SROO and the South Carolina SHPO, its subsequent acceptance by the Council, and implementation of its terms, evidences that the DOE SROO has afforded the Council an opportunity to comment on its programs and their effects on archaeological sites on the specified DOE Savannah River Site, South Carolina, and that the DOE SROO has taken into account the effects of its activities on archaeological sites.

UNITED STATES DEPARTMENT OF ENERGY

By: Ernest L Chapt
Date: 5/22/90
Assistant Manager for Administration, Savannah River Operations Office

SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICE

By: Mary W. Edmonds
Date: 6/4/90
State Historic Preservation Officer

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:
Date: August 24, 1990
Chairman, ACHP