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PROCEEDINGS OF THE

THIRTY-FIFTH SOUTHEASTERN ARCHAEOLOGICAL CONFERENCE

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NOVEMBER 9-11, 1978

Edited by
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PREFACE

The Thirty-fifth Southeastern Archaeological Conference was held in Knoxville, Tennessee, on November 9-11, 1978. Jefferson Chapman of the University of Tennessee served as program chairman and organized local arrangements. The size of the Conference—more than one hundred papers presented and more than three hundred people in attendance—reflects the growth in Southeast archaeology during the last forty years. It is hard to believe that in the early days of the SEAC all of the participants could be seated around one table.

This *Bulletin* contains thirty papers from the Conference. In some instances the titles have been changed as papers were revised for publication. Several of the papers represent last-minute additions to the Conference and were not listed in the original program distributed at the meetings.

At the time that this *Bulletin* goes to press (December, 1979), it is obvious that the SEAC is now "big business." The Conference proceedings have gone from a mimeographed *Newsletter* to a typeset *Bulletin*. Like the evolution of material culture, this change has not been abrupt (it started with *Bulletin* 19). We still have several back issues to be published and most likely they will be reproduced in the "old tradition."

In preparing this *Bulletin*, which is modeled after *Bulletin* 19 edited by Drexel Peterson, I have had the help of Becky Laman and Vernon J. Knight, both graduate students at the University of Florida, and Annette Fanus and Sharon Parr of the Florida State Museum. I am grateful to them and to the authors of the *Bulletin* for their help and cooperation.

J. T. Milanich, Editor

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T. K. Perttula (Southern Methodist U): Caddoan Prehistory: Relationships to Southeastern Prehistory

E. S. Sheldon (Auburn U): Ethnobotany at the Ivy Creek Archaeological Sites, Autauga County, Alabama

J. D. Nance (Simon Fraser U): Lower Cumberland Project

K. A. Schneider (Chattahoochee-Oconee National Forests): A Cluttered National Register: Use, Abuse, and Loopholes

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M. Trinkley (S.C. Dept. of Highways and Public Transportation): Survey Methodology: The Perspective from the Carolina Piedmont

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Timothy A. Kohler

THE SOCIAL DIMENSION OF VILLAGE OCCUPATION AT THE McKEITHEN SITE, NORTH FLORIDA

The McKeithen site in Columbia County, Florida, is one of three known major Weeden Island centers which bracket an area extending more than 480 km east-west and, in places, almost 640 km north-south. The main defining element for this culture area is the presence of the Weeden Island ceramic series which is superimposed on various local ceramic assemblages, the material residue of groups which seem to have shared similar levels of sociocultural and technological complexity. What is the meaning of the peripheral distribution of the three major sites in relation to the central area which they presumably served in some manner? I believe that this phenomenon must be understood as a symptom of the attainment of a certain level of sociopolitical complexity within the particular trajectory of cultural development described by the matrilineal, clan-based tribal groups of the deep Southeast during the emergence of the ascribed status positions transitional to the chiefdom.

The position of the Kolomoki, Mitchell, and McKeithen sites near the geographical extremes of the Weeden Island core area (see Fig. 1) qualifies them as "gateway communities" in the sense of Hirth (1978). According to Hirth such communities may arise as a result of increased interregional trade and are generally located

> along natural corridors of communication and at the critical passages between areas of high mineral, agricultural, or craft productivity; dense population, high demand or supply for scarce resources; and, at the interface of different technologies or levels of sociopolitical complexity (Hirth 1978:37).

Such interregional trade may first have been stimulated by clan group competition for status items. Later, however, the Weeden Island culture area seems to have been distinguished by a higher level of sociopolitical complexity from the areas surrounding it (cf. Phillips' 1970:8 statement that the Late Woodland period "in the southern half of the Lower Valley . . . is a period of florescence, marked in its earlier part by strong interchange with the by no means recessive Weeden Island culture of the Gulf Coast. . . ."). Under these circumstances, then, gateway communities to the Weeden Island area could have acted as exchange points for an in-bound trade in high-status items which would be relatively more valuable to the emerging ranked elite in the Weeden Island area than to, for example, the contemporaneous St. Johns I-b groups in northeastern Florida or the Cades Pond culture in North-central Florida. If ethnohistoric evidence from the Gulf coastal plain can be used as a guide, such in-bound status items would have included many perishable items such as feathers and furs; less perishable items such as copper, conch shell beads, mica sheets, and galena are also occasional in Weeden Island contexts. Many of these materials must have been obtained outside the Weeden Island area; in fact, it was certainly in part their relative scarcity which allowed them to fulfill a function as rank markers.

From a cultural-evolutionary perspective, the interest in the emergence of such centers is linked to the proposition stated by Flannery (1968) for the Oaxaca area that differential access to scarce resources was an initial identifying factor serving to set apart a group of ranked elites. The growth and institutionalization of a trade which supplied such prestige goods, then, should correlate with the growth and institutionalization of this ranked elite, or, in more familiar terms, the appearance of the chiefdom level of social organization. If the process of increasing control over and growth of interregional trade is visible in the emergence of outlying "centers" rather than central places, we might also expect that items which can be identified as non-local might serve as markers for elite residential areas in one of these gateway communities, the McKeithen site. We might further expect that non-local items would be increasingly differentially distributed over time in such a community.

The Identification of Non-local Items

What are the non-local items in the midden assemblage from the McKeithen site? In the identification of non-local ceramics both paste and design characteristics have been used as indicative of origin. A systematic sample of 336 large rim sherds drawn from all areas of the site was subjected to a detailed visual and microscopic attribute analysis noting variations in paste, surface treatment, and surface finish; altogether nominal, ordinal, or ratio-level measurements were made on 32 attributes for each sherd in addition to provenience information and typological classification.

While technical analyses of local clay sources and a comparison with the paste of the McKeithen ceramics are still underway (see papers by Rice and Cordell, this volume) early indications are that clays easily exploitable in the immediate vicinity of the site contain neither sponge spicules nor micaceous inclusions allowing these attributes to be used as identifiers of non-local origin. As expected, ceramic types which proved to contain high densities of sponge spicules included St. Johns Plain, St. Johns Check Stamped, a Swift Creek-like complicated stamped on a St. Johns paste, Papys Bayou Punctated and Papys Bayou Incised. In only a few ceramic types was the incidence of micaceous inclusions noted in more than 10% of the specimens; these were Weeden Island Red (28.6%), Weeden Island Zoned Red (20%), Weeden Island Punctated (25%), Weeden Island Incised (12.5%) and Crooked River Complicated Stamped (14.3%).

In other instances known regional distributions of ceramic types suggest a non-local origin. Such is the case with Kolomoki Complicated Stamped, the distribution of which peaks in the Chattahoochee River area of Southwest Georgia (Steinen 1976). Likewise, Napier Complicated Stamped seems to have a Fall Line center of distribution in Georgia (Wauchope 1966). Pasco series ceramics reach their peak frequencies at the Crystal River site and are rare outside the North Peninsular Gulf coast region (Kohler 1975). This is a very conservative list; other ceramics which

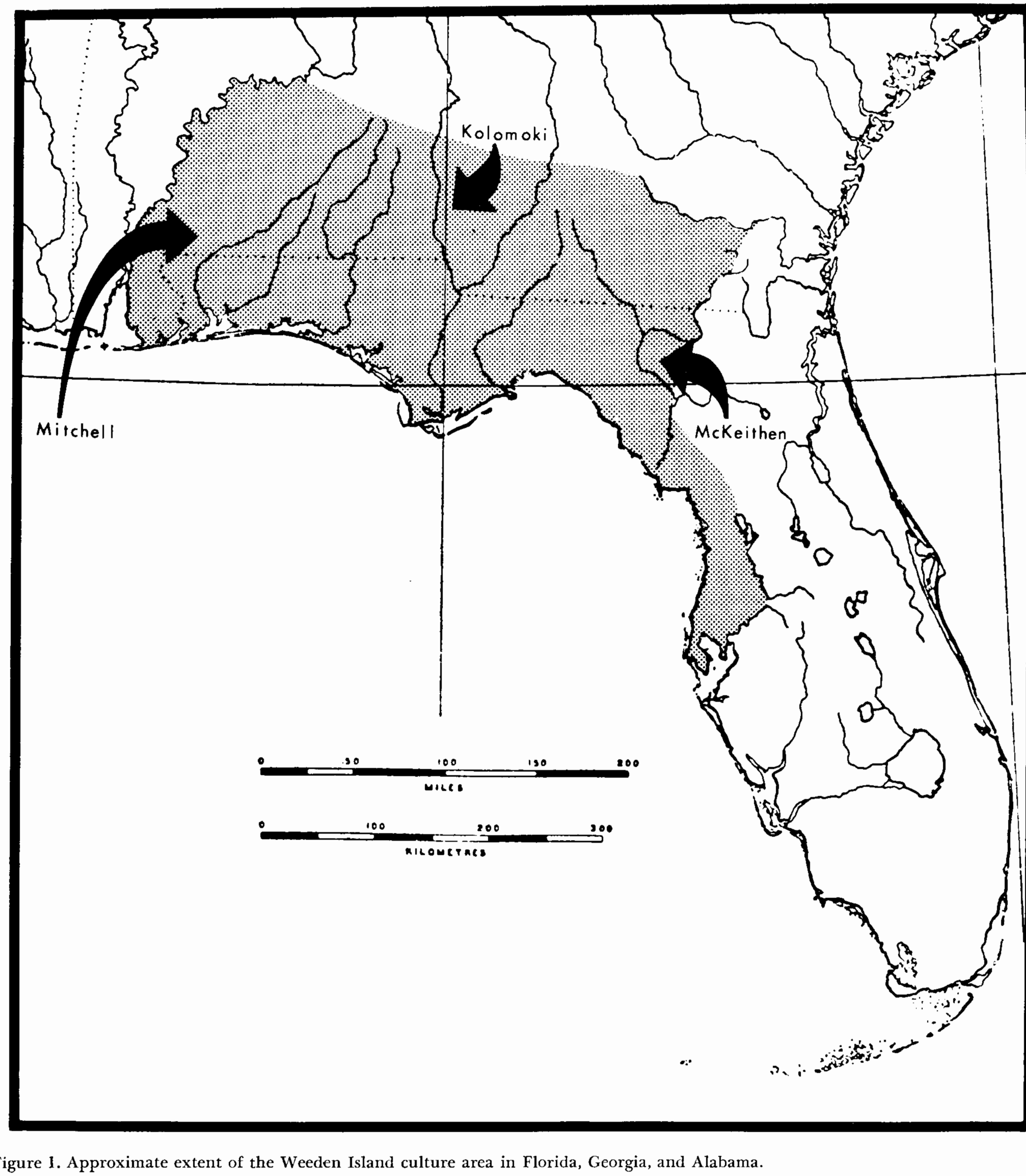

Figure 1. Approximate extent of the Weeden Island culture area in Florida, Georgia, and Alabama.

could probably be considered non-local (such as Old Bay and St. Andrews Complicated Stamped, Tucker Ridge Pinched, and Indian Pass Incised) have not been included because they are such minor types wherever present that it is difficult to identify centers of distribution.

By continuing to draw on the results of the attribute analysis it is possible to divide this list of probable non-local pottery types into two groups. The ceramics of the first group are distinguished from those of the second by displaying the highest diversity of vessel shape of any of the ceramics in the midden, the highest frequency of interior and exterior polishing or burnishing, the highest frequency of lip additions such as adornos or lateral flanges, and the highest occurrence of the finest category of paste texture. In all these categories the four types—Weeden Island Incised, Weeden Island Punctated, Weeden Island Red, Weeden Island Zoned Red—distinguish themselves. On the basis of Otto's (1975) discovery in a 19th century plantation context that diversity of vessel form is a good indicator of high-status refuse, and because of the observed correlations between these ceramic types and apparently high status individuals in burial mounds, I am categorizing this group of four ceramic types as "elite." (Although Sears' "sacred" category identifies a similar group of ceramics, it remains a depositionally-defined term not appropriately applied to ceramics in a midden context.) Those non-local ceramics remaining after the subtraction of the elite ceramics will be called "trade" ceramics.

Other exotic materials which might be expected to act as markers for high-status occupational areas include non-local fauna, shell, and lithics. Because of the poor preservation of bone at the site, and the scarcity of shell in a midden context, these first two categories were excluded. Occurrences of silicified coral, quartz, galena, mica, and obviously non-local cherts have been aggregated to form a non-local lithics category.

Finally, a fourth category of evidence which has been demonstrated by Otto (1975) to be a successful indicator of high-status occupation in the plantation context is total ceramic type diversity. This has been computed for each provenience using the Shannon-Weaver modified information index, $\overline{H}$, which actually measures both the diversity and evenness of the ceramic types in each provenience.

The Sample and the Chronological Controls

The midden excavations which produced the data on the distribution of these artifact categories were conducted during the course of a thirty week multi-level sampling strategy which included stratified probability, transect, and cluster samples as well as gridding and mapping activities at the 18 hectare site. Altogether 399 sq m of midden was excavated, providing a sampling proportion of about .002 when the village area and the plaza are both included in the estimation of site size, or about .006 when only the midden itself is included. In spite of this small sampling proportion, I believe that the way in which the sample was drawn and the sample size allow hypotheses about distributions of artifact categories across the site to be tentatively tested without, unfortunately, having detailed knowledge of the structural remains at the site which would also be powerful evidence in establishing the existence of status differentiations. The horseshoe-shaped village area, open to the west, bounded on the north by Orange Creek, and encompassing the large, residential Mound A on the southeast, the "feast-council" house platform on the southwest and the burial structure on the bluff of Orange Creek, Mound C, is shown in Fig. 2.

Because the series of ten radiocarbon dates from the midden indicate an occupational span of about 600 years for the site, it was necessary to provide temporal control in order to minimize the possibility of confusing significant socially-caused artifactual differences across the site with variation due to temporal change. The final ordination of the provenience units within the village was based on a seriation in each of three distinct areas of the site, the areas in which the larger cluster samples had been excavated. Each of these seriations was based on both stratigraphic evidence and an ordering of proveniences produced by a principal components analysis of the relative frequency of ceramic types in individual levels. The three stratigraphic columns were placed in proper relation to each other by correlating changes in the attributes which crosscut changes in typological differences, and by means of the series of radiocarbon dates, which allowed a degree of scaling of the ordinal distances represented by changes in factor scores in

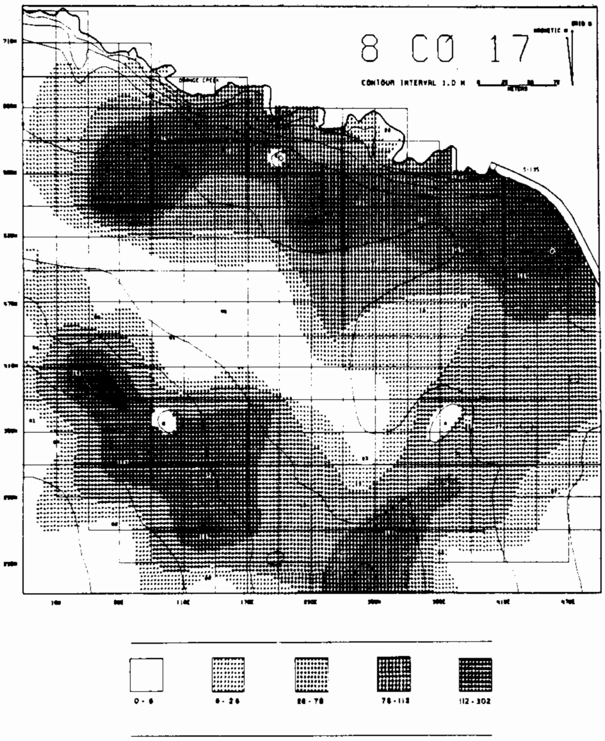

Figure 2. Artifact density per meter^3.

each of the stratigraphic columns while giving an absolute indication of the relation of the stratigraphic columns to each other. (For more detail see Kohler 1978:130-184.)

After the construction of this total site seriation the chronological continuum was arbitrarily divided into three phases which seem to correspond, in a general way, to the period of construction and use of each of the three mounds at the site. The first phase consists of proveniences believed to have been deposited between about A.D. 150 and A.D. 250; the second, A.D. 250-A.D. 550; and the third, A.D. 550 until the abandonment of the site, probably shortly after A.D. 750. Proveniences which were deposited during each of these three phases could be easily identified by reference to the master chronological chart, and were used to produce the maps of artifactual distributions which follow.

Mapping the Distributions of Exotic Artifacts and Ceramic Type Diversity

The number of proveniences used for these maps was 14 for the early phase, 15 for the middle, and 11 for the final phase. Larger samples would of course be desirable but are not presently available. SYMAP maps have been produced showing the distributions of elite ceramics, trade ceramics, and ceramic type diversity. The class boundaries which determine how dark any value will be shaded in these maps were held constant for each variable from phase to phase to facilitate direct comparisons between phases on any data category.

Let us first look at the distribution of the elite ceramics in the early phase, Fig. 3. Dark areas indicate high percentages of these ceramics in the total collection for that provenience; blank areas indicate either a very low percentage of the mapping variable, or an area to which the extrapolation of values from data points did not extend. (The extrapolation distance

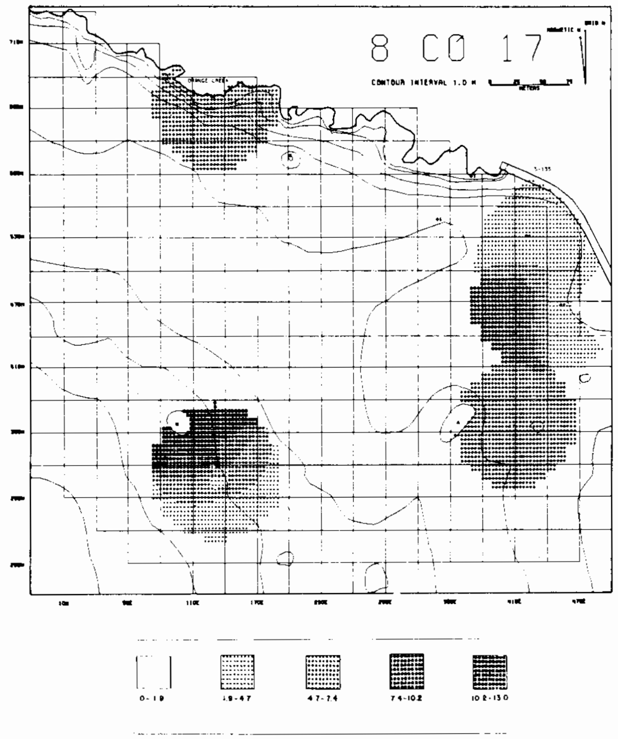

Figure 3. Percentage of elite ceramics in the ceramic assemblage, early phase.

between points was not allowed to exceed 50 m.) The highest percentages of elite ceramics during this phase are found in the area southeast of Mound B, which is also the area from which we have the earliest radiocarbon dates.

During the middle phase high percentages of elite ceramics appear east of Mound C to the north of the plaza area, and directly across the plaza from Mound C to the south (Fig. 4).

Finally, during the last phase, the highest values appear in the eastern midden area, northeast of Mound A (Fig. 5).

Both the mean relative frequency and the mean density of these elite ceramics increase from the early to the middle phase, but fall off noticeably during the final phase (Table 1). Interestingly enough, the coefficients of variation decrease steadily from the early to the late phase. In this situation the coefficient of variation can be thought of as a measure of how evenly or how differentially the variable is distributed across the site, and its decreasing values through time for the elite ceramics indicate that they are increasingly homogeneously distributed, the opposite of what was predicted from the hypothesis of increasing organization. This apparently reflects the fact that Weeden Island Red and especially Weeden Island Zoned Red decline in frequency and possibly disappear after about A.D. 550, while the remaining Weeden Island Incised and Punctated types become increasingly sloppily executed and possibly lose some of their value as markers for elite status.

The mean relative frequencies and the densities of trade ceramics (other than the Weeden Island types) decline steadily over time from the early to the late phase (Table 1). Their distributions across the site, however, become increasingly more organized (that is, less even) as shown in the rising coefficients of variation. The distributions of trade ceramics and elite ceramics have significant positive correlations in both the early and late phases (Figs. 6 and 8). Even during the middle phase, however, the second highest percentage of trade ceramics is localized in the same area that produced one of the two high concentrations of elite ceramics (Fig. 7). Once again, the highest concentration of trade ceramics in the late phase is concentrated in one of the two peak areas for elite ceramics during the late phase.

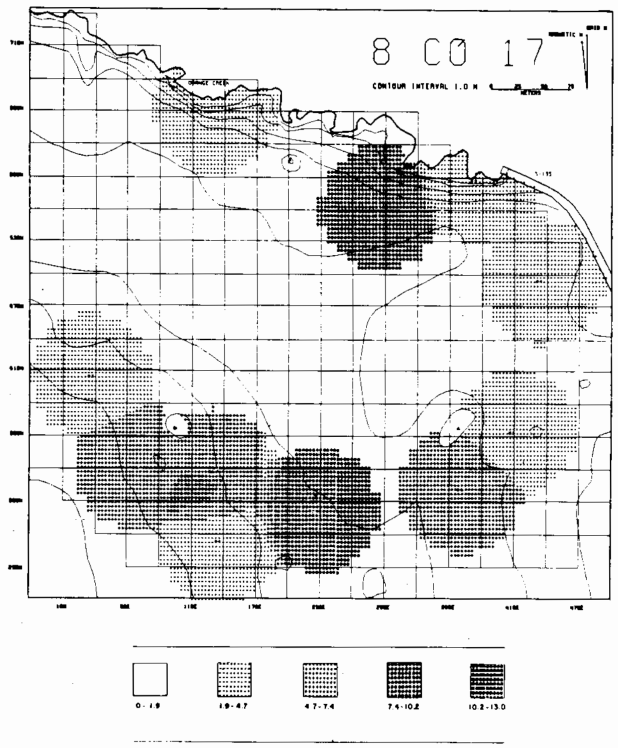

Figure 4. Percentage of elite ceramics in the ceramic assemblage, middle phase.

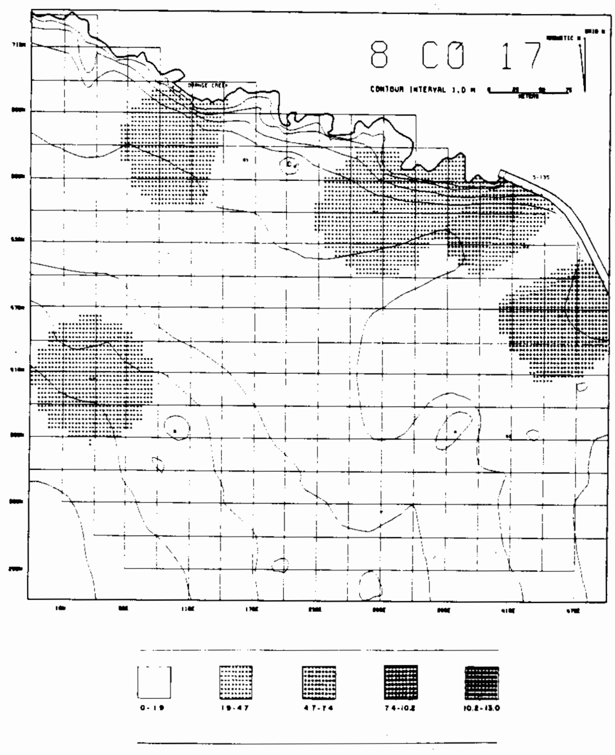

Figure 5. Percentage of elite ceramics in the ceramic assemblage, late phase.

Table 1. Variations over time in the central tendancies, dispersions, and correlations of the mapping variables: percentage and density data.

	Early Phase	Middle Phase	Late Phase
n of proveniences	14	15	11
Elite ceramics:			
mean:*	3.60/3.78	4.69/4.49	2.57/3.65
standard deviation:**	3.86	2.95	2.06
coefficient of variation:**	106.9	62.9	80.2
Trade ceramics:			
mean:	3.52/3.51	3.26/3.19	2.05/2.94
standard deviation:	2.65	3.21	2.44
coefficient of variation:	75.3	98.5	119.0
correlation w/elite ceramics:***			
r	0.43/0.60	0.07/0.15	0.60/0.54
r^2	0.19/0.36	0.01/0.02	0.35/0.29
significance	0.06/0.01	0.40/0.30	0.03/0.04
Non-local lithics:			
mean:	7.57/5.22	2.67/1.93	7.18/5.32
standard deviation:	7.83	3.48	3.16
coefficient of variation:	103.4	130.4	44.0
correlation w/elite ceramics:			
r	0.07/-0.26	-0.62/-0.54	0.44/0.21
r^2	0.01/0.07	0.38/0.30	0.20/0.04
significance	0.40/0.01	0.01/0.02	0.09/0.27
Ceramic diversity index ($\bar{H}$):			
mean:	1.46	1.37	1.40
standard deviation:	0.30	0.33	0.21
coefficient of variation:	20.3	24.4	14.9
correlation w/elite ceramics:			
r	0.53/0.64	0.36/0.53	0.39/0.58
r^2	0.28/0.41	0.13/0.28	0.15/0.34
significance	0.02/0.01	0.09/0.02	0.12/0.03

*Data is in form "relative frequency/density per m^3"
**Standard deviations and coefficients of variation are based on percentage data
***Correlation coefficients are expressed first for the percentage data, then for density data. Because of the closed array effect the significance of r^2 computed over the percentage data generally slightly underestimates that (the alpha level is higher than that) computed over the density data when r is positive. The opposite is true when r is negative.

In the distributions of the non-local lithics (not displayed here) we can see two peaks of concentration during the early phase, one of which coincides with peaks for the elite and trade ceramics. The middle phase sees a dramatic decline in the frequency of non-local lithics, while in the late phase one of the areas of high frequency for the exotic lithics corresponds with the eastern locality which displayed a concentration of trade and elite ceramics. There is a positive correlation between the distributions of elite ceramics and non-local lithics only during the final phase of occupation (see Table 1).

Finally, if we look at ceramic type diversity as computed using the $\bar{H}$ index, we see once again a tendency for the most diverse ceramic lots to be located in the same areas manifesting high concentrations of the other mapping variables (Figs. 9-11).

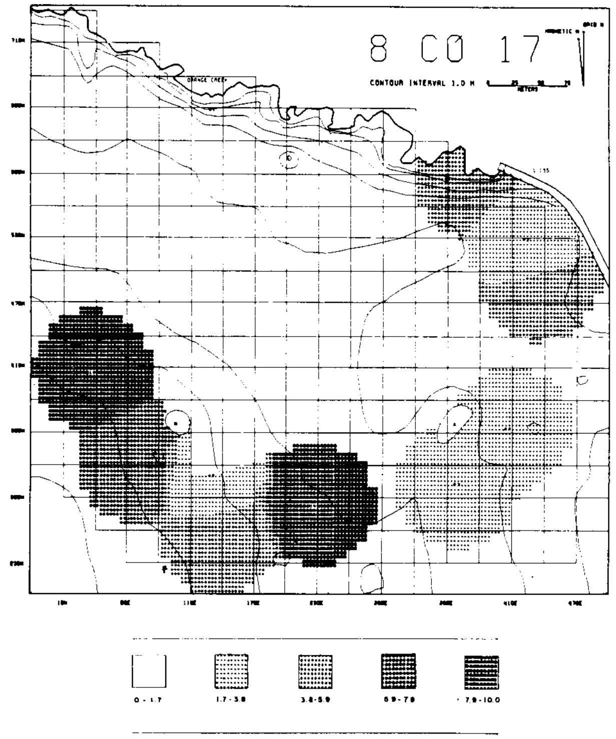

Figure 7. Percentages of trade ceramics in the ceramic assemblage, middle phase.

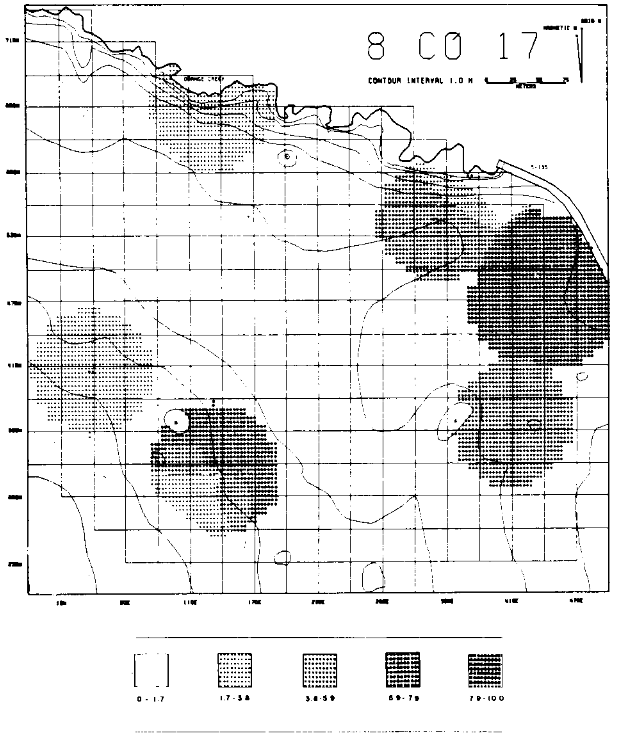

Figure 6. Percentages of trade ceramics in the ceramic assemblage, early phase.

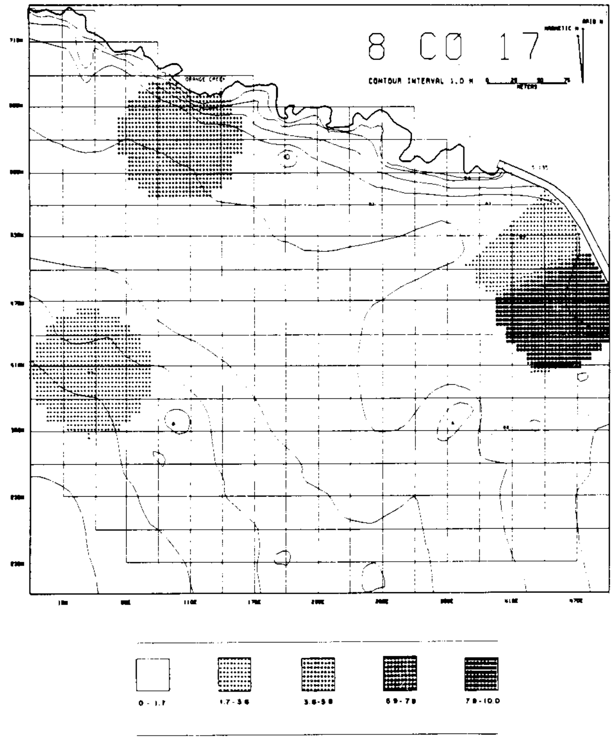

Figure 8. Percentages of trade ceramics in the ceramic assemblage, late phase.

an increasing monopoly over the extra-local items received. In fact, over three of the four variables examined, the distribution of exotic artifacts seems to reach a nadir during the middle phase of occupation, at the same time when the relative frequency of the impressively-crafted Weeden Island ceramics reaches a peak. Something happens during the final phase of occupation which decreases the connectivity of McKeithen with the surrounding areas, as evidenced by the smallest relative frequencies of both elite and other non-local ceramics found in the village area after about A.D. 550. It has been suggested elsewhere that an increasing dependence on a more efficient agriculture might result in a centrifugal pattern of settlement on the relatively poor soils of North Florida (Kohler 1978:224-231; see paper by Lavelle—this volume—for survey results to date in the support area).

An equally plausible explanation for the apparent decline of McKeithen suggests that if the differences in the levels of social organization between the Weeden Island culture area and those surrounding it became less pronounced, the hypothesized function of McKeithen as a gateway center for the assemblage of non-local materials from surrounding areas to supply an intraregional demand for elite status markers would be weakened, with an inevitable effect on the intra-regional Weeden Island trade similar to that seen in the record at McKeithen. Thus the reasons for the eclipse of Weeden Island during the last third of the first millenium A.D. might best be sought not at McKeithen or Kolomoki but along the Florida and Georgia Atlantic coasts, in piedmont Georgia and Alabama, and along the Tombigbee.

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Jerald T. Milanich

WEEDEN ISLAND STUDIES—PAST, PRESENT, AND FUTURE

Southeastern United States archeology had its birth in the 1930s, mothered by the federal government relief programs and fathered by a double-handful of archeologists. The afterbirth is said by some observers to have been the Southeastern Archaeological Conference, an annual meeting which provided a forum for discussions relating to the myriad of artifact complexes confronting the archeologists.

Reading back through the earliest publications of the SEAC, one is struck by the complexity of the Southeastern archeological cultures; not complexity of organization, but by the raw numbers of diverse, newly recognized archeological complexes. Consequently, research initially became concerned with delineating and describing complexes, defining cultures on the basis of ceramic types and their distributions, and asking questions about who, when, and where.

Gradually, since the 1950s, the nature of archeological enquiry has been shifting, and today general questions concerning cultural process are being asked and then examined against archeological data derived from past and ongoing research projects. The shift is from description to explanation, from compiling a data base on which additional research can be constructed, to actually using that data base to generate hypotheses which can be tested through scientific methodologies.

In some areas of the Southeast, however, we are still trying to define archeological complexes and establish a data base from which comparisons with other cultures can be made and additional anthropologically significant research can be generated. I suspect that our lagging back is due to several factors, the most important of which was a lack of archeologists able to devote years to one project. Also, prior to the 1970s there was a lack of doctoral programs in anthropology in Florida, Georgia, and Alabama, which prevented the establishment of long-term projects offering the opportunity to involve a succession of researchers working on related problems.

One such archeological "laggard" is the Weeden Island culture. Like many other Southeastern archeological cultures, Weeden Island underwent a period of conceptualization a half-century in length. During this period, from the late 1880s to the 1930s, C. B. Moore, Jesse Fewkes, and others excavated at a number of Weeden Island sites. It was Gordon R. Willey, however, who was finally responsible for the formal birth of Weeden Island in the 1940s. Later, in the 1950s, William H. Sears reared the concept of Weeden

Island to adolescence utilizing data from his work at Kolomoki in southwestern Georgia.

For more than a decade since that time, Weeden Island has remained something of a delinquent child who was argued about and fought over. In the last several years Southeastern archeologists have completed this assessment of Weeden Island and are now engaged in a variety of new research projects intended to finish the Weeden Island culture history studies begun in the 1940s and before. We are also beginning to use these new research opportunities to examine questions of broader anthropological interest.

This paper is intended to be a brief status report on the state of Weeden Island studies today, focusing on changes in interpretations that have taken place and pointing out some directions that current research is taking us. Weeden Island is growing up.

The Past and Present

In 1949 Willey published his monumental *Archeology of the Florida Gulf Coast* which contained a description of the Weeden Island archeological complex based on information gathered by Willey and other researchers over the previous six decades. [Willey and Woodbury (1942) and Willey (1945) actually published pertinent definitive criteria on Weeden Island which appeared in print prior to the *Gulf Coast* volume.] Willey focused on the coastal distribution of Weeden Island since the bulk of his data came from that general region. There were enough hints, however, from a smattering of sites in the coastal plain of southeastern Alabama and southwestern Georgia, as well as inland locations in Florida, for Willey to recognize that Weeden Island ceramics were present in those areas and that Weeden Island was not restricted to the coast. Today the widespread nature of Weeden Island has been substantiated by surveys and excavations. The distribution of Weeden Island ceramics extends from the Alabama River east to the upper Altamaha River, and from the fall line south to subtropical Florida, largely excluding the Atlantic coast. The heartland of this coastal plain region seems to be northwest Florida, southwest Georgia, and southeast Alabama.

At the time of its publication the *Gulf Coast* volume was the only synthesis available for any major geographical region in Alabama, Georgia, or Florida. The coastal sequence of Deptford, Santa Rosa-Swift Creek, Weeden Island I, and Weeden Island II, hypothesized by Willey, served as the archetypical sequence for all areas adjacent to the Gulf Coast. Over the next two decades after the publication of the volume, many researchers working in adjacent areas felt compelled to try and fit their local sequences into the coastal scheme, not realizing that several different ceramic sequences existed within the Weeden Island region after ca. A.D. 200. Today, we know that no single ceramic sequence can provide chronological control for the entire Weeden Island region.

In the past, the use of ceramics as definitive characteristics of Weeden Island in time and space was also made difficult by the presence of what Sears (1973) has called the sacred-secular cultural dichotomy. This dichotomy of village and ceremonial life is applicable to many aspects of the prehistoric aboriginal cultures of the Southeast, including the ceramic inventories. Fired clay pottery vessels manufactured for everyday (secular) use in the villages differ from the special vessels manufactured for ceremonial or special (sacred) use.

Consequently, the Weeden Island archeological cultures often have very different secular pottery assemblages from one another. And, any one archeological culture has an inventory of secular pottery types which is different from the well-known Weeden Island sacred vessels generally found in mounds. [Although recent analysis suggests that regional differences in the "sacred" ceramic "complex" probably exist (Stafford 1979).]

Presently, we can demarcate the region occupied by the various Weeden Island cultures and, in some instances, list specific trait complexes associated with each of these cultures. We can also describe some of the behavioral patterns and a large number of the traits associated with Weeden Island religious activities. What we cannot do is offer a stringent definition or interpretation of Weeden Island "socio-political-economic organization," either at one point in time or diachronically. Sears (1954, 1956a, 1958, 1962) and more recently, David S. Brose and George Percy (1974), and Karl Steinen (1976) have offered pertinent paradigms, basing their constructs mainly on interpretations of Sears' Kolomoki data and information from C. B. Moore's many reports. The lack of a widely accepted explanatory definition of Weeden Island (and one tested empirically) is not surprising, since it is a major goal of research, not a starting point. Once we can offer such an operational definition, then we can use that data base to address more general anthropological problems regarding the nature and evolution of culture in the Southeast. The same has been true of Hopewellian and Mississippian studies; explanatory models have only emerged after a great many hypotheses were tested both in the field and against already available data.

Sears' Kolomoki-derived model of Weeden Island socio-political organization (simply stated here) views the Weeden Island archeological complex as reflecting a complex society with ranked lineages similar in organization to that of the historically-described Natchez Indians. According to Sears, the Weeden Island polity was organized around the major site of Kolomoki at which the major priest/chief, the most important political/religious figure, resided. Outlying villages and minor ceremonial centers and their lesser chiefs were under the political control of the major Kolomoki priest/chief. Although Sears (1962) has referred to this level of socio-political complexity as a state, most archeologists today agree that such a society would have been a chiefdom.

The distribution of certain types of specialized sacred pottery vessels, including figurines and effigies, is hypothesized by Sears to reflect the distribution of Weeden Island political influence. Thus, the distribution of Kolomoki hegemony is approximated by the range of the well-known Kolomoki effigy wares. These vessels—most are better described as sculptures since their form indicates that they could not have contained anything—*may* have been symbols of status whose distribution to lesser chiefs signified their rank and their political ties to the major priest/chief. They eventually found their way into the burial mounds (tombs for the chiefs) along with other status and ceremonial objects. This model is similar to that generally accepted for distribution of certain status items within Mississippian cultures (e.g., Peebles 1971). Sears originally postulated that this Kolomoki "complex" overlapped temporally with Mississippian cultures.

However, duration of the Weeden Island and Kolomoki Weeden Island components at the Kolomoki site is still questioned by some archeologists, and new evidence related below points toward a pre-Mississippian date for the Kolomoki Weeden Island complex. Additionally, whether or not the Weeden Island region was occupied by a single polity, organized around Kolomoki as the major center, is also questioned. Some archeologists feel that perhaps the Weeden Island archeological cultures represent separate chiefdoms rather than one single unit, and others even disagree with the premise that Weeden Island society was organized on a chiefdom level at all. Emerging data suggests that during Weeden Island times, ranked societies were developing.

Presently we can designate seven Weeden Island or Weeden Island-related archeological cultures which appear to be restricted geographically and which last through time. These groupings are based on varying quantities of empirical data. For instance, while we have good information from North and North-central Florida and an increasing quantity of interpretive data from the Upper Apalachicola River Valley, we have almost no information beyond potsherds for southeastern Alabama and southwestern Georgia (excepting Kolomoki). Basing the definition of these subregional cultures solely on ceramic typologies is almost impossible since at this time we do not have sufficient analytical sherd-count data from some sub-regions. Making comparisons of secular sherd counts in order to prove contemporaneity of Weeden Island cultures is also very difficult because of the great ceramic variation, both geographical and temporal, within the Weeden Island region.

This considerable ceramic variation is due to the presence of four ceramic traditions, several of which may be combined into a single complex within one sub-region at any one point in time. All but one of the traditions were present within the Weeden Island region prior to the first appearance of the Weeden Island sacred ceramic complex. These four traditions are: (1) plain pottery, associated almost entirely with bowl forms with distinctive incurving rims; the tradition seems to have been earliest in South Florida and appeared along the central peninsular Gulf Coast by A.D. 1, later moving into North-Central Florida; sometime prior to A.D. 800 a variety of new vessel shapes replaced the original large bowls; (2) check stamped pottery, a continuation of the carved-paddle malleating technique which originated with Deptford and later appeared in the Georgia Piedmont; (3) complicated stamped pottery, a continuation of the carved-paddle malleating technique which originated with Early Swift Creek, quite likely in the western Georgia Coastal Plain; and, (4) incised and punctated pottery which is thought by some to have originated in the Lower Mississippi Valley (Sears 1956a) although new evidence from northern Florida suggests an autochthonic origin in that region with ties to the Lower Valley (trade?). One characteristic of all these ceramic traditions is that during the Weeden Island period, the "Weeden Island" rim (thickened or folded and smoothed with an "incised" line underlining the fold) comprises roughly 50% or less of the rim sherds; this percentage is probably highest in the tri-state Weeden Island heartland region and lowest along the peninsular Gulf Coast, although about 50% of the Weeden Island decorated rim sherds in the latter area are of this type.

Using as definitive criteria the distributions of secular ceramic complexes (recognizing that they change through time) in conjunction with available subsistence, settlement, and artifact data as well as geographical considerations, the seven Weeden Island or Weeden Island-related archeological cultures are as follows (some are archeological cultures in the broadest sense).

Cades Pond—A Weeden Island-related culture in North-Central Florida (Sears 1956b; Smith 1971; Cumbaa 1972; Hemmings 1978; Milanich 1978); late Cades Pond overlaps temporally with early Weeden Island, as evidenced by the presence of Weeden Island secular pottery (less than 5%) in late village middens and the presence of sacred vessels, including some effigy forms (but not Kolomoki-style pedestaled effigies) in mounds; both platform and burial mounds are present, and at two sites such mounds are known to flank plazas; some villages do not have mounds; subsistence centered on use of lakes, swamps, and hardwood forests; no direct evidence of horticulture, but it must have been present.

Central Peninsular Florida Gulf Coast—A Weeden Island-related culture distributed from approximately Pasco County south along the coast to Charlotte Harbor (Bullen 1971; Bullen and Bullen 1976; Sears 1971; Luer 1977; Luer and Almy 1979); the temporal position of Weeden Island-related culture(s) in this region is the same as that of the Weeden Island cultures in northern and northwestern Florida, although they may terminate later than in the Panhandle; village ceramics are 95% or more plain (St. Johns ware with characteristic sponge spicules in clay and, to a lesser extent, limestone-tempered Pasco ware may comprise up to 25% of the plain ware, the remainder is tempered with sand and grit; there is increasing evidence that much of the limestone is actually fuller's earth); Weeden Island ceramics placed in mounds; burial mounds are continuous-use and mass-use types; no patterned mounds with east-side pottery deposits are known; as evidenced by Mound A at Bayshore Homes (Sears 1960), temple mounds appear late in the Weeden Island period; subsistence is centered on use of the salt marshes and adjacent shallow portions of the Gulf as well as coastal hammocks; coastal oystering and fishing sites exist apart from other villages; inland small camps are characterized by lithic scatters whose functions (hunting or collection of other resources?) are unknown (Hemmings 1975; Padgett 1976); recently Luer and Almy (1979) have suggested the name "Manasota" for the Weeden Island-related culture in this region.

North Peninsular Florida Gulf Coast—A Weeden Island-related culture distributed along the coast from Pasco County to Taylor County (Goldburt 1966; Kohler 1975); temporal placement is the same as the Central Peninsular Gulf Coast culture; village pottery averages 95% plain with Pasco limestone-tempered ware accounting for 25%; nearer Taylor County the relative frequencies of Weeden Island types increase (check stamped, punctated, and incised); Weeden Island sacred vessels are found in mounds, but not in caches; mounds appear to be continuous-use type; several "ceremonial centers" with multiple mounds and adjacent villages are known; subsistence like that of the Central Peninsular coastal region; one village is known to have been located inland along the Suwannee River (Bullen 1953).

Wakulla Weeden Island (or, Tri-State Weeden Island)—A Weeden Island culture located along the Upper Apalachicola River (Percy 1971; Percy and Brose 1974; Milanich 1974; Percy and Jones 1976), the Lower Chattahoochee River (Caldwell m.s.), and the Flint River (Kelly n.d.), and extending into southeastern Alabama for an unknown distance where similar ceramic complexes which are associated with related cultures receive a variety of names (Chase 1967; Dickens 1971; Nielsen 1976; Nance 1976); radiocarbon dates for the culture in Florida are from ca. A.D. 600 to 1000 (Milanich 1974; Peebles 1974a:639-640); ca. 50% of the village pottery is Wakulla Check Stamped; in the Upper Apalachicola River area patterned mounds with pottery deposits of sacred ceramics and mounds used as structure bases are known; evidence for maize and use of forest and freshwater resources has been documented (Milanich 1974:31-34); small camps (for hunting?) exist apart from villages.

Northwest Florida Weeden Island— Weeden Island culture extending along the Gulf Coast from the Aucilla River westward to about Mobile Bay; sites extend up the river systems into the coastal flatlands, but for the most part, except for small camps, the villages are located on the ecotone between the coastal strand and the scrub flatlands or adjacent to the salt marsh, (Willey and Woodbury 1942; Willey 1949; Lazarus 1961; Sears 1963; Bense 1969; Percy and Brose 1974); some small camps or homesteads are found further inland adjacent to water sources (Tesar 1976); few radiocarbon dates are available for this region, but probably the culture dates from ca. A.D. 400 or 500 to 1200; village pottery consists of various plain, check stamped, incised, punctated, and complicated stamped types whose relative frequencies vary both geographically and temporally, and it appears that no single ceramic seriation can provide temporal control for the entire region; most village middens are small (ca. 100 m in diameter, Willey 1949:402); a few "horseshoe-shaped" middens like some of those of the earlier Swift Creek sites are known; often a single burial mound is present at villages; some mounds were evidently used as bases for structures; subsistence activities are probably like those of the peninsular Weeden Island cultures.

Kolomoki Weeden Island—A Weeden Island culture in southwestern Georgia known almost exclusively from Sears (1956a) work at the Kolomoki site; an early village component at the site is characterized by Weeden Island plain, incised, punctated, and complicated stamped pottery; a presumed (other evidence suggests this component may be earlier; see radiocarbon dates from 8-Ja-63 in Bullen 1958:331, and from the Yon site on the Apalachicola River, Peebles 1974a:640, see also Chase 1978) later village component is characterized by plain and complicated stamped pottery; exact dates for the two components are uncertain, but comparisons of the "sacred" ceramic vessels from Mounds D and E with those of the well-dated McKeithen site in North Florida suggest a similar date of A.D. 375-500 for at least Mounds D and E; the presumed earlier midden at Kolomoki forms an arc along one side of a plaza while the believed later "horseshoe-shaped" midden encloses two sides of the same plaza; thus these two village-mound complexes may have been occupied at the same time, reflecting social differences; a variety of mounds are present at the site, including a platform mound, mounds for the interment of a single individual of high status, and mounds whose functions are unknown; Weeden Island ceramics, including some complicated stamped varieties, extend eastward from Kolomoki into the Georgia Coastal Plain (Walker 1974; Steinen 1976), but no villages or mounds have been scientifically excavated in that area. Chase (1978) has documented other Weeden Island sites in the lower Chattahoochee River Valley.

McKeithen Weeden Island—A Weeden Island culture centered in northern Florida east of the Suwannee River and north of the Santa Fe River; research is presently underway in the area, both surveys and test excavations at a number of sites and extensive excavations at an early (A.D. 375-500) mound complex (Kohler 1978; Cordell, Lavelle, and Milanich 1979) with a village occupied from as early as A.D. 300 to perhaps A.D. 700.

The above list differentiates Weeden Island from Weeden Island-related archeological cultures. This taxonomic nomenclature, unsatisfactory though it may be, reflects a growing awareness that some archeological cultures which have been referred to in the literature as Weeden Island for three decades differ significantly from the Weeden Island cultures of the "heartland" region. As noted above, the archeological complexes of the Weeden Island-related cultures do not include such traits as patterned burial mounds with east-side pottery deposits and central burials; and Kolomoki-style pedestaled effigy vessels are rare or absent. The behavioral patterns associated with these traits may also be absent.

Calling the cultures of peninsular Florida "Weeden Island" before we are sure what Weeden Island is, obfuscates our attempts to understand the cultural dynamics associated with the archeological data obtained by Sears from Kolomoki and, to a much lesser extent, that gleaned from C. B. Moore's reports. Perhaps the greatest irony of Weeden Island studies is that the Weeden Island-type site in Pinellas County may not be a "classic" Weeden Island site!

The Future

Although the archeologists who are involved in Weeden Island studies do not always agree on interpretations, there is general agreement on one major point. We cannot proceed further in our understanding of Weeden Island, nor can we verify present interpretations, without new data generated by additional research projects structured toward providing specific answers to pertinent questions. It is incredible that the only major or minor Weeden Island mound complex excavated since the time of C. B. Moore is the Kolomoki site. Although there are a large number of sites with single mounds, less than one dozen of these mounds have been excavated since the 1940s, and most of them are in peninsular Florida and associated with Weeden Island-related cultures. One reason for the paucity of modern data from Weeden Island and Weeden Island-related mounds is the widespread destruction of such sites by Moore's excavations and by vandals. It is almost impossible, in Florida, to find a Weeden Island mound which has not been severely disturbed by pothunting activities.

The record on village sites excavated since the 1940s is somewhat better, although little information on community patterning is available. Detailed subsistence information is available from only three village sites, one each in the Wakulla Weeden Island region (Milanich 1974), the Cades Pond region (Cumbaa 1972), and the North Peninsular Gulf Coast region (Kohler 1975). Recently Kohler (1978) has provided us with a comprehensive look on distributional patterning of artifacts in the large McKeithen site village.

It is evident from research carried out elsewhere in the New World that for future Weeden Island archeological projects to be successful, they must be both problem-oriented and extensive enough to provide answers to the questions posed. And they need to be part of planned, long-range research designs involving more than one archeologist. Past experience has shown that Weeden Island covers a large geographical area, and that it is not uniform throughout that area. Data from several Weeden Island regions are needed for comparative and interpretive purposes.

As with much modern archeological research, future Weeden Island studies should be dual in nature. On one level of enquiry they must deal with culture history, with describing and explaining the evolution and nature of Weeden Island and the relationships of the Weeden Island societies to other Southeast aboriginal groups. Such basic data are still only poorly understood.

In addition, Weeden Island can be used as a case study for general cultural processes in the prehistoric southeastern United States, e.g., how and why did the Weeden Island societies bridge the "evolutionary continuum" from the less complex cultures of the pre-A.D. 1 period to the more complex cultures of Mississippian times? How does this developmental process compare with similar processes which occurred elsewhere in the Southeast and the world?

The remainder of this paper will examine some of the general problems of culture history and culture process that need to be approached through future Weeden Island studies. Research presently being conducted by the Florida State Museum into McKeithen Weeden Island culture in northern Florida is focusing on some of these questions as they relate specifically to that culture. In addition, George W. Percy and David S. Brose and their respective students and associates are investigating these and related questions on a similar specific level in northwestern Florida and the Upper Apalachicola River Valley. In addition, Judith Bense has begun a long term study of the Northwest Florida Weeden Island culture in the Saint Andrews Bay area near Panama City. Out of such regional studies, comparisons can be made and general hypotheses formulated and then retested with more empirical data. The eventual result will be an understanding of Weeden Island which also will have significance for our knowledge of the development of New World cultures.

On the level of culture history, one important problem to be approached in the future is the development of Weeden Island through time. In northwestern Florida a date of ca. A.D. 400-500 is often accepted for the beginning of Weeden Island, as evidenced by the appearance of Weeden Island styles of incised and punctated ceramics in middens along with late types of Swift Creek ceramics. This date of A.D. 400-500 is supported by radiocarbon dates for Swift Creek of A.D. 465 and A.D. 600 obtained by Phelps (1969) at the Gulf Breeze site and the dates of A.D. 270 (Peebles 1974:640) and A.D. 350 (Bullen 1958:331) from Swift Creek components at the Yon and 8-Ja-63 sites, respectively. Brose's work in the Upper Apalachicola River Valley has demonstrated that the Weeden Island peoples in that area were "Mississippianized" by about A.D. 1000, while to the east in Leon and Jefferson counties this process may have occurred slightly later (see Scarry, this *Bulletin*). Thus, in northwestern Florida, Weeden Island lasted approximately 600 years.

In northern Florida, data emerging from the McKeithen site indicate an earlier A.D. 200/300 beginning date for Weeden Island (Swift Creek is not a recognizable component at sites). Later Fort Walton sites are not present in that region and it presently appears that Weeden Island culture(s) lasted almost a millenium.

The significance of these data is that the Weeden Island ceramic complex was present in the Southeast for a long period of time. This, in turn, raises two pertinent questions: Do we have sufficient understanding of changes in the archeological complex through time to provide chronological controls? What changes in Weeden Island culture(s) took place through time, e.g., did populations increase; were there changes in settlement and subsistence systems; and, were there changes in socio-political organizations with, probably, increased complexity through time?

We know from earlier sections of this paper that our chronological controls for Weeden Island are not exact. Willey's original Weeden Island I and II division seems to hold up as a general rule of thumb for most of the Weeden Island regions. However, other than Kohler's (1978) work in North Florida at the McKeithen site, no one has yet undertaken a detailed examination of Weeden Island village ceramics from one site and/or region to determine whether or not there are recognizable changes that can provide chronological (and, perhaps, spatial) controls. Statistical analyses of ceramic attributes is one approach to the problem. Percy has begun such an analysis with collections excavated from the Upper Apalachicola Valley and similar work has been completed on collections from the McKeithen site (Kohler 1978).

Once a good dating tool is available, such as a ceramic analysis tied to absolute dates, then we can begin to interpret data regarding culture change through time. It is almost inconceivable that, over six to ten centuries, important aspects of the Weeden Island culture did not change and that these changes are not recognizable archeologically. Yet our knowledge of Weeden Island development is so slight that it is difficult to even formulate specific hypotheses. Several lines of future enquiry can be suggested, however, from data on hand.

Willey's (1949:397-401) list of early (Weeden Island I) versus later (Weeden Island II) Weeden Island middens in northwestern Florida shows three single component early sites and 15 single component late sites. Although Willey (1949:451-452), utilizing site quantities from the entire Gulf Coast, estimates ". . . the population to have been about equal for the two periods. . . ." his figures for the northwestern part of the state clearly show more sites present for the later Weeden Island period than for the early period. A thorough survey by Percy and Jones (1976) of upland locales in a portion of the Upper Apalachicola River Valley revealed a site density of four sites per mile^2 (with a survey area of 14.25 miles^2). Nearly all of the sites, based on analysis of ceramics, were middle to late (ca. A.D. 650-1000) Weeden Island. None of those located were early Weeden Island.

These two sets of data suggest that: (1) there were more people in later Weeden Island times and, hence, more sites (assuming that village size stayed the same); or, (2) the increased number of sites reflects a greater dependence upon horticulture and the need to continually find and use suitable horticultural land. The latter hypothesis, originated and elaborated by Percy and Brose (1974:19-21), fits with unpublished observations made by various persons who have collected archeological sites in south-central Georgia. In that area small sites with Wakulla Check Stamped pottery and other Weeden Island pottery types are present along the river valleys, intermixed with sites associated with cord marked pottery. The unproven assumption is that the late Weeden Island sites were intrusive into the valleys where the better horticultural soils were present.

If Percy and Brose's hypothesis proves to be true, then we would expect that Weeden Island populations did increase through time as they expanded geographically. In addition, if such increased horticulture was carried out by small family groups practicing shifting cultivation due to soil exhaustion (as suggested by Percy and Brose, 1974), we might expect to find that late Weeden Island sites would be both more numerous and smaller than early ones.

A program of surveys and test excavations (carried out by B. J. Lavelle as a dissertation project for the New School for Social Research) in the McKeithen region has revealed many small activity loci, perhaps camps and households for hunting and agricultural activities and/or unknown activities, located out from mound-village complexes. The mound-vilage complexes possibly functioned as centers for shared religious activities by the outlying population. There is some evidence for geographical grouping of such mounds and outlying settlements, perhaps reflecting ethnicity or the shared (kin-based?) communal religious activities. Some evidence points toward an increase in such non-mound associated sites after ca. A.D. 700, perhaps the "tip-over" when agriculture became important enough to be a deciding factor in site location selection.

This hypothesized developmental pattern—households and small villages placed to take advantage of better soil locations and the sharing by the people of political and religious allegiance symbolized by central ceremonial centers—needs to be tested in several Weeden Island culture regions. North Florida provides one suitable test case, since the region evidently has a very long history of Weeden Island occupation.

Future Weeden Island studies can also focus on the cultural processes manifested in the evolution and nature of Southeast United States chiefdoms. Although a great deal of theoretical literature exists concerning the development and form of complex societies, both states and chiefdoms (e.g. Service 1962; Fried 1967; Flannery et al. 1967; Flannery and Coe 1968; Flannery 1972; Sanders 1974), archeological research into New World chiefdoms *per se* is restricted largely to Mesoamerica. To date in the Southeast, there have been almost no scientifically rigorous attempts to archeologically determine the presence and nature of prehistoric or historic chiefdoms, the major exception being Peebles' (1971, 1972, 1974b) analyses of Moundville data.

The presence of complex societies in the Southeast has long been suggested by anthropologists (Service 1962:158; Sanders and Marino 1970;98-112; Meggers 1972:118-123), although several researchers have referred to these societies as states (e.g., Sears 1962; Goggin and Sturtevant 1964; Olah 1975) when they should have been more correctly categorized as ranked societies or chiefdoms. This misuse of the term "state" appears to be a result of using too broad a definition for stratified societies, rather than misinterpretation of empirical data. The suggestion that chiefdoms were present in the Southeast has apparently been based mainly on the presence of the large Mississippian mound complexes such as Moundville and Etowah, the association of Southern Cult paraphernalia and other sumptuary goods with presumed high status burials, and the descriptions by the Spanish, English, and the French (especially the latter's descriptions of the Natchez Indians) of certain historic societies. Thus, although there seems to be agreement that chiefdoms were present in the Southeast, anthropologists have not, by and large, used southeastern ranked societies to test hypotheses concerning such societies in general. The recent work by Peebles and Kus (1977) is a step in this direction.

Weeden Island could, in the future, provide an interesting southeastern example against which to test hypotheses concerning the cultural processes involved in the formation of complex societies. For example, some anthropologists have felt that chiefdoms (characterized by ranked descent groups, redistributive economies, hereditary leadership; Flannery 1972:401) and states (characterized by the above in addition to full-time craft specialization, elite endogamy, social stratification, codified laws, governmental bureaucracy, a kingship, military draft and taxation; Flannery 1972: 401) were thought to represent an evolutionary continuum, thus implying a unilineal relationship (e.g., Service 1962; Fried 1967; Renfrew 1974). More recently, researchers working with Mesoamerican examples of complex societies have begun to stress a multilineal model, suggesting that different natural and cultural environmental conditions act as stimuli for the evolution of societies with different levels of social complexity (Tourtellot and Sabloff 1972:Fig. 2; Sanders and Webster 1978). Thus, under certain conditions a state may develop, while under other conditions, environmental factors may interact to result in a chiefdom.

Sanders and Webster (1978) have suggested that chiefdoms are more characteristic of those geographical regions which, although containing diverse habitats or offering differential access to certain non-food raw resources, can be characterized as low risk (and non-diverse) regarding subsistence potential (i.e., although marine resources were available in one area and forest resources in another, both areas could be exploited on an almost continual basis). Also, in such regions, land for horticulture, rainfall, and growing season, did not normally vary greatly either spatially or temporally; thus, for example, the Valley of Mexico can be considered a high-risk situation, while many areas of the Southeast presented low-risk environments.

Once we begin to understand the nature of the subsistence adjustments of Weeden Island societies, we can begin to make constructive comments concerning this multi-linear environmental hypothesis. Although Weeden Island is primarily an inland culture, there are Weeden Island cultures and Weeden Island-related cultures along the Gulf Coast. Both inland and coastal zones would appear to offer sufficient food resources for year-round habitation (with some seasonal use of specific habitats such as, perhaps, shellfish), thus fitting the model chiefdom environment briefly related previously. Lavelle's surveys have pointed out the strategic placement of late Weeden Island sites which allow simultaneous utilization of all available habitats. Clearly, the environment of the Weeden Island cultures was not a restrictive factor.

Recently, Peebles and Kus (1977) have argued that the concept of a redistributive economic system between environmentally specialized local production units does not hold for all chiefdoms, and should be discarded as a definitive characteristic. Weeden Island again may serve as an excellent test case for their arguments, with the presence of river valley sites in the coastal plain near the Piedmont, sites in the mixed deciduous forest-lake and swamp region of northern Florida, and sites along the coast.

The same is true of the distribution of exotic status items within chiefdoms; did the geographical location of Kolomoki nearest the Piedmont allow that site to act as a conduit for the southward distribution of exotic goods from the Piedmont and more northerly areas, thus allowing it to develop as the center of a chiefdom; and/or were status items (such as Kolomoki-style pedestaled vessels) manufactured and traded southward from the site? The question of whether or not Weeden Island chiefs controlled non-reciprocal distribution of items is a complex one, but one germane to our understanding of prehistoric chiefdoms. Physiochemical and technical analyses of Weeden Island ceramics (see both Rice and Cordell, this volume) support the contention that the "sacred" Weeden Island vessels were *not* all manufactured at one center.

Still another line of enquiry regarding complex cultures that can possibly be examined through future Weeden Island studies is whether or not Southeastern chiefdoms originated independently or due to contact with existing ranked societies. Did the hypothesized Weeden Island chiefdom(s) develop as a result of contact with Lower Mississippi Valley cultures? What is the nature of contact between ranked and tribal societies that leads to increased complexity of the latter? And, just what form did these pre-Mississippian chiefdoms take? How much "evolutionary influence" did Weeden Island have on the nature of the later Mississippian societies? One of the most significant anthropological problems that can be approached through Weeden Island studies is determining the very nature of cultural systems referred to as ranked. Should the present concepts and definitions regarding chiefdoms (at least partially derived from Polynesia, an area characterized by more limited land resources) be altered to fit the Southeast examples (i.e., perhaps there are different types of chiefdoms in different environmental settings)?

An even more basic problem, one being approached through the McKeithen project and one which involves both culture history and general process, regards our anthropological concept of a chiefdom and the archeological manifestations of such a system. Kolomoki, based largely on the contents of its mounds, has been interpreted as being associated with a chiefdom. Certainly, ranking of individuals is indicated in mound burials. But is this ranking a reflection of social stratification, stratification sufficiently complex to be called a chiefdom? Do the "definitions" which exist fit the Southeast?

At the McKeithen site, the mound complex appears to have been associated with a "burial cult". And, although some ranking is indicated by the special status awarded one presumed religious specialist at the site and by non-random distribution of certain elite items in the village, these differences certainly do *not* reflect the social stratification present at Mississippian sites such as Moundville, Etowah, or Cahokia. More information is needed to solve this problem. Work in the village areas of Kolomoki and other Weeden Island sites should provide us evidence of social stratification, if it were present. However, I believe that Weeden Island is only one point in a continuum beginning with the appearance of the production of food surpluses and stretching to the Mississippian societies which are the first to be unquestionably recognizeable in the archeological record of the eastern United States as stratified. Perhaps we need to view this continuum as just that and not be as concerned with a taxonomy that divides and sub-divides, both through time and space. I strongly suspect that the cultural processes ongoing in the McKeithen region between A.D. 200 and 1000 were the same as those occurring in the Lower Mississippi Valley and the Ohio Valley. By comparing temporal and geographical points along this continuum, we should be able to understand how, when, and where Mississippianism appeared and, more importantly, why.

These are but a few of the types of questions that can, in the future, be examined by Weeden Island researchers, and which are already beginning to arouse considerable interest. Building on the research of Willey and Sears, and on their own work of only several years ago, anthropologists have grasped the concept of Weeden Island by the neck and tossed it out of the closet, where the length and breadth of its development can be examined. The future can only bring greater and more significant understanding of Weeden Island, its place in the context of the Southeastern prehistory, and its significance for anthropological interpretation of that prehistory.

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PRELIMINARY REPORT ON TECHNOLOGICAL INVESTIGATIONS OF McKEITHEN SITE-WEEDEN ISLAND POTTERY

This paper addresses the question of local manufacture versus non-local or trade-in origin of certain McKeithen site-Weeden Island ceramics. A preliminary technological investigation of physical and mineralogical properties was carried out on two bodies of data for comparison. These include: (1) 18 of the 19 pottery vessels recovered from Mound C at the McKeithen site, and (2) two clay samples from the immediate vicinity of the McKeithen site. The specific goals are: to distinguish groupings of the 18 vessels which might be attributable to different ceramic resources and to suggest local versus non-local origins for manufacture of the particular groupings.

Brief formal, decorative, and contextual descriptions of the vessels analyzed are presented in Figure 1 in the appendix. The physical and mineralogical properties measured or observed on each vessel included surface and core colors, scratch hardness, and gross mineralogical characterization of type, frequency, and size of non-plastic inclusions present in the paste. The methods used for obtaining these data are also described in the appendix. Measurements and observations were recorded on a refired sherd from each vessel considered. The sherds were refired in a Thermolyne electric furnace at 500° C for 30 minutes. This was done in an attempt to eliminate the possibility that variations in original firing conditions "caused" differences in certain attributes, color in particular.

Ceramics Data

Five groupings containing thirteen of the vessels were distinguished on the basis of consistent similarities in the attributes measured or observed. The remaining five vessels are "outliers"—vessels whose technological attributes do not seem sufficiently or con-

Vessel Groupings	Surface Color: exterior	Surface Color: interior	Core Color: oxidized portions	Core Color: coring	Scratch Hardness: ext.	Scratch Hardness: int.	Paste Texture	Paste Constituents
1 vessels 4,9	0	pale brown to light brown	very pale brown	0	0	6-7	medium	Quartz: abundant fine, common medium, rare coarse; Ferruginous inclusions; Black inclusions; Carbonaceous streaks
2 vessels 2	0	reddish yellow	reddish yellow (2, 13)	dark grey (2, 13)	0	3	fine (2, 13)	Quartz: frequent to abundant very fine to fine, common medium; Ferruginous inclusions; Whitish inclusions
13	0	0			0	0		
3 vessels 1,12,15	reddish yellow to light red	reddish yellow to light red	reddish yellow	0 to brown	7	7	fine	Mica: occasional to common; Quartz: common fine, common medium; Ferruginous inclusions; Black inclusions
4 vessels 10	very pale brown to pale yellow (10, 11)	very pale brown to pale yellow	brownish yellow	0	3	3	fine (10, 11, 18)	All vessels: abundant sponge spicules; 10: Quartz: common fine, common medium;
11					7	7		11: Quartz: abundant very fine; White to yellowish red inclusions;
18	light grey	light grey	light grey	0	5	5		18: Quartz: frequent fine; White to yellowish red inclusions; Black inclusions
5 vessels 5,6,7	reddish brown	reddish brown	yellowish red	0	5	5	medium	Quartz: abundant fine, frequent medium, occasional coarse; Whitish inclusions
Outlier Vessels 8	0	0	light yellowish brown	brown	0	0	medium	Quartz: abundant fine, common medium, rare coarse; Black inclusions
14	very pale brown to light yellowish brown	very pale brown to light yellowish brown	very pale brown	light yellowish brown to brownish yellow	0	7	medium	Quartz: abundant fine, common medium, rare coarse; Black inclusions
16	reddish yellow	light brownish grey	very pale brown	light brownish grey to greyish brown	0	7	medium medium	Quartz: abundant very fine to fine, common medium, occasional coarse; Black inclusions; Carbonaceous streaks
17	0	reddish yellow	pink	brown to dark brown	0	6	very fine	Mica: occasional; Quartz: frequent to abundant very fine, occasional medium, rare coarse; Black inclusions
19	0	light brownish grey to greyish brown	pink to light brown	0	0	6	medium	Quartz: abundant fine, common medium, rare coarse; Ferruginous inclusions; Black inclusions

Figure 1.

sistently similar to permit the grouping of these vessels with each other or with the other groupings. The groupings are here interpreted as products of the selection of particular ceramic resources for manufacture. The primary differentiating attribute for group formation is paste composition. The type, relative frequency, and relative size of paste constituents was determined in sherd cross-section with a binocular microscope. Scratch hardness is least able to function as a discriminator as it is influenced by such factors as surface finishing techniques and firing conditions as well as by paste composition. Color is of intermediate utility as it is determined by the presence and amount of iron compounds and organic materials in the clay and variability in firing conditions. The refiring of sherds was thought to eliminate variability attributable to firing conditions for most of the vessels.

Discussion of Groupings

It should be noted here that similarities within groupings were rather subjectively determined and do not represent statistically derived clusters. Descriptions of the vessel groupings according to the attributes examined are presented schematically in the appendix. Explanations for particular features of data presentation are included. The measurements and observations specified are those made on the refired sherds.

Group 1 consists of two derived effigies, vessels 4 and 9. Identical paste configurations and textures, and nearly identical values for the other attributes suggest that a particular ceramic resource may be represented by these vessels.

Group 2 consists of vessel 2, a pedestaled effigy, and vessel 13, a squared plate. Identical technological data were obtained for these vessels. Retention of dark coring in this group may be related (1) to the fineness of the paste, (2) to the possibility that these vessels represent a clay higher in organic materials relative to the ceramic resources represented by most of the other groupings, (3) to variations in original firings conditions which may not have been eliminated by refiring, or (4) to a combination of any of these possibilities.

Group 3 consists of vessels 1 and 12—the two Weeden Island Incised variants of a globular bowl form, and vessel 15—the multiheaded globular bowl. The presence of mica as a paste constituent is this grouping's most distinguishing feature. Similarities in color, hardness, paste texture, and other paste constituents suggests that similar micaceous clays were selected for the manufacture of these vessels.

Group 4 consists of vessels 10, 11, and 18. This grouping is more variable in the attributes considered but all are characterized by the abundant occurrence of sponge spicules. The white to yellowish red inclusions also contain sponge spicules and quartz inclusions and may be interpreted as lumps of the clay-paste which did not get thoroughly mixed during paste preparation. Similar spiculite clay sources are represented by these vessels.

Group 5 consists of vessels 5, 6, and 7. These are globular bowls with effigy and lug adornos. These vessels are essentially identical in the attributes measured or observed. This indicates that a particular or similar clay source may be represented by these vessels.

Outlier Group The remaining five vessels are "outliers". Each may represent a distinct clay source. Exceptions to the retention of outlier status for these vessels might group vessel 8, and 14 together. Although differing somewhat in paste constituents, they are similar with reference to refired core colors. Vessel 16, except for greater retention of coring, is also broadly similar to vessels 8 and 14. These data would suggest the possibility that a similar clay was exploited for their manufacture.

Vessel 17 might well be placed with Group 3, as both this outlier and Group 3 vessels are characterized by a micaceous paste. The finer textural designation of paste and greater retention of coring after refiring classed this vessel as an outlier.

Vessel 19 is moderately similar to Vessel Group 1 in terms of paste constituents and scratch hardness. But a redder hue designation of core color (7.5 YR as opposed to 10 YR for Group 1) would suggest that vessel 19 may have been manufactured from a clay containing more iron than the one postulated for vessels 4 and 9.

Interpretation of Groupings

If outlier vessels 8, 14, and 16 are grouped together, and if vessel 17 is included in Vessel Group 3, with vessel 19 remaining as an outlier, then a minimum of seven kinds of clay resources may be postulated for the manufacturing of Mound C vessels. If outlier status is retained for all five of the vessels, then a maximum of 10 kinds of clay resources may be postulated.

Sherds from four Mound C vessels were included in the sample of sherds and clays that were examined trace-elementally by Prudence Rice (this volume). Group 2 (vessel 2, characterized by dark coring), Group 3 (vessel 12, characterized by micaceous paste), Group 5, and outlier vessel 14 were represented and each vessel was found to be characterized by distinct trace-elementally-derived paste types. This evidence supports maintenance of these vessel groupings as representatives of distinct ceramic resources.

Attribution of local versus non-local status to these vessel-resource groupings can now be attempted: Vessel Group 3 (consisting of vessels 1, 12, and 15) and outlier vessel 17 are characterized by a micaceous paste. Vessel Group 4 (consisting of vessels 10, 11, and 18) is characterized by a sponge spiculite paste. Although their geographical extents have not been conclusively demonstrated, micaceous and spiculite clays have traditionally been thought to originate principally from northwest Florida to southwest Georgia and east Florida, respectively. Recent research by Shaak and Thanz (1977) suggests a wider geographical distribution for spiculite clays. However, non-local status for the four micaceous paste vessels and three spiculite paste vessels is reinforced by the fact that two clay samples from the McKeithen site's immediate vicinity contain neither mica nor sponge spicules.

Analyses of surface and core color, scratch hardness, and type, relative frequency, and relative size of non-plastic inclusions were carried out on two clay samples which were gathered from the immediate vicinity of the McKeithen site. FC-1 (designating the first of a number of Florida clay samples collected by P. M. Rice and students from the University of Florida) was collected from the south bank of Orange Creek which forms the northern boundary of the site. FC-5A was collected from a road cut from the north side of State Road 135, just north of and adjacent to the site. Detailed comparisons of results of analyses of these samples with those of the vessel groupings will not be presented here. Preliminary findings do indicate, however, that high degrees of similarity exist between FC-1 and Vessel Group 1 (vessels 4 and 9), and between FC-5A and outlier vessel 19. These findings tentatively permit a local origin to be posited for manufacture of these three vessels. FC-1 and FC-5A were also included in Rice's investigation. They clustered into two clearly different paste types. This would support the distinction between Group 1 and outlier vessel 19. Therefore, from preliminary analyses of Mound C vessels and two local clays, it can be tentatively hypothesized that three of the eighteen vessels (Group 1 and outlier vessel 19) were probably manufactured locally; seven more vessels (Groups 3, 4, and outlier vessel 17) were probably obtained from non-local centers of manufacture. Three to five distinct ceramic resources are represented by the eight remaining vessels, which are of still questionable origin.

In conclusion, the preliminary nature of this study should be emphasized. The non-statistically determined groupings are tentative as is their interpretation regarding numbers and origins of ceramic resources. Future analyses will include petrographic examination of sherd thin sections to offer more precise mineralogical characterizations and to test the validity of the ceramic groupings presented in this report. In addition, statistical grouping of the ceramic data will be carried out. Analyses of clay samples are continuing on three more samples which are local to the site and on five collected by Lavelle. The results of clay analyses will provide more data for comparison with Mound C and other McKeithen site ceramics. However, a preliminary study such as this does exhibit utility as a first step in suggesting relationships between data which can be tested with further types of analyses. In particular, the relationships within and between groupings and clay samples have presented a basis for sample selection for future trace-element analyses which would certainly be able to validate or refute these tentative relationships.

Appendix:

Vessels 1 through 14, 18, and 19 were recovered by L. A. McKeithen, Jr. from the mound's east side subsequent to damage caused by previous potting activities. Sherds fitting all of these vessels were recovered by J. T. Milanich's excavations. The cache of vessels is thought to have been deposited beside or on top of the primary mound. Vessel 15 was recovered by Milanich from an undisturbed context and is thought to represent the northern extent of the east-side cache. Vessel 16 was recovered from an undisturbed context on the mound's west side under the edge of or right beside the primary mound; it is apparently not associated with the east-side cache. Vessel 17 was obtained from a local collector; most of its base was recovered by Milanich from an undisturbed context. The following descriptions are presented according to the formal and decorative typologies established by Sears (1956) and Willey (1949):

Vessel 1 (Vessel Group 3)—Squared flattened-globular bowl; Weeden Island Incised; stylized bird motif.

Vessel 2 (Vessel Group 2)—Pedestaled effigy with triangular cut-outs; associated with crested bird-head adorno; incision outlines body contours and wings; entire vessel exterior is slipped with a red-firing substance.

Vessel 3 Pedestaled bird effigy with triangular cut-outs and pre-fired basal perforation; incision outlines body contours and wings; exterior slipped with a red-firing substance. This vessel has been undergoing restoration; its condition prohibits analysis at this time.

Vessel 4 (Vessel Group 1)—Derived effigy (jar form) with bird-head adorno (Milanich identifies it as an owl) affixed to lip; tail is attached below rim area; vessel has squared-flattened base with pre-fired basal perforation; has triangular cut-outs; incision outlines body contours and wings; vessel exterior is slipped with a red-firing substance; interior surface appears to have a "self-slip" resulting from surface finishing rather than decorative technique.

Vessels 5, 6, 7 (Vessel Group 5)—Globular bowls; both surfaces appear to have "self-slip" rather than decoration. One vessel has two round lugs on opposite sides attached below the rim; each of the others has a tail attached below the rim and a bird-head adorno (vulture) affixed to the lip portion of the rim on the opposite side.

Vessel 8 (outlier vessel)—Simple bowl; entire vessel—exterior and interior surfaces—slipped with a red-firing substance.

Vessel 9 (Vessel Group 1)—Derived effigy (jar form) with triangular cut-outs and pre-fired basal perforation; probably a bird effigy—incision outlines what looks like a wing area. Exterior surface is slipped with red-firing substance; interior surface appears to have a "self-slip" (see Vessel 4).

Vessel 10 (Vessel Group 4)—Large simple bowl; plain.

Vessel 11 (Vessel Group 4)—Shallow bowl with flaring and scalloped rim; lip is punctated, similar to Weeden Island Punctated. Approximately one-third of the vessel was recovered.

Vessel 12 (Vessel Group 3)—Unique flattened-globular bowl, shaped like a "winged-nut"; Weeden Island Incised; stylized bird motif. Post-firing basal "kill-hole" is present.

Vessel 13 (Vessel Group 2)—Squared plate or squared shallow dish; both surfaces slipped with a red-firing substance; center/base not recovered.

Vessel 14 (outlier vessel)—Globular bowl; Indian Pass Incised. Approximately one-half of the vessel was recovered.

Vessel 15 (Vessel Group 3)—Globular bowl; plain; four effigy head adornos are affixed to a thickened rim. Post-firing basal "kill-hole" is present.

Vessel 16 (outlier vessel)—Globular bowl; Tucker Ridge-pinched.

Vessel 17 (outlier vessel)—Flattened-globular bowl; exterior surface appears to have been slipped with the same material used for the clay body. Post-firing basal "kill-hole" is present.

Vessel 18 (Vessel Group 4)—Large simple bowl; plain. Approximately one-third of the vessel was recovered.

Vessel 19 (outlier vessel)—Derived effigy(?); Weeden Island Zoned Red; bird-head and tail adornos are attached below the rim on opposite sides of the vessel; zoned areas are painted with a red-firing substance.

Methods:

Surface and core colors were measured using the Munsell Soil Color Charts. Scratch hardness was measured with Moh's Mineral Hardness Scale under 30X magnification. Fresh cross-sections of sherds were examined under a binocular microscope at 70X magnification. Gross inclusion-type determinations were made and relative frequencies of non-plastics were subjectively ranked as rare, occasional, common, frequent, or abundant; relative size of inclusions was measured with reference to Wentworth's Size Classification with the aid of an eye-piece micrometer.

Data presentation:

Color is designated by Munsell color names rather than specific hue, value, and chroma notations which were the original measurements. A zero (0) color designation is given when a slipped surface is present, as it is the clay body color and not slip color that is revelant for the determination of the number of possible clay resources represented by the vessels. A zero designation is also given for scratch hardness of slipped surfaces and the decorated exterior of vessels 14 (incised) and 16 (pinched). Color names are presented for coring (i.e., less oxidized core colors) as well as for the more oxidized colors. When coring is absent, a zero designation is given. Relative frequency and size categories are here charted for quartz inclusions only; relative frequencies for mica and sponge spicule inclusions are designated when applicable. Gross identification as to type is presented for any other paste constituent. In addition, paste is given a textural designation (very fine, fine, medium, or coarse) derived from consideration of relative frequency and size of quartz inclusions.

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Brenda Sigler-Lavelle

ON THE NON-RANDOM DISTRIBUTION OF WEEDEN ISLAND PERIOD SITES IN NORTH FLORIDA

The transformation from egalitarian to rank society occurred numerous times in the prehistory of the southeastern United States. This paper presents an overview of the results of regional archeological research, the anthropological objectives of which were to: (1) to identify processual dynamics involved in the emergence of institutionalized inequality in a pre-mercantile ranked society within particular historical context; (2) develop a preliminary, socio-political model for Weeden Island society; (3) determine the implications for our findings in comparison to comparable cross-cultural studies, and incorporate southeastern material when constructing evolutionary models of pre-mercantile economic systems; and, (4) contribute to the "demystification" of social processes through identification of a wider range of interacting variables that have affected, and continue to affect, the evolution of real-world social systems.

Settlement pattern analysis provided the cohesive framework for archeological investigation within select portions of Columbia and Suwannee counties of North Florida. The archeological objectives of the survey were to: (1) determine the spatial and temporal distribution of Weeden Island period sites, site types, size and functional relationships; and, (2) ascertain intraregional social and ecological factors affecting the observed distribution.

In this presentation substantive information is modeled according to topology and subsistence-settlement structure, and a processual model is suggested for the relationship between spatial order, production process and socio-political responses.

Research Design

The research project was operationalized in two successive stages. The first consisting of a literature search to provide data on the following: (1) substantive, theoretical, and methodological history of Weeden Island studies in the southeast and north Florida specifically; and, (2) regional environmental communities, as well as the geologic, hydrologic, and meteorologic processes relevant to human occupation within the survey area. This served as a basis for establishing the procedures of the second stage, a 9-month archeological field investigation. The ultimate goal of the project was to obtain data on the economic, social, and religious dynamics involved in the development of ranking in Weeden Island society.

Theoretical. In approaching the task of collecting data to explore relationships between economy, social relations, and ideology, "economy" became theoretically and methodologically pivotal for analytic purposes. It is an explicit strategy which provides a consistent data base for cross-cultural studies with the ultimate goal of understanding economic systems within their social matrix. Methodologically it focuses on the material culture which provides the archeologist with a structure within which to work, as well as a body of theories from the subfield economic anthropology.

As a heuristic device, the economic field is divided into three elements which form an invariable structure through which regionally operative cultural systems can be examined. These interrelated event sectors, common to all economies, are production, distribution-exchange, and consumption of goods and services (Godelier 1972). Production is defined as the "totality of operations which supply a society with its material means of existence" (Godelier 1972:259). Distribution is the process by which the products are channeled to individuals, by virtue of their control over, or their role in, the productive process. Exchange denotes the way goods or services flow between individuals and groups (Cook 1973:823).

While the data base available to an archeologist is less complete than that available to an ethnologist, materiality defines the economic event sectors operationally for both subfields of anthropology. By identifying the material conditions represented in the archeological record in a structured way, we can ideally determine the articulation of the production process and habitat, consider the common elements of its spatial order, and examine the relationships of these to cultural responses. These material items, or "commodities," also represent social products, the production, distribution and consumption of which will be organized by social relations (after Friedman 1975). Such inferences are grounded in the material data whose analyses reveal allocative patterns representing social realities.

Field Procedures. Territorial boundaries for the project were set with respect to the historic location of the Utina Timucua, since one of the wider research goals of the McKeithen Project was to determine whether Weeden Island peoples were ancestral to the Utina Timucua. This region actually constitutes a cultural sub-area and lies north of the Santa Fe River, south of the Okeefenokee Swamp, west of the Aucilla River (Milanich 1976:10). (See Fig. 1). Columbia and Suwannee counties were targeted for survey within this geographical area.

Within this region there are two physiographic zones that exhibit repetition of similar environmental elements but differ in spatial arrangements. Differences in geologic, hydrologic, and meteorologic characteristics could also be documented. These two zones are the Coastal Lowlands and the Central Highlands. The events of the economic process became the focus for investigation within the above defined subregions. That is, within the two zones, production, distribu-

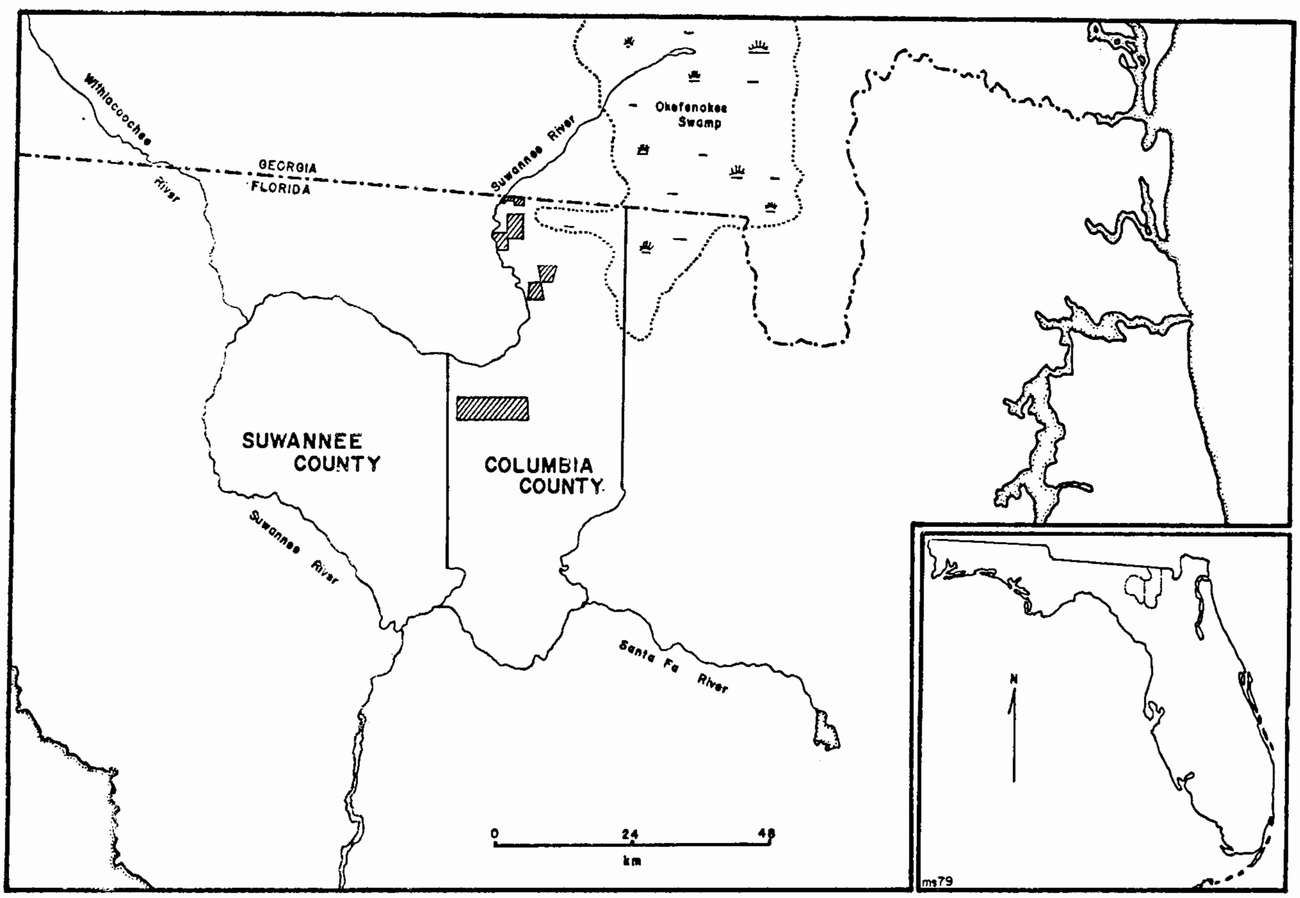


Fig. 1.

tion, and consumption of goods and services (Godelier 1972) provided the problematic for examination of micro and macro settlement structures, and interpretation of the data obtained.

On the micro level, data were obtained through a sampling scheme defined around the concept of total production. The initial targets then, became environmental sectors offering the total range of potentially exploitable resources from a known habitation site. This approach is referred to as "site catchment" analysis and is defined as the "study of the relationships between technology and those natural resources lying within the economic range of individual sites" (Vita-Finzi and Higgs 1970:5). What constitutes the economic range will differ for each archeological project depending on the ecological peculiarities of the region. There are essentially six vegetational zones which are comparable and occur in the two topographic regions defined above: (1) stream bank thickets and woods; (2) flood plain forest; (3) mesic hammock; (4) dry pinelands; (5) flatwoods; and, (6) prairie. These plant communities are in relation to the four types of aquatic environments; (1) high plain swamps with fluctuating gwt (ground water table); (2) permanently watered sinkhole lakes and ponds; (3) permanently watered streams; and, (4) poorly drained flatlands.

Since preliminary research suggested that at least some types of villages were usually associated with burial mound sites during the Weeden Island period, it was decided to use the mounds for pivotal purposes. An area encompassing the four aquatic environments and vegetational communities was defined around specific mounds within the two physiographic zones.

Using the above information a multiphase sampling scheme was devised and operationalized during a 9 month field survey period beginning in January and continuing through August, 1978. The first phase of the survey consisted of locating and mapping mound sites. Information on their locations was obtained primarily from local residents and hunters in both counties. In all cases we were either given explicit directions or were taken directly to these sites by informants, thereby saving numerous hours of nonproductive survey. Three weeks were spent on the initial mapping procedure, but as our information network expanded more sites became known. Days were taken during phase two sampling procedures to visit and map locations of these mounds as the occasion arose.

Excluding the 3 mounds at the McKeithen site, 14 others were located. Since that time 7 more have been called to our attention, but have not been seen or mapped by the author. In addition to mapping procedures, at 7 mound sites test pits were placed on line in the 4 cardinal directions from the mounds 25 m apart to determine the presence of associated village midden. Midden areas were present east of the mounds in 6 out of 7 locations tested. Using the same test pit spacing these village areas were delimited by running a test line perpendicular to that which intersected the midden initially. The east-west and north-south perimeters were determined in this way.

Phase two strategy was based on information obtained in the first stage. As a result of the latter, it was determined that an area of high mound frequency existed north of the McKeithen site and that a transect could be defined that, while not encompassing all the mounds, could cover a major portion of the intervening space. And, by extending the sampling area east it could include the four desired aquatic environments. A 3 x 10 mile transect was therefore defined which encompassed the mound areas on the western edge. The mounds and their associated villages were not the object of investigation, since they had been located, villages delimited, and sampled in stage one. The purpose of the transect was to determine the range of site types peripheral to ceremonial "centers" and environments of location.

There were four types of aquatic environments which exhibit differences in resource diversity, density and reliability, within the transect. These are the high plain swamps, permanently watered sinkhole lakes (ponds), poorly drained flatlands, and permanently watered streams. The western part of the transect contained streams and lakes/ponds, while the central portion had high plain swamps and streams, and the eastern sector consisted of poorly drained flatlands. This transect is located in the west central section of Columbia County, the major portion of which falls within the Central Highlands topographic zone. The portion east of Lake City, however, is within the Coastal Lowlands.

The 3 x 10 mile transect contained 30 sections with 1 mile to a side. Each of the 1 mile sections was divided into quarter sections which were numbered consecutively. A 15% sample was drawn at random. Within the selected quarter sections we ran diagonal transects consisting of test pits placed every 25 to 30 m apart. Each test was 60 x 80 cm and excavated in arbitrary 10 cm levels to depths ranging from 50-150 cm, depending upon topographic evolution. That is, if the terrain suggested deposition due to soil creep or other surficial processes, tests were adjusted for those depositional surfaces. In addition, information on the targeted sampling units was obtained from discussion with property owners and, when possible, examination of both cultivated and fallow fields.

Information obtained from continued excavations at the McKeithen site, as well as that obtained from the first and second phases of the regional survey suggested significant developmental variation between the northern and central portion of Columbia County. The third and final stage, therefore, consisted of intensive sampling around mounds selected with regard to both theoretical and pragmatic questions. These included: (1) possible ethnic diversity between groups of the region and possible interaction between them; (2) relevant temporal factors that might account for observed developmental differences; (3) the nature of the interaction between homogenous cultural units and their articulation to the natural environment; and, (4) access to mounds and sufficient adjacent acreage to make survey meaningful.

Two areas were selected and delimited such that a surrounding 2 to 2½ mile area could be covered by transects using the quarter section procedure. The same diagonal lines of sub-surface tests and field methods were utilized. This phase of the survey was conducted during the summer months when rainfall was greatest. Swamp areas and low sections of the floodplains were approached, but not penetrated when standing water was present.

The first and second areas targeted in stage three occurred within Coastal Lowland sections and were designated Carter Mound #1 and Little Creek Mound. The third sampling area was around Rocky Creek Mound in Suwannee County. The topographic zone is Central Highlands. Sampling units were selected within a 1 mile radius of the Rocky Creek Mound. Time factors forced a choice between continuing to survey around Rocky Creek or sampling an undisturbed site, Carter Mound #2, which had since come to our attention. Of all of the sites that were located and sampled in Columbia and Suwannee counties, all but a portion of one had been disturbed due to farming or timber interests. It was decided that greater benefit would be derived by taking stratigraphic samples for temporal control and for interpreting data from the northern portions of the survey area. Two weeks were all that were available for sampling this site. Two 3 x 3 m squares were excavated in 5 cm levels. All artifacts were mapped *in situ* so that, in addition to the information we sought, our records could be incorporated into excavations of the village designed to determine intra-site structure.

Regional Environments

The structure of regional ecological systems establish "parameters of choice" within the confines of which people make decisions concerning resource utilization. The distribution of resource opportunities, therefore, provide locational constraints which affect economic organization and will be reflected in the type and areal placement observed within the ecological zones of a region (Douglas 1968; Piddocke 1968; Yellen 1976). In north Florida there are two natural regions that exhibit repetition of similar environments —the Coastal Lowlands and Central Highlands. While they contain similar ecological zones, variations in elevation and hydrologic regimes affect the distribution of micro-environments. These are essential considerations since the distribution and reliability of exploitable resources affect production activity and risk factors for dependent populations.

Coastal Lowlands. The Coastal Lowlands, which extends into northern portions of Columbia County, is north of Lake City, west of the Okefenokee Swamp (e.g., Sandlin Bay, the southern extension of Okefenokee), east of the Suwannee River, and south of the Georgia state line. Although the physiography is listed Coastal Lowlands, in reality this classificatory scheme masks localized differences. Elevations are generally given as 100-150 ft but the upper limit is confined to marine terraces which are essentially a series of eroded, discontinuous sand ridges, the apexes of which are well to excessively drained. The lower elevations consist of poorly drained lowland swamps and the Suwannee River floodplain.

The terraces were left at 100, 70, 42, and 25 ft above present sea level, and correspond to the Pleistocene shore lines, Wicomico, Penholoway, Talbot and Pamlico, respectively (Cooke 1945:11). The Coastal Lowland is underlain by low, flattened hills of silicified cavernous limestone which is overlain and filled by sand and clay. The region is one of active karst topography due to the soluable limestone substrates (Cooke 1945:11).

Because precipitation on the Coastal Lowlands either evaporates or percolates into the ground, a well integrated drainage pattern of streams has generally not developed (Meyer 1962:12). Spring-fed sinkhole ponds and streams occur in this environment but they are highly restricted geographically and experience some fluctuations in water level. The most significant dynamic in terms of the seasonal and locational availability of floral and faunal species seems to be fluctuations of water resources. While the above mentioned ponds will remain watered and support habitat specific aquatic species, the localized perched water tables created in poorly drained lowland areas are unreliable due to extremes in fluctuations.

The dominant river in this area is the Suwannee and it too sustains drastic periodic fluctuations in flow. The Suwannee originates in the Okefenokee Swamp, northeast of the region in question, and is dependent on runoff from local rainfall above White Springs, Florida. Below this point there is an increased base flow from large springs along its route.

Characteristically, the water resources in the area are darkly stained, acidic, and low in nutrients. The acidity of the water imposes limitations on species of fish and amphibians. Generally there is a limited number of animal groups represented by a few species but many individuals. This varies locally, however, due to differences of acidity, velocity, vegetation, temperatures, oxygen, and water hardness (Beck 1965; Hellier 1967). In short, the streams and ponds differ chemically, physically, and biologically which creates micro-environmental differentials of importance to foragers.

If one takes a vegetational transect across the quiescent sand ridges from the Suwannee River east it reveals: (1) stream bank thickets and woods; (2) floodplain forest along low bank regions of the Suwannee River; (3) mesophytic hammocks; (4) dry pinelands; (5) flatwoods; and, (6) prairie (Shelford 1963). While this is a somewhat simplified version of reality, from midpoints of these ridges there is access to these six environments within a 1 mile distance.

In addition to these plant communities there are three types of aquatic environments: (1) permanently watered sinkhole lakes and ponds; (2) permanently watered streams; and, (3) poorly drained flatlands.

With the obvious exception of aquatic species, much of the fauna of this region, and the coastal plain generally, are not habitat specific. Hence, a wide variety are available for exploitation across these micro-environments. Based on what is known of fauna utilization by prehistoric populations, the most important were herbivores including a wide variety of birds, fish, snakes, turtle and tortoises, and larger mammals such as *Odocoileus virginianus* (white-tailed deer). Concerning the potential of the latter, an interesting differential has been documented for the reproductive rate between the region under study and the counties to the west and within the northern Piedmont physiographic zone.

Harlow (1972), Sileo (1966), and Short (1969) have argued that low fecundity rates of the white-tailed deer are not related to over population or quantity of available forage, but that forest types and soils exert greatest influence. Short (1969) states that infertile soils produce roughages that are seasonally deficient in net energy, protein and phosphorus. Harlow (1972:167) notes that uplands soils of counties *west* of Columbia and Suwannee have more clay present and have higher potential fertility. In addition, certain mineral elements (iron, copper, cobalt) were found deficient in soils which would include most of those of the survey area. This ecological factor would provide obvious constraints on productive potential and would affect the size of territories required to support hunting activities.

Central Highlands. The Central Highlands in Columbia and Suwannee counties are composed of clay and sand which were terraced by Early Pleistocene Age seas. A high ridge, remnants of the Coharie and Sunderland terraces, crosses central Columbia County from east to west (Cooke 1945; Meyer 1962). The ridge existed as a series of keys forming the southern boundary of the Okefenokee Sound.

The terrain in this area is typical karst topography characterized by limestone outcroppings, extreme changes in elevation, numerous sinkhole lakes and ponds and solution depressions, and significant fluctuations in gwt due to poor drainage and perched water tables. The ridge is drained northward by tributary streams of the Suwannee River. There are more extremes in elevation within this zone compared to the Coastal Lowlands but the selective pressures exerted by fluctuations in the gwt is still an important contributor to micro-environmental variation.

The nature of the hydrologic regime and the greater frequency and larger size of sinkhole lakes/ponds are the most striking differences between the two topographic zones. For populations exploiting these environments there is considerable *increase* in the density of exploitable resources (e.g., aquatic) and a *decrease* in the distance between them. These factors would reduce risk as it relates to resource density and reliability and would translate into less movement for larger populations (See Lee 1965, 1968; Jochim 1976; Pianka 1974).

In addition to complexity and diversity of surficial hydrologic patterns, rainfall is known to vary within portions of this region. For example, figures provided by the United States Weather Bureau for five stations within a 30 mile radius of Lake City showed considerable differences between sections in any one year, as well as within one section from year to year. In the following discussion the structure of regional ecological systems can be seen to relate directly to areal site distribution, type and function, population densities, and indirectly to developmental processes.

Description of Weeden Island Sites in North Florida

It was determined that Weeden Island sites within the two physiographic zones exhibited variation in socio-political development and apparent population densities. In both physiographic provinces the investigation evidenced the following six types of sites: (1) sand burial mounds which are believed to be of a continuous use type; (2) habitation sites associated with the mounds; (3) dispersed habitation sites or 'hamlets' representing discrete social entities; (4) task specific sites; (5) chert quarries; and, (6) clay exposures which are listed as possible sites. In both zones, the pattern was one of mound 'centers' and their associated villages and dispersed satellite villages, all within easy access to clay sources and chert quarries.

Coastal Lowlands. Four mounds were located and support villages sampled in the Coastal Lowland physiographic province; three of the mounds had been previously destroyed. The four mounds were located in northern Columbia County and occurred on the small, discontinuous sand ridges running roughly north to south in an area west of the Okefenokee

Swamp and Sandlin Bay, and east of the Suwannee River (see Fig. 2).

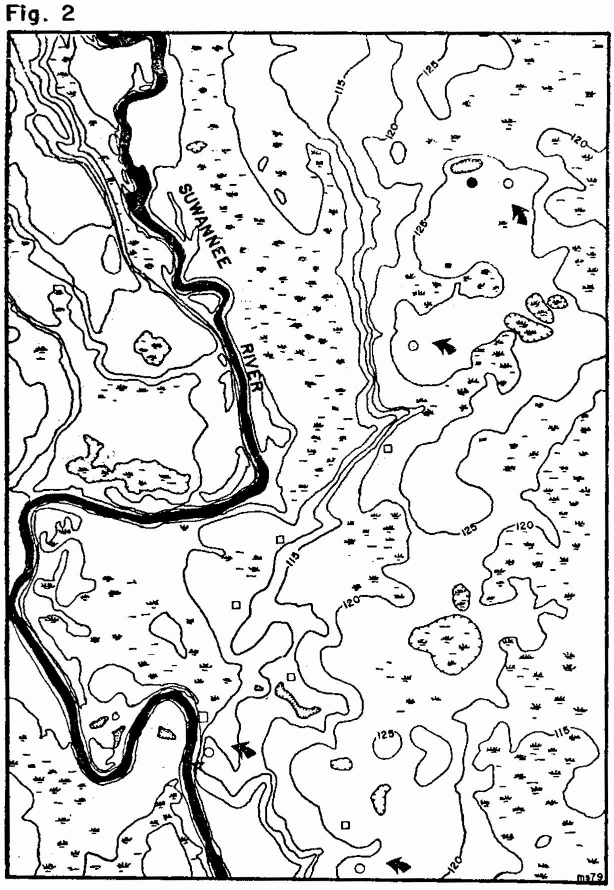
Carter Mound #1 and its associated villages and task specific sites are used for illustration purposes here. A comparable pattern, however, was observed at Little Creek Mound southeast of Carter Mound #1. This settlement structure was the most recent within this province. There were two others (Carter Mounds #2, 3) located 5 and 6 miles north of #1, respectively.

Regional Settlement Structure

There were three *hamlet sites* found in the tract between Mound #1 and its associated village and the Suwannee River. All contained tool assemblages with the following categories: projectile points (within the range of Pinellas), decortication flakes, retouched transverse and side scrapers, flake knives, gravers, spokeshaves, non-utilized flakes, and cores. Sherds of the residual, smooth and burnished plain types were most common. All but one site in this area was disturbed; therefore levels within each site were necessarily taken as a single unit of analysis and comparison was made between units. While pottery types suggest the sites to be contemporaneous, plain pottery is made for an extremely long period of time in this region, as shown from stratigraphic samples taken from the undisturbed village at Mound #2. Technological changes in the plain ware that might provide temporal indicators have not been documented.

The similarities of artifact categories suggest that comparable activities were being conducted at each of

Fig. 2



● mound
○ village
□ chert and flake scatterings
□ quarry
☆ clay

the hamlet sites, and that they were of a "maintenance" type (after Binford and Binford 1966). In addition to spacing and low intersite variability, the following similarities were noted for the hamlets: (1) all were within 300 m of a spring; (2) they occur within hammock environments; (3) they occur within elevations ranging from 115 to 125 ft above msl (mean sea level); (4) if an east-west line is drawn through sites from the Suwannee to the edge of Sandlin Bay, the entire range of habitat diversity can be tapped within 0.8 km in both directions from the site. Hence, resources can be exploited from a single location; and, (5) all but one was completely disturbed. No contextual information or features are therefore available from most of the sites.

Village sites associated with the mounds have the same tool assemblages as outlined above with two exceptions. A hammerstone and nutting stone, the latter of a non-local sandstone, were obtained in context at the village at Mound 2. Ceramics are still predominately plain with the Weeden Island decorated series comprising the minority. All three of these sites are within 300 m of a 5 to 10 acre spring-fed pond.

The *mounds* were all west of the village areas. Mound 1 was the only one sampled during survey and it was almost completely destroyed. The eastern quarter was still intact and provided invaluable information. A 2 x 10 m trench was placed through the center of the remaining portion. Evidence of probably seven individuals was obtained, all in badly deterioriated condition and appeared to be secondary burials. Two nearly complete vessels were obtained from the east side, both were Carrabelle Punctated. A profile of the mound showed construction to have started on a cleared surface, with a base of very white sand, followed by primary mound fill. There were charcoal scatterings and evidence of burned sand irregularily occurring throughout the test trench. Material for the base appears to have been obtained from the banks of the Suwannee River where the pure white, fine sand is abundant. The fill for the primary was apparently taken from the extreme eastern portion of the village area. Two celts were also obtained from the mound and represent the only items made of non-local raw material. The closest source for this fine grained granite is northern Georgia.

Task specific sites consisted of small isolated scatterings of non-utilized flakes. The distribution appears random and is throught to be related to hunting activity. Non-aquatic faunal species are not habitat specific on the Coastal Plain and would be available within all environments covered by our transects. One might reasonably expect the distribution to be reflective of these kinds of extractive activities.

Both the clay and chert formations are exposed at different points along the Suwannee River channel, approximately 2½ miles southwest of Mound 1. The chert outcropping seems to be the source of lithic samples obtained in village midden. It is of a displacement nature and occurs along the eastern bank. This material is continuously accessible, except during river flood stage. The clay is a possible source for village potters but elemental analysis linking the samples from the exposure to specific vessels has not as yet been attempted.

Economic Organization. Data on flora and fauna species utilized for basic subsistence needs were not available on the disturbed sites sampled within this area. Reliable, if scanty, information does come, however, from Kohler's excavations at the McKeithen site (Kohler 1978). This information, plus the nature of the lithic assemblages from the hamlets and their location with respect to potential resources, implies a broad base fishing-collecting-hunting economy utilizing resources from all four environmental zones. This pattern has been amply documented by Cumbaa (1972) for contemporaneous Cades Pond people to the south.

Site type and placement, the unspecialized tool kit, localized nature of the material conditions of production, and the insignificant amount of non-local items (except in limited ceremonial context) suggest: (1) the economies to have been sectional. That is, production, and exchange are closely circumscribed by regionally operative social, cultural and ecological factors (after Cook 1973); (2) the units of production and consumption are the same with no market to act as a barrier between them; (3) trade-related increases in functional size of settlements in the area are not a factor in settlement hierarchy; (4) units of production within the individual hamlets would be economically autonomous with equal access to means of production; (5) surplus labor, i.e., labor beyond the time required for the laborer's own maintenance, is a necessity related to funerary ritual (mound construction specifically); (6) given the above it is doubtful that control of production factors could become the foundation of authority or coercive power.

The relationship between the material conditions required of the suggested mode of production and the distribution of environmental elements appear to result in land value differentials manifest in the observed spatial development. Some of the locational constraints for all the habitation sites have been noted; potable water, hammock environments within ½ mile of aquatic micro-environments, elevations ranging from 115-125 ft above msl., a location within less than 1 mile of the total range of habitat diversity, and a location within 2 to 3 miles of the mound site.

Additionally, ordering of site location is evident with respect to cost-benefit factors related to frequency of task repetition (acquisition of water), and risk factors related to resource heterogeneity and discontinunities of resource distribution. That is, exploitation of aquatic micro-environments is the primary mode of production and heterogeneity and discontinuities of resources affect production cost through travel and pursuit time. The location of maintenance sites near permanently watered ponds reflect these factors. In addition, travel time will be inversely related to patch size; and search or pursuit time inversely related to intra-patch resource density (after Pianka 1974; Sanders and Webster 1978; Chisholm 1968).

An examination of existing data shows that an inverse relationship exists between the frequency of task repetition (water acquisition) and the distance to that resource (spring-fed streams or ponds). This type of relationship also seems to be true with social obligations. For instance, the distance is greater between habitation and burial mounds, and obligatory social maintenance tasks were also less frequent.

Central Highlands. Although there was variation in placement of settlements and an increase in their frequency, similar types of sites were documented in the Central Highland. In addition to these changes the following were noted: (1) hamlets were dispersed around large ponds and lakes which provide a relatively dependable, high density resource base obtainable from one location; (2) density of artifact material appears to be higher than that occurring at contemporaneous sites in the northern survey area, probably reflecting larger populations; (3) platform mounds in association with burial mounds occur (at the McKeithen site and Peacock Lake); (4) non-local items of exchange, including perishable food from marine environments, were in evidence at least one mound center.

Discussion

In the development of ranked society the number of valued status positions become limited (Fried 1967: 109). The investigation of this phenomenon is usually couched in terms of the development of "chiefdoms", a term avoided in this paper. While this may appear as semantic maneuvering, "chiefdom" is a loaded term. It represents the reification of the form conceptual categories take (e.g. economic, political and ideological institutions) within this developmental stage. Expectations of socio-political processes have been established primarily on the basis of ethnographic data from Polynesian society. Hence, Polynesia became a reductionist yardstick by which one measured the development of other groups.

In addition, the identification of the totality of influential variables possible in the emergence of inequality has been hampered by theoretical dogma involving production and distribution (redistribution) issues. In the emergence of social stratification and institutional inequality it is: (1) participation of the producers and control over the scarce material means of the production process that has been the object of study (Fried 1967; Sahlins 1962, 1965); and, (2) economic integration that was characterized by the flow of goods into and out of a center.

Such redistribution occurs on the local or village level and involves consumable goods and a "paramount" officiating. The generosity of the "chief" or "Big Man" in turn becomes the source of prestige and the platform for power (see Drucker 1965; Sahlins 1962:293-294). This particular kind of exchange is more prominent in the literature, but the types of distribution can vary with the nature of the commodity being distributed. Salisbury (1962) identifies in small scale, non-monetary economies three types of exchange with different commodity focuses: subsistence, ceremonial, and luxury. It seems more beneficial to outline these variables in a wider range of societies in our effort to understand the role of production and distribution variables in the development of ranking.

Smith (1976, Vol. 2:309-11) has shown that production resources are just one, and not necessarily the most fundamental type of resource, that can be manipulated. She questions the dominance of production sectors in the development of inequality, and feels that evidence suggests the emergence of inequality depends on imbalance in the exchange processes. Hence, she would stress the development of other modes for the accumulation of resources and reiterates her emphasis on political centralization not stratification as a primary issue focus.

This is an important point for the development of ranking in Weeden Island society since control over the material means of production does not appear to be a factor in the attainment of prestige. That is, positions of prestige are limited but all members, or satel-

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Prudence M. Rice

TRACE ELEMENTAL CHARACTERIZATION OF WEEDEN ISLAND POTTERY: IMPLICATIONS FOR SPECIALIZED PRODUCTION

The pottery of the Weeden Island period, whether that recovered from the McKeithen site (western Columbia County, Florida) specifically or from the Gulf coastal region of the Southeast in general, has borne much of the burden for illuminating inter- and intra-site workings of Weeden Island culture. Described by Willey (1949:406) as "the most outstanding of the Gulf Coast and, in many respects, of the entire aboriginal Eastern United States", some of the Weeden Island pottery (especially the elaborate effigy and derived forms) has been suggested to be the product of a full-time artisan class (Sears 1956), presumably residing at Kolomoki. Sears (1973) divided Weeden Island pottery into two general categories, "sacred" and "secular", on the basis of depositional context; that is, burials versus village middens, respectively. At the McKeithen site, Kohler (1978a) found that approximately 3% of village ceramics were "sacred" Weeden Island types. He analyzed *village* pottery from this site and used its distribution to infer social status differences in different parts of the residential area of that site. Weeden Island pottery in the village midden (incised, punctated, red, and zoned red types) was hypothesized to be trade ware, and therefore indicative of high status residence.

With the continuing significance of this pottery in Southeastern cultural-historical reconstructions, a program of technological and physicochemical analyses of Weeden Island pottery has been initiated at the University of Florida. Some preliminary findings are reported in this paper.

Sherd Sample Selection

For purposes of this report, the actual or potential variability of Weeden Island pottery as it may relate to inter- and intra-site processes (namely production and trade considered here) was considered from four viewpoints. These operated on sherd sample selection and in interpretations of the analytical results as follows:

(1) Contextual variability (Sears' mound-midden distinction)—refers to depositional context of recovery of the sherds. Thirty sherds were taken from the McKeithen village midden, and four sherds from the "sacred" context of Mound C at the McKeithen site, which has been radiocarbon dated to A.D. 487±49.

(2) Geographical (intersite) variability—relating the pottery from the McKeithen site to pottery from other Weeden Island sites. It is recognized that spatial coverage is by no means complete, and that there is a lack of good temporal control in the material selected. Nevertheless, a preliminary attempt is being made to compare geographical (site-to-site) differences in ascertaining local versus nonlocal (i.e., traded-in) production of particular pottery types. Fifteen sherds are from four sites other than McKeithen; all but two sherds are from mound locations.

(3) Typological variability—the types analyzed represent three categories of Weeden Island period pottery types: (a) those that Kohler (1978a) hypothesized to be "elite or trade wares" (n=30); (b) other proposed trade wares (n=6); and (c) 13 miscellaneous sand-tempered stamped, incised, or plain wares, presumably non-elite or "utilitarian".

These first three dimensions of variability formed the basis of the non-probabilistic selection of 49 sample sherds for analysis; their distribution is given in Table 1. The fourth dimension of variability was the focus of analysis itself:

(4) Paste variability—here are reported the results of trace elemental (neutron activation) analysis only. Physicochemical analysis, such as NAA, provide a means of characterizing pottery and clays by their particular chemical constituents, usually present in trace or minor amounts. Their most productive application to anthropological and archaeological problems has been in the areas of: distinguishing local from non-local or trade pottery; identifying specialized manufacture of formal or decorative classes of pottery; and discerning patterns of trade, exchange, or distribution of such classes of pottery. These are topics of major interest for an understanding of Weeden Island pottery and its role in Weeden Island culture.

Clay Samples

For these kinds of provenience studies, it is desirable to have samples of ceramic resources (principally clays) from the local or hypothesized trade centers in question. No clays included in this analysis were from Georgia (the postulated center of manufacture of many of the Weeden Island types), but 12 clays from Florida were included. Eight clays were from the vicinity of the McKeithen site: 2 from the stream at the northern boundary of the site, 4 from a roadcut at the northeastern edge of the site, and 1 from a depression roughly 1/2 mile south of the site. Four other clays were from scattered locations in north-central Florida, including Paynes Prairie and Orange Heights, Alachua County; plus one clay from Marion County north of Ocala, and one from Citrus County northeast of Crystal River.

Results

The "most satisfactory" grouping of the 61 samples obtained through neutron activation analysis is presented in Table 2. This grouping is partly an artifact of a number of procedural decisions made during the course of analysis, and the discussion and interpretation which follows from it refer specifically to the sherds and methods utilized in this study. Generalizations to the corpus of Weeden Island pottery from the Southeast as a whole should be made only in a spirit

Table 1.

Location: / Pottery type:	McKeithen	Palmetto	Alabama	Grinier	Other	Total
Weeden Island series						
Punctated	6	1			1	8
Incised	2 *	1				3
Red	2	1				3
Zoned Red		2				2
Carrabelle	3		1*			4
effigy	2 *			1		3
Keith Incised	3				2	5
Plain		1	1*		1	3
odd				1		1
Subtotal	18	6	2	2	4	32
Other presumed trade						
Napier Comp. St.	1					1
Pasco Plain	3					3
St Johns Plain	2					2
Subtotal	6					6
Miscellaneous						
incised	3					3
check stamp	2					2
complic. Stamp	2					2
plain	2					2
odd	1	1				2
Subtotal	10	1				11
Total	34	7	2	2	4	49

*from non-mound locations

of suggesting hypotheses for future testing. A more complete discussion of the methods of analysis is provided in Appendix I.

Nineteen elemental concentrations (ppm) present in amounts from ca 5% to a few thousandths of a percent, were used in characterization. Moderate to strong correlations existed between some of the elements, so the original 19 were reduced to 8 for the "final" grouping. Those strongly intercorrelated elements were the transition metals (Fe, Co, Sc, and Cr) and the lanthanide (rare earth) series (La, Yb, Ce, and Sm).

Cluster analyses were done using 8 standardized log variables (that is, standardized, log transformations of the elemental concentrations in ppm), through several clustering algorithms of Wishart's Clustan IC release 2 (1978). Single linkage and average linkage cluster analysis revealed that certain samples did not easily group with the body of the data. These are indicated on Tables 2 and 4 with an asterisk as "outliers"; their membership in clusters shown is regarded as provisional or doubtful. The final clustering was obtained using Ward's method of hierarchical cluster analysis. Certain clusters of sherds and clays reappeared more or less consistently, regardless of the statistical manipulations they underwent. These form the "cores" of the six clusters shown, formed at a similarity of 2.0 (Table 2).

Groups may be characterized by differing quantities or concentrations of transition metals, lanthanides, gold, zinc, and zirconium (Table 3). The group containing 6 clays immediately stands out as having low concentrations of all elements or groups. Group or cluster V has all elements present in significant concentrations. Groups W through Z have variable patterns of elemental occurrences, relative concentrations, and absences.

With regard to the components of the clusters, shown in Table 4, it should be noted that cluster W contains a variety of pottery types, but predominantly Weeden Island Punctated. It also has a subgroup that consists of 3 clay samples obtained from a roadcut near the McKeithen site. The 4 vessels from Mound C at McKeithen fall into 3 separate clusters, X, Y, and Z, plus 1 is an outlier. This agrees with the findings of Cordell (1978), who included these same 4 vessels in

Table 3. Elemental differentiation of clusters (based on relative amounts of elements and groups given; symbols are: ++ relatively high concentration; + moderate; - relatively low concentration; 0 absent.

Cluster	Transition Metals	Rare Earths	Zirconium	Zinc	Gold
V	+	+	++	+	+
W	-	-	+	0	+
X	++	++	++	0	+
Y	+	-	0	0	0
Z	+	+	0	+	0
clays	-	-	-	-	-

Table 2.

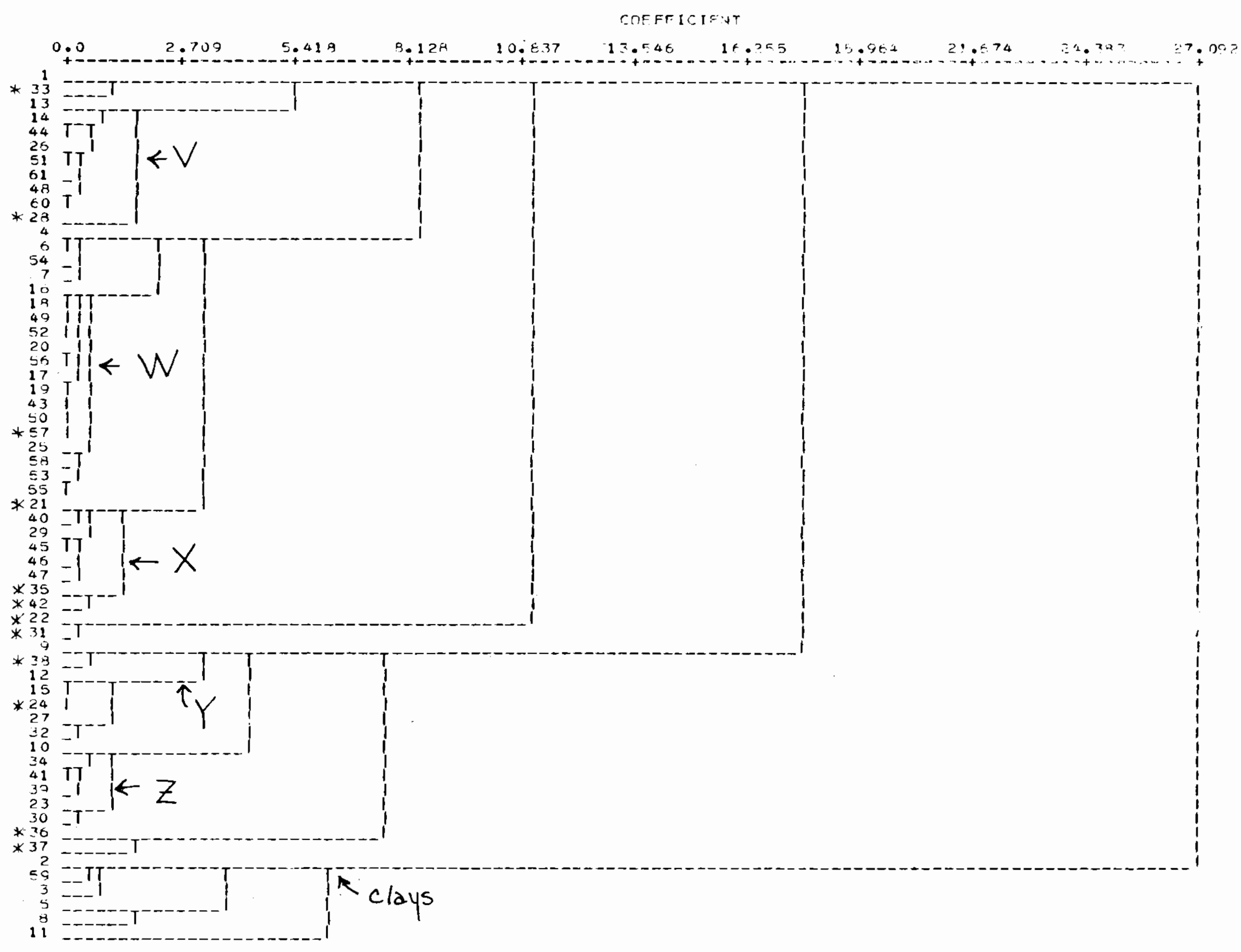

Table 4.

Provenience	type		ID#	Cluster
	Suwannee Cty. clay	c	101	V
B	effigy figure		*133	V
	Keith Incised		113	V
	Keith Incised		114	V
P	unk-cornered rim		144	V
	unknown - incised		126	V
	Check stamped		154	V
	Napier Compl. Stamped	t	165	V
	Pasco Plain	t	151	V
	unk - Compl. stamped		164	V
	unk - squared lip		*128	V
	McKeithen clay	c	104	W
	McKeithen clay	c	106	W
	Pasco Plain	t	*157	W
	McKeithen clay	c	107	W
	Weeden Is. Punctate		116	W
	Weeden Is. Punctate		118	W
	St. Johns Plain	t	152	W
	Carrabelle Punctate		155	W
	unk - incised		120	W
	Carrabelle Incised		159	W
	Weeden Is. Punctate		117	W
	Weeden Is. Punctate		119	W
P	Weeden Is. Punctate		143	W
	Weeden Island Red		153	W
	unk - Check Stamped		160	W
	Weeden Island Red		125	W
	St. Johns Plain	t	161	W
	Sand tempered plain		156	W
	Weeden Is. Punctate		158	W
	unk - incised		*121	X
W	Weeden Island Punctate		140	X
MdC	Weeden Island Incised		129	X
P	Weeden Island Zoned Red		145	X
P	Weeden Island Zoned Red		146	X
P	Weeden Island Incised		147	X
CK	Keith Incised		*135	X
A	Carrabelle Incised		142	X
	unk - incised		*122	
MdC	effigy		*131	
	Paynes Prairie clay	c	109	Y
W	Weeden Island Plain		*138	Y
	Keith Incised		112	Y
	Weeden Island Punctate		115	Y
	unk - Complic. Stamp		*124	Y
	Pasco Plain	t	127	Y
MdC	Weeden Isl. der. eff.		132	Y
	Marion Cty. clay	c	110	Z
B	unk - spiral bowl		134	Z
A	Weeden Island Plain		141	Z
W	Keith Incised		139	Z
	unk - incised		123	Z
MdC	Indian Pass Incised		130	Z
P	Weeden Island Red		*136	
P	Weeden Island Plain		*137	
	McKeithen stream clay	c	102	
	McKeithen stream clay	c	162	
	McKeithen clay	c	103	
	McKeithen clay	c	105	
	Orange Hts. clay	c	108	
	Citrus Cty. clay	c	111	

c - clay; t - presumed trade ware

Table 5.

1. context-

context	V	W	X	Y	Z	outlier
	Cluster (Paste group)					
village	3	9	1	2	1	0
mound	0	1	5	1	3	6

2. geographical-

area	V	W	X	Y	Z	outlier
McKeithen	3	9	1	3	1	1
non-McKeithen	0	1	5	0	3	5

3. typological-

type	V	W	X	Y	Z	outlier
W. I. series	3	10	6	3	4	6
"secular"	4	2	0	0	0	5

type	V	W	X	Y	Z	outlier
Weeden Island A*	0	0	4	1	1	2
Weeden Island B*	3	10	2	2	3	4
"secular"	4	2	0	0	0	5

*A types - Weeden Island Incised, Zoned Red, effigy
B types - Weeden Island Punctate, Red, Plain; Carrabelle Punctate, Incised; Keith Incised

her technological examination of the paste of Mound C vessels, and concluded that they were dissimilar.

Incised and stamped sherds of determined (e. g., Keith Incised, included within the Weeden Island series) and unknown types tend to scatter in all groups. The 6 sherds of "presumed trade wares" other than Weeden Island types similarly have a broad scatter. Napier Complicated Stamped, for example, with a hypothesized center of manufacture in northern Georgia on distributional grounds, falls in with a number of presumably local types. It may be argued that copies of Napier Complicated Stamped were made locally; or, alternatively, that the sherd analyzed was misidentified as to type. The 3 Pasco Plain sherds do not group together as would be expected if this type had a single locus of manufacture, nor do the two St. Johns sponge-spicule paste sherds appear to have a distinctive origin.

We may now examine the content of these trace elemental clusters with respect to the dimensions of variability discussed in the introduction to this paper (Table 5).

(1) With respect to example 1 on Table 5, contextual variability, although there are different distributions between village and mound as represented by the sherds analyzed, comparison between sites (contexts) is not really legitimate because differences may be due to local geology. Within the McKeithen site alone, comparisons between midden and mound cannot legitimately be made, because different types were taken from these different contexts.

(2) The geographical distribution shown on Table 5 is essentially the same as contextual, further illustrating that the sample is not controlled for context as discussed above. At the McKeithen site, pastes V, W, and possibly Y appear to be local to McKeithen, and note that W was the paste that clustered with the clays taken from near the site. Pastes X and Z seem to be non-local, i.e., associated with sites other than McKeithen.

(3) In terms of typological variability, Weeden Island series types and utilitarian ("secular") types are both made of V and W paste groups; except for one W paste sherd, all V and W paste sherds are from McKeithen and not from other sites. This suggests local manufacture of both utilitarian and Weeden Island series. However, if the Weeden Island series types alone are divided into two groups, a different pattern emerges, shown in the second table under (3) on Table 5. At McKeithen the Group B type sherds occur in the same paste as do the "secular" sherds (i.e., V and W); all are from the village midden area of the site. Group A type sherds from McKeithen are all from Mound C, consisting of one sherd each of paste X, Y, Z, and an outlier.

Interpretation

The central hypotheses as to local or nonlocal manufacture and distribution of Weeden Island "sacred" types (ignoring depositional context for purposes of this argument) can be idealized and simplified for graphic representation (Table 6). In this table, the alphabetic letter designations A, B, etc indicate trace elemental groups of similar paste composition, interpreted as discrete resources or preparation involved in production. In hypothesis H1b, for example, the "sacred" types show up in more than one paste group, but the groups are constant regardless of site (e. g., pastes A, B and so on show up at all sites). "Secular" types are of different groups at each site indicating local manufacture and no trade or exchange.

These models are not considered to exhaust the possibilities for manufacture and distribution of Weeden Island pottery, but they portray the central hypothesis proposed to date, and one alternative. Obviously these models are both simplifications and idealizations of what is doubtless going to be a more complex reality. Any number of factors, cultural, natural, and analytical, could operate to confuse the picture, including the possibilities that: (1) *all* pottery was traded, including the secular types; or perhaps only the secular types; (2) regionally all clays are very homogeneous and cannot be separated out into distinct groups of pottery; (3) clays were traded; (4) post-depositional factors altered the pottery trace elemental pattern; etc.

However, granting for a moment the validity of these schematic models of the relationship between trace element groups and production/distribution patterns, we can arrange the hypotheses in order of increasing complexity of production/distribution and, by extension, in order of increasing sociopolitical or socioeconomic complexity and centralization. Hypothesis 2b represents the simplest structure: in it the sacred-secular dichotomy appears to be purely depositional (as well as obviously formal or stylistic), but cannot be used except negatively for inferences of socioeconomic structure (organization of production or trade) of the society. Hypothesis 1a appears to be the most complex and indicates the highest degree of politico/religio/social centralization. There is one center of manufacture of the "sacred" vessels; from that center they are distributed to other sites within a sphere of political, economic, or religious influence, where they are "disposed of" in mortuary ritual and/or in elite usage. The resources used in their manufacture are different from those used in manufacture of "secular" vessels, presumably used for more prosaic or non-elite service, which further reinforces their uniqueness and status.

Table 6.

H_1: The "sacred" types have restricted center(s) of manufacture; "secular" types are locally manufactured.

H_{1a}: "Sacred" types are made at one center of manufacture and traded out; "secular" types are locally manufactured.

site	"sacred"	"secular"
1	A	B
2	A	C
3	A	D

H_{1b}: There are a few centers of "sacred" manufacture from which the vessels are traded; "secular" types are locally manufactured.

H_{1b1}

site	sacred	secular
1	A,B...	C
2	A,B...	D
3	A,B...	E

H_{1b2}

site	sacred	secular
1	A,B,D	A,D
2	A,B...	C
3	A,B,E	E,F

H_2: All types, "sacred" and "secular", are locally made at each site.

H_{2a}: Different clays are used for "sacred" and "secular" types.

site	"sacred"	"secular"
1	A	D
2	B	E
3	C	F

H_{2b}: The same clays are used for "sacred" and "secular" types.

site	"sacred"	"secular"
1	A	A
2	B	B
3	C	C

Interpretations of the manufacture and distribution patterns of the Weeden Island sherds included in this study should be afforded by comparing the distribution of the paste clusters from Table 4 with these models. Diagramatically, following the form used above in Table 6, the paste clusters obtained through neutron activation analysis are distributed as below:

	Paste Clusters							
	Weeden Island series types					"Secular" types		
Site								
McKeithen	V	W	X	Y	Z	V	W	(Y?)
Palmetto Island		W	X					
Mitchell, Ala.			X		Z			
Grinier, Fla.					Z			
Other			X		Z			

These data suggest that while the "sacred/secular" *depositional* context distinction may hold true for Weeden Island series pottery, the Weeden Island series itself appears to have a relatively complex pattern of manufacture and distribution. Although the samples analyzed herein do not represent a full range of types from both mound and village contexts, preliminary indications are that types of the Weeden Island series itself can be divided into "trade" and "local" classes. Compared to the hypothetical models postulated above, the pattern appears to conform closest to hypothesis 1b2; that is, where there are multiple centers of manufacture of "sacred" types and local usage of some paste(s) for utilitarian and "sacred" types.

"Local" manufactures within the Weeden Island series are identified with paste clusters V and W. Paste cluster W was discussed above as having a subcluster consisting of three clays taken from a roadcut near the McKeithen site. Cluster V is tentatively interpreted as a grouping of McKeithen local manufactures as well, even though no clays were grouped into the cluster, largely because all but one of the samples are from the McKeithen site and because of the results of one of the average linkage clustering runs (see Appendix I, point (2) under "Grouping"). Keith Incised is a Weeden Island series type that occurred in paste group V.

Besides Keith Incised, other types in the Weeden Island series at McKeithen that appear to be of local manufacture are Weeden Island Punctated, Weeden Island Red, Carrabelle Punctated, and Carrabelle Incised. (Weeden Island Plain probably also falls in this group, although no samples from McKeithen were analyzed.) Except for sherd #143, a Weeden Island Punctated sherd from Palmetto Island that fell into

Group W (suggesting McKeithen manufacture), the sherds of these types from the different sites sampled fell into a variety of paste groups, suggesting multiple centers of manufacture.

Some types in the Weeden Island series may indeed be non-local manufactures, traded into the McKeithen site and/or into other Weeden Island period sites in the Southeast. Represented by pastes X, Z, and possibly Y, in the schematized version, the types include Weeden Island Incised, Weeden Island Zoned Red, and various effigy forms. Samples of these types were taken from Mound C at McKeithen and from the other mound sites included in this analysis; they seem to be of non-McKeithen pastes (i.e., groups X and Z) as clustered through the procedures described. Cluster Y is difficult to interpret; the items in the cluster are variable both in terms of provenience and type (though primarily "secular") and one clay sample, from Alachua County, is associated. This grouping may represent another aspect or dimension of local/secular manufacture of pottery in the north-central Florida area that needs further exploration.

Summary and Conclusions

In summary, there are certain things that can and cannot be said about Weeden Island pottery from this analysis. It is recognized that there is no adequate time control on samples from sites other than McKeithen included in the analysis. Indeed, the village middens at McKeithen represent a period of occupation from A.D. 100 to 750, and an alternative interpretation of the clusters obtained through this analysis may be based on time rather than on local-nonlocal manufacture. There is some indication that the sherds in cluster V paste ("secular" types) are middle-late phase and mostly from the northern midden area, while those of cluster W paste ("local sacred") are primarily early-middle and mostly from the southern midden area of the site. It will be remembered that cluster W includes a number of Weeden Island Punctated sherds. Kohler (1978b) has suggested that this type appears to lose status by the later phases of occupation of McKeithen, being found in a wider range of status contexts in the midden. Thus cluster W sherds may represent a time as well as manufacturing dimension. Future analyses will be directed toward further exploration of temporal differences in resources used in manufacture at McKeithen.

Equally important is that for secure attribution of "local" or "nonlocal" status to pottery manufacture, a variety of clays from all areas under consideration is essential. In this study I used only clays from Florida. No clays or sherds from Kolomoki, the southwest Georgia site postulated as a possible source of some of this pottery, were used; nor were any clays used from the vicinity of other sites yielding sherds used in this analysis. Consequently, except for the material that more or less clearly appears to be from McKeithen, no other sites or regions of manufacture can reliably be suggested on the basis of this analysis. Future studies will also attempt to obtain broader geographic sampling of clays and pottery for analysis.

More positively, what can be stated with a fair degree of assurance is that although the mound versus midden depositional distinction for the occurrence of Weeden Island series vs. stamped utilitarian types holds up in general, the Weeden Island series itself appears to have a relatively complex provenience structure that is only hinted at here. This pattern is more complex than a simple "sacred" appellation, and the associated model of a single center of manufacture, would suggest.

On the basis of sherds and methods utilized in this study, there would appear to be multiple centers of manufacture of Weeden Island series "sacred" types. A relatively few (as yet unlocated) areas were engaged in manufacturing certain types such as Weeden Island Incised, Zoned Red, and effigy forms, and these may have been traded to various sites in the Southeast. Other types within the Weeden Island series appear to have been locally manufactured and locally "consumed", at least on the village level.

Acknowledgements

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Appendix 1: Description of Methods

Analysis

Fragments of sherds selected for chemical analysis were prepared as follows. Sherds were heated in an electric furnace for 2-1/2 hours in an oxidizing atmosphere to a temperature of approximately 700° C. They were cleaned of dirt and slips by removing approximately 0.5 mm with a tungsten carbide drill, then the sherd was ground into a powder in an agate mortar. Small samples weighing 0.125 to 0.500 mg were irradiated for 7 hours in the nuclear reactor on the University of Florida campus, operating at a flux of 8.563×10^{11} neutrons/cm^2/second. The samples were analyzed using a Ge(Li) detector system with 2048 channels.

Samples were analyzed three times after decay periods of 5, 30, and 90 days to pick up short, intermediate, and long half-lived elements. Of these trace and minor elements, 19 were selected on the basis of nuclear, geochemical, and archaeological criteria to be experimentally the most reliable. These were ultilized in various combinations in the two major operations ot this study: chemical characterization of the samples, and then use of this characterization data to form groupings of like samples through cluster analysis.

Characterization

The 19 elemental concentrations, which varied in the sherds from about 5 percent (iron) to a few thousandths of a percent (gold), were translated into a logarithmic scale for further multivariate analysis in order to minimize skewing caused by extreme values. Pearson product moment correlations and principal components factor analysis of the standardized log data indicated a complex structure of variable intercorrelations. Basically, the 19 variables could be divided into three groups: (1) the transition metals, including Sc, Cr, Fe, and Co, which were intercorrelated with Ce and Cs; (2) the rare earth or lanthanide series, La, Yb, Sm, and Ce, the latter element correlating strongly with the transition metals; and (3) miscellaneous elements not correlated with either of the above groups or among themselves; these include Hf, Zr, Zn, Au, Rb, and lanthanides Eu, Ta, and Lu.

The net effect of such intercorrelations is that rather than having 19 independent, individual, equally weighted data points, instead there are 10 individual points of equal weight plus 2 heavily weighted points of 5 and 4 members each.

The final grouping presented in Table 4 attempted to correct for this problem by eliminating some of the strongly intercorrelated variables. The eight variables used in the clustering are: Sc, Fe, Ce, Hf, Zr, Zn, Eu, and Ta. Ce was included because although it is weakly correlated with Sc and Fe, it very strongly correlates with lanthanide elements Yb, La, and Sm, which were eliminated. There was actually little change in the patterning of the clusters of data between those achieved through use of all 19 variables and those on the reduced number.

Grouping

The computer program used for the cluster analysis was Clustan IC release 2 (Wishart 1978). This program provides a number of options for similarity coefficients (variance or distance) and for clustering algorithms, all of which reveal different aspects of the structure of the data set.

1. A single linkage cluster analysis was run on the raw (non-log) data, using the Euclidean distance coefficient. Single linkage forms small clusters of the most similar objects, then adds successively less similar members. This method tend to form "chains" instead of what are usually considered "clusters". Such a tendency may be useful in preliminary clustering, however, because those members added on at the end of the operation are less similar to the total data set and may be regarded as "outliers". Eleven of the samples in this analysis were "outliers" of the main body, and are indicated on Tables 2 and 4 with asterisks.

2. Several average linkage clusterings were run on the log data using Pearson product moment correlation as the similarity measure. The effect of this procedure was to form groups of sherds and clays based on similar forms or "shapes" of elemental occurrences (e.g., high on A and B and low on C) rather than on their corresponding absolute values.

In terms of the particular data set being reported on here, one such linkage performed on the data using all 19 variables resulted in the removal of 5 sherds from cluster W and their placement in a cluster with the clay samples. Interestingly, 4 of the 5 sherds removed from this cluster were undecorated (non-Weeden Island series) sherds that might be presumed to be untempered clays (2 St. Johns, one incised, and one sand-tempered plain). The resultant sherd and clay grouping then clustered with cluster V in this run.

When average linkage clustering is performed using only eight variables, three main clusters of sherds are formed. But all the outliers are placed outside these clusters rather than being tacked onto the core groupings. The outliers appear because of their shape or form distortions along the eight main elements. When all elements (variables) are used, the overall similarity of outliers to the core clusters appears to increase.

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Marian Saffer

TECHNOLOGICAL ANALYSIS OF SOME SAPELO ISLAND POTTERY: SOCIAL AND/OR FUNCTIONAL DIFFERENCES

The preliminary analysis of pottery from the Kenan Field site has shown a marked association of certain decorative modes and aplastic constituents. The correlations of grit inclusions (quartz greater than 1.0 mm) with check stamping and grog inclusions (clay lumps) with cord marking are striking because typically in coastal archaeology, they would be attributed to temporal differences. However, this explanation will not suffice for the present case, because the two kinds of pottery, grit/check stamped and grog/cord marked, are clearly contemporaneous. Ceramic technological analysis was employed to test alternative hypotheses about the correlation of traits, with results which support independently derived hypotheses about the Kenan Field site.

There are a number of explanations for regular physical differences in pottery manufactured at the same time period. The patterns may reflect the exploitation of two kinds of clay, the working characteristics of which demanded different techniques of manufacture or decoration. The patterns may reflect differential exploitation of clays, tempers, and decorative elements by distinct manufacturing units of some kind, for instance, lineages. The patterns may be indicative of function differences between the two categories of pottery. It is toward evaluation of the latter two hypotheses that the technological data were applied, that is, the manufacturing group difference and the function difference.

The pottery in question was excavated from two Savannah period (A.D. 1200-1520) structures at the Kenan Field site, located on the barrier island, Sapelo. The structures, designated I and II, were apparently large, low platforms and consisted in part of lines of rectangular postholes, regularly spaced and oriented. The structures are at the periphery of an open, plaza-like area. Structure I may be as large as 35 by 50 meters, but Structure II appears to be smaller (Crook 1978).

Both structures have some shell-filled pits, ashy concentrations that may have been from small fires, and organic stain areas. There were two hearths in Structure I, one of which yielded a radiocarbon date of A.D. 1155±75 years. The hearths in Structure I were found at the edge of a low, in-structure mound, which may have served to drain rain water from that activity area. Structure II had one hearth which appeared to be contemporaneous with the structure. Structure II had no mound, but two wall trenches were exposed, one of which divided the structure into north-south halves.

The spatial distribution of debris was also different in the two structures. In Structure I, pottery and other materials were present throughout, with check stamped pottery most frequent along the north wall, and plain and cord marked pottery most frequent in the interior areas. In Structure II artifactual materials came almost exclusively from along the north wall, with only sparse scatters of sherds and bone in the interior areas. In Structure I check stamped pottery was most frequent (33% of total) and in II cord marked pottery was most frequent (28% of total).

Crook (1978) has posited an interpretation of these structures which is based upon the artifact inventories, spatial distributions of artifacts and features, the features, and ethnohistoric documents. He suggests that the size of Structure I, its proximity to the plaza, and a number of exotic artifacts indicated that some sort of community activity was carried out there. In addition however, the structure may have served as a residence, which is reflected by the size of the hearths and the refuse pits.

Crook's interpretation of Structure II is that it also was for community activity of some sort. More specifically, he sees evidence that groups of individuals held decision-making meetings there, and were attended by other persons who were involved in food preparation and cooking. On the basis of ethnohistoric documents, Crook has inferred that the individuals at the meeting were of high status. Again, the size of the structure, location, and debris distribution contribute to the interpretation (Crook 1978).

The pottery from Kenan Field was categorized initially with a cross-classification system (rather than "typing"), the dimensions of which were two variables: decorative mode and aplastics (a term inclusive of temper and naturally occurring inclusions). The use of this method for classifying pottery avoids relying upon the accepted but problematic typology in current use by coastal archaeologists. Using the established typology may have resulted in forcing the data to fit the pattern, rather than examining the data to detect patterns. Moreover, the association of grog with cord-marking and grit with check stamping would not have been documented (Figure 1).

After noticing the aplastic/decoration association in pottery from Structures I and II, technological analysis was carried out to define other traits in the categories and to facilitate interpretation of the differences.

The physical traits of a pottery vessel may vary according to the function intended for that vessel, particularly traits built in or controlled for by the potter in the process of manufacturing and/or the selection of raw materials. If check stamped/grit pottery and cord marked/grog pottery from Kenan Field served different purposes, they may be expected to show consistent variation in any of a number of traits. The same kind of consistent variation may be seen in pottery made by different groups with access to or preference for differing raw materials and techniques of manufacture. The specific hypothesis guiding the technological analysis was that discreet constellations of physical traits would be found for each pottery category, and that those clusters of traits may be related to raw materials and/or manufacturing techniques. The point of the analysis was not to test or support one of the above explanations vis-a-vis the other as the cause of the observed trait correlation. Rather, the purpose of the technological measurements was to see if the distribution of traits was nonrandom, in which case either explanation—"manufacturing group" differences or functional differences—is possible.

Numerous variables may be examined to form a body of data for the purpose of comparing two categories of pottery. A number of these variables were measured on 30 sherds from the check stamped/grit pottery and on 30 from the cord marked/grog pottery. The variables studied were color, coring, scratch hardness, porosity, thickness, and the particle sizes and proportions of aplastics. The data are at various levels of measurement, some appropriate for statistical treatment, and some not. It should be emphasized that even a marked disparity in one variable cannot be considered definitive evidence in favor of the hypothesis being tested. The interest is in patterns of the variables together. A summary of the data follows.

The first variable to be considered was surface color. On the basis of measurements done with a Munsell Soil Color Chart, four mutually exclusive color categories were set up for the samples. The color categories may be indicative of, among other things,

	Grit	Grog
Check-stamp	226	27
Cord-mark	58	278

Figure 1.

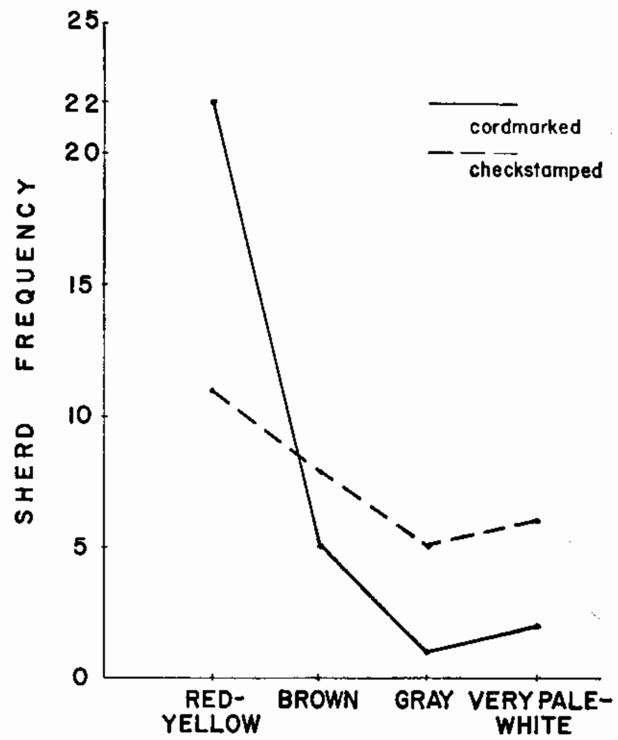

Figure 2.

variation in firing conditions and coloring agents in the raw clay. The latter are principally iron compounds and organic matter. The distribution of colors for each pottery sample has been graphed (Fig. 2) and a Chi-square significant at .001 indicates that the distribution of colors is not random. There is a higher proportion of the cord marked pottery in the color categories which indicate more complete oxidation of coloring agents than there is of the check stamped pottery. Eighty per cent of the cord marked pottery appears to be well-oxidized, as opposed to 56% of the check stamped.

The second variable considered was coring. The term coring refers here to the presence of grayish or brownish colors in a sherd's cross-section indicative of unoxidized, charred organic matter. Coring is a function of firing conditions, paste density, sherd thickness, porosity, and the initial amounts of organic matter in a clay. The sample sherds were rated from zero to five for degree of coring. Zero was 'no core', one was 'light core', two and three were 'moderate core', and four and five were 'heavy core'. The results were that 50% of the check stamped sample was heavily cored, 40% was moderately cored, and 10% had no coring. The cord marked sherds overall exhibited lesser degrees of coring, with 60% moderate and 40% lightly or not cored. As with the surface color results, the cord marked sherds tend to be more fully oxidized.

The third variable was hardness. Hardness is a dimension affected by the particle sizes of the clay and aplastics, firing conditions, chemical and mineralogical composition of the raw materials, and post-depositional factors. Scratch hardness tests with Mohs' Hardness Scale yielded mean hardness measurements of 2.7 for the check stamped sherds and 1.5 for the cord marked. The maximum hardness for the cord marked group was the minimum for the check stamped.

Sherd porosity was also measured for the data set. Porosity has to do with the permeability of the clay body and is computed as the ratio of the volume of pore space to the volume of the piece. Like color, coring, and hardness, porosity is affected by many factors. The mean apparent porosity for the check stamped sample was 28.6%, and for the cord marked it was 36.5%. A comparison of the means was significant at 0.1. The cord marked sherds are decidedly more porous, a trait that may have been caused by different sizes and shapes of aplastic inclusions, more complete firing and therefore less charred matter clogging pore spaces, or a difference in the texture and composition of the raw clays employed.

Sherd thicknesses were also measured. Three measurements were taken for each sherd and the mean recorded as the thickness. The mean thickness of the cord marked sample was 0.8 cm and for the check stamped it was 0.7 cm. Small differences in thickness in handmade pottery is subject to slight variation by virtue of the manufacturing method. Ranking the thickness measurements for each sample demonstrated a great many interspersed values, thus the small variation must be interpreted carefully.

The last variables to be considered are the particle sizes and proportions. Aplastic particle sizes and quantities affect several of the preceding dimensions, including hardness, porosity and coring. The sherds were examined under a magnification of 70x to rate particle sizes by the Wentworth Scale (Shepard 1956) and to estimate relative quantities.

In all 30 cord marked sherds and 29 check stamped, sand was the most frequent inclusion and was always rated 'abundant', the highest frequency rating. In the cord marked sherds grog was the next most frequent inclusion type, whereas in the check stamped, grit was. There were several minor types of inclusions, but they were uniformly rare in each sample. The samples appear to carry equivalent loads of aplastic inclusions, even though one has grog and the other has grit. However, the sand in the two samples was not of the same size; the sand in the cord marked pottery is smaller than that in the check stamped pottery.

A summary of the data shows the following. The cord marked sherds show more oxidized color development and less coring than the check stamped sherds. The coring also points to more oxidation in the cord marked sample. The check stamped sample is harder than the cord marked. A reducing atmosphere as opposed to an oxidizing one may increase hardness. A reducing atmosphere would also cause dark surface colors and coring. Although there is a great deal of overlap in thickness distributions, the mean thickness of the check stamped pottery is less than for the cord marked. Finally, the two samples contain comparable loads of aplastic inclusions but not comparable size categories; the cord marked pottery has smaller sand particles.

With the preceding information the most parsimonious explanation of the group differences, in technological terms, hinges on the relative levels of oxidation in the two samples. Different firing techniques are posited as the reason for differences in color, coring, porosity, and possibly hardness. Less complete oxidation resulted in larger quantities of charred organic matter in the pore spaces of the check stamped sample, which has the effect of clogging the spaces and reducing permeability. The incomplete oxidation may be caused by a reducing atmosphere which could also increase hardness.

From the data just presented, it is apparent that a number of quantifiable differences between check stamped/grit and cord marked/grog pottery do exist. These differences bear out the research hypothesis that discreet constellations of traits related to raw materials and/or manufacturing techniques exist for the two samples. Specifically, the dark colors, heavy coring, and lower porosity of the check stamped sample point to firing conditions insufficient for complete oxidation of organic matter. For whatever reason, the two pottery categories were produced in a consistently different manner, even beyond the obvious differences of decoration and aplastic inclusions.

The question now is, why would these differences exist? If functional distinctions led to the variation, at least some of the properties should relate to functional, working characteristics. In fact, porosity, hardness, and thickness—dimensions in which the samples do vary—are related to such characteristics as strength, absorbent behavior, and resistance to weathering, shock, abrasion, and thermal stress. Therefore the explanation of functional differences as a source of physical variation cannot be eliminated.

To illustrate how the traits defined for each pottery type might be related to a difference of function, one could suggest that the cord marked pottery was a cooking ware, and the check stamped pottery for storage or container use. A potter manufacturing a cooking vessel would want an item which could withstand repeated shock and handling. By using a paste with large quantities of sand particles, a certain amount of porosity could be expected: porosity is a positive trait for withstanding the stresses of thermal expansion and contraction. A thicker vessel would be more heat retentive, another positive trait for cooking. In addition, a cooking vessel is repeatedly exposed to heat and so may continue to oxidize through usage. The Structures I and II cord marked pottery exhibits such traits, at least relative to check stamped pottery. On the other hand, a less porous vessel would be relatively more watertight, a desirable characteristic for a container. Also, a storage vessel would be subject to less handling than a cooking pot and so thinner walls might be acceptable. The check stamped pottery possesses these traits, relative to the cord marked.

It is interesting to note that in fact, cord marked pottery in Structures I and II had a relatively high frequency of association with faunal remains. This may be viewed as independent data supporting the idea that cord marked pottery at Kenan Field functioned as a cooking ware.

The viability of the explanation pivoting on manufacturing group differences must still be considered as a source of the detected patterning. Since, as had already been noted, raw materials differ between the samples, and in all likelihood manufacturing techniques do also, the possibility of separate units manufacturing the pottery can not be dismissed.

To substantiate the validity of one of these hypotheses over the other, further testing should take place. In further excavation for example, if it were found that the two kinds of pottery had an uneven distribution in a series of residential structures, one could say the manufacturing group difference had been supported. That is, such a difference could be construed to be related to kin group differences. But at this time, we can test the functional difference hypothesis against Crook's interpretation of Structures I and II.

Though Crook believes both were some sort of community-use structures, Structure I also looks like a residence—thus it would have served a dual purpose, as opposed to the solely community activity in Structure II. One would expect diverse types of activities in the structures to leave diverse artifact types and patterning. We have seen that this is the case, in patterns of deposition, types and spatial associations of features, and types of artifacts recovered, particularly pottery type frequencies. Structure I had a much higher frequency of check stamped pottery, and the situation is reversed in Structure II, where cord marked pottery dominated. Assuming that Crook has correctly assessed the existence of some functional differences between the two structures, one would expect to find a variation in pottery distribution. Since this is in fact the case, I consider the functional difference explanation to be supported by independent data.

At this stage of Kenan Field research, the functional explanation seems strongest, or at least more elegant, because it treats more of the observed differences, in more detail. Moreover, Crook's hypotheses about the structures are in agreement with the function difference hypothesis. It is important to note that Crook's ideas were developed and tested independently of the pottery data analysis. The concurrence of hypotheses arises from separate data bases. It is clear, in any case, that the investigation, beyond cursory classification, into technological properties of coastal pottery has the potential to contribute insights to a variety of archaeological problems-social, functional, and chronological.

Acknowledgements:

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John F. Scarry

THE CHRONOLOGY OF FORT WALTON DEVELOPMENT IN THE UPPER APALACHICOLA VALLEY, FLORIDA

Fort Walton chronology

During the period of 1971 to 1975, a program of survey and excavation was carried out in the Upper Apalachicola River Basin by Case Western Reserve University and Florida State University. This program concentrated on examinations of the two latest prehistoric cultures of the area—Weeden Island and Fort Walton—and has resulted in a number of reports detailing various phases of the program (Brose 1975a, 1975b; Brose and Percy 1974, 1978; Brose *et al.* 1976; Jones 1974; Percy 1971, 1972, 1976a, 1976b; Percy and Brose 1974; Percy and Jones 1976; Scarry 1975, 1977). One major aspect of the program was the investigation of the timing and processes of the development of the Fort Walton culture.

Fort Walton was originally defined as the latest aboriginal ceramic complex in northwest Florida (Willey and Woodbury 1942). This definition was based on data from a survey of 87 sites in northwest Florida, augmented by limited stratigraphic test excavations at six of these sites. Later, in 1949, Willey presented a fuller definition, noting that ". . . the Fort Walton culture is essentially Mississippian in type and equated with the late Middle Mississippian time horizon in the Southeast" (Willey 1949:455). Unfortunately, Willey's data were limited, and his definition necessarily vague and general.

However, since the formulation of these initial constructs, a considerable amount of additional research has been conducted, resulting in a greatly enlarged data base. These additional data have allowed the formulation of a refined chronology for the Fort Walton Period in the Upper Apalachicola Valley. The data also permitted a more detailed examination of models of Fort Walton development, particularly those aspects of the models concerned with the dating of the change from Weeden Island to Fort Walton and the processes involved in that change.

Largely based on the work directed by Brose and Percy, but also utilizing data from previous research in the Apalachicola Valley and related areas, six phases have been tentatively identified for the late Weeden Island and Fort Walton periods. These phases are: the Wakulla phase; the Chattahoochee Landing phase; the Bristol phase; the Cayson phase; the Sneads phase; and the Yon phase (Fig. 1). Full and complete definition of these phases will be presented later, in a more detailed study of Fort Walton development in the Upper Apalachicola Valley. The present discussion will concentrate on minimal definition of each of the phases and the relation of the phases to the questions of the chronological placement of the change from Weeden Island to Fort Walton and the mechanism by which this change took place.

The Wakulla phase is the earliest, and at the present, best known of the late prehistoric phases to be discussed here. It has been widely recognized as a temporal and regional variant of Willey's Weeden Island II culture (cf. Bullen 1950; Hurt 1975; Kelly 1953; Milanich 1974; Percy and Brose 1974; Sears 1977). Sites of the Wakulla phase are extremely common in the Upper Apalachicola and Lower Chattahoochee Valleys and several of these sites have been investigated in considerable detail. The present definition of the phase is largely based on data acquired by Milanich at the Sycamore site, 8Gd13, and Percy at the Torreya site, 8Li8 (Milanich 1974; Percy 1971, 1972). As defined here, the Wakulla phase can be equated to Percy and Brose's Weeden Island 5.

The ceramic assemblages of the Wakulla phase are marked by extremely high frequencies of the type Wakulla Check Stamped. At the Sycamore site, Milanich found that Wakulla Check Stamped formed 47.6% of the total ceramic assemblage and 81.5% of the decorated wares (Milanich 1974:16, Table 4). At Torreya, this type comprised 66.3% of the total assemblage and 97.7% of the decorated pottery (Percy 1976:Table 9) (see Table 1). Percy and Brose note that the remainder of the Wakulla phase assemblage includes ". . . very limited representation of [Weeden Island types featuring] incising and punctating, and a minor occurrance of corn-cob marked pottery" (1974:6). At Sycamore, Northwest Florida Cobmarked was the second most frequent decorated type, forming 4.6% of the total assemblage and 7.9% of the decorated pottery (Milanich 1974:16, Table 4). The plain ceramics of the Wakulla phase are, like those of the succeeding phases, divisible into categories based on surface treatment. At Sycamore, smooth plain accounted for 22.0% of the total (52.5% of the plain wares) while rough plain formed 20.0% (47.5%).

A number of radiocarbon dates have been obtained for the Wakulla phase. As may be seen in Table 2, these cluster in the 9th Century A.D. The dates for the Sycamore site have been averaged, following the procedure of Long and Rippeteau (1974), and the resulting date corrected according to Damon *et al.* (1974) to yield a calendar date of A.D. 876. This compares well with the date from the Nichols site (Daugherty *et al.* 1971). These dates, coupled with dates from similar sites elsewhere in northwest Florida, suggest a time span for the Wakulla phase of A.D. 800-900.

The Chattahoochee Landing phase, the second phase to be defined here, has been established on the basis of data from Chattahoochee Landing, Curlee, and Cayson. The components of this phase contain the first indications of relationship to Mississippian cultures elsewhere in the Southeast.

As was the case for the Wakulla phase, ceramic as-

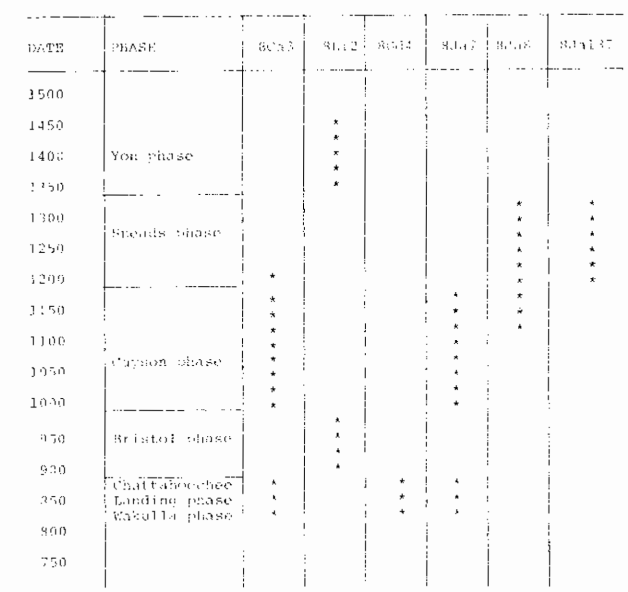

Figure 1. Chronological framework for the Upper Apalachicola Valley.

TYPE	8Li8			8Gd13		
	#	Total	Decorated	#	Total	Decorated
Residual Plain	1708	(32.2)		2779	(41.6)	
Wakulla Check Stamped	[illegible]	(66.3)	(97.7)	[illegible]	[illegible]	[illegible]
Carrabelle Incised	3	(0.1)	(0.2)	56	[illegible]	(1.7)
Carrabelle Punctated	1	[illegible]	(0.03)	[illegible]	[illegible]	(1.3)
Keith Incised	8	(0.1)	(0.2)	[illegible]	[illegible]	[illegible]
Tucker Ridge Pinched	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Weeden Island Incised	1	[illegible]	[illegible]	[illegible]	–	–
Weeden Island Punctated	20	[illegible]	[illegible]	[illegible]	–	
Complicated Stamped	26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cord Marked	0		–	[illegible]	[illegible]	[illegible]
Cob Marked	0	–	–	[illegible]	[illegible]	[illegible]
Miscellaneous Decorated	21	(0.4)	[illegible]	[illegible]	[illegible]	[illegible]
Weeden Island Plain	17	[illegible]	[illegible]	[illegible]	–	[illegible]
TOTAL	[illegible]			[illegible]		

Table 2. Wakulla phase radiocarbon dates.

Sycamore site, 8Gd13 (Milanich 1974)		
I-7258	955±85	AD 995
I-7255	1055±85	AD 895
I-7252	1090±85	AD 860
I-7253	1090±85	AD 860
I-7256	1125±85	AD 825
I-7254	1145±85	AD 805
AVERAGE	1077±35	AD 873
NEW AVERAGE*	1090±43	AD 860
CALENDRICAL CORRECTION	1074±66	AD 876
Nichols site, 8Wa3 (Daughery <u>et al</u>. 1971:21)		
FSU-154	1145±40	AD 805
CALENDRICAL CORRECTION	1126±65	AD 824

semblages of the Chattahoochee Landing phase are marked by very high frequencies of Wakulla Check Stamped. However, while the two phases share this dominant type, there are differences between their typical ceramic assemblages. At Wakulla phase sites, Wakulla Check Stamped forms 45-70% of the total assemblage and at least 75% of the decorated pottery. For the Chattahoochee Landing phase, these frequencies are reduced to 20-30% of the total and 55-80% of the decorated pottery (Table 3).

Bullen noted differences between the Wakulla Check Stamped found at Chattahoochee Landing and that found at nearby Wakulla phase sites. He states that check stamped sherds from Chattahoochee Landing are

> . . . similar to those from the Fort Walton zone of site J-5 but differ from those found at sites J-18 and Ja-62 and in the Deptford zone at site J-5. Those from G-4 were made of a less sandy paste and have the smooth frequently black interior surfaces lacking at sites J-18 and Ja-62. They do not have a Weeden Island type of rim. There is less difference, however, in the character of the stampings themselves (1958:351).

Unfortunately, Bullen's observations have not been demonstrated at other sites. While his distinctions may hold at these particular sites, they are not sufficient to distinguish between components of the Wakulla phase and those of the Chattahoochee Landing phase in general.

While varietal differences in the type Wakulla Check Stamped may not serve to distinguish Chattahoochee Landing phase assemblages, the overall composition of these assemblages is sufficiently distinct to permit identification. It is in the ceramic assemblages of the Chattahoochee Landing phase that Fort Walton period types first appear. Wakulla Check Stamped, Northwest Florida Cobmarked and cordmarked ceramics continue to appear but in reduced frequencies. Lake Jackson Plain, Cool Branch Incised, Point Washington Incised, and Marsh Island Incised all occur in low frequencies at Curlee and Chattahoochee Landing. These types are, of course, much more common in later Fort Walton contexts, but they do occur during the Chattahoochee Landing phase.

A much more striking and significant change from the Wakulla phase to the Chattahoochee Landing phase may be seen in the sites of the phases. The three known Chattahoochee Landing phase components occur at large mound-village complexes on the natural levee of the Apalachicola. The components at these sites are also quite large, the one at Chattahoochee Landing is approximately 20-25 acres in extent. This is in marked contrast to the many small Wakulla phase sites scattered throughout the Basin.

Table 3. Chattahoochee Landing phase ceramic assemblage.

TYPE	8Gd4			8Ja7		
	#	% Total	% Decorated	#	% Total	% Decorated
Residual Plain	780	(59.5)		360	(65.0)	
Lake Jackson Plain	16	(1.2)	(3.7)	15	(2.7)	(7.7)
Fort Walton Incised	16	(1.2)	(3.7)	18	(3.2)	(9.3)
Cool Branch Incised	2	(0.2)	(0.4)	0	–	–
Point Washington Incised	14	(1.0)	(3.2)	11	(2.0)	(5.6)
Marsh Island Incised	2	(0.2)	(0.4)	1	(0.2)	(0.5)
Pinellas Incised	0	–	–	1	(0.2)	(0.5)
Pensacola Plain	1	(0.1)	(0.1)	0	–	–
Wakulla Check Stamped	410	(31.3)	(77.1)	124	(22.4)	(63.9)
Cord Marked	1	(0.1)	(0.2)	1	(0.2)	(0.5)
Cob Marked	10	(0.8)	(1.9)	1	(0.2)	(0.5)
Carrabelle Punctated	1	(0.1)	(0.2)	0	–	–
Miscellaneous Decorated	59	(4.5)	(11.1)	22	(4.0)	(11.3)
TOTAL	1312			554		

One radiocarbon determination has been obtained for the Chattahoochee Landing phase component at the Curlee site. This date, A.D. 400 (DIC 657), is, unfortunately, very clearly out of line with the dates for earlier Weeden Island components. The charcoal dated in this trial came from a pit which contained large quantities of shell. This possibly caused the obvious error in the determination (David S. Brose, personal communication, 1978).

The Bristol phase has been found only at the Yon site. The assemblage which was utilized to define this phase is rather small, but it is quite distinct from those of both the Chattahoochee Landing phase and the subsequent Cayson phase.

While the Bristol phase ceramic assemblage differs from those of the Chattahoochee Landing phase, there are elements indicative of some continuity. Wakulla Check Stamped, Northwest Florida Cobmarked and cordmarked ceramics continue to appear as significant elements of the assemblage. However, they do not dominate as before. The most frequently encountered decorated wares are Point Washington Incised (that variety featuring incised lines parallel to the rim of simple bowls), Marsh Island Incised, Fort Walton Incised, and an undefined engraved ware. The majority of the sherds are tempered with fine sand and possess smoothed, black exteriors and interiors, similar to those found in Chattahoochee Landing phase ceramics. Vessel forms include open bowls, standard jars, flaring rim bowls, carinated bowls, bottles, and beakers.

Four radiocarbon determinations have been made for the Bristol phase (Table 4). These dates were averaged and corrected to yield a calendrical date of A.D. 939. When this averaged date is compared to the average obtained for the Wakulla phase at Sycamore, a t value of 0.75 was obtained (Long and Rippeteau 1974). This indicates a probability of contemporaneity of approximately 0.4.

Typologically, the assemblage of the Bristol phase most closely resembles contemporary materials from the Middle Chattahoochee Valley at Cemochechobee (Schnell, Knight, and Schnell 1978). However, there is also a slight resemblance to early materials at Moundville (cf. Steponaitis 1978 regarding engraved wares with areas of excision in Moundville I).

The Cayson phase is represented by components at Cayson, Curlee, and Scholz Parking Lot. At the type site, it forms the major occupation. At Curlee, it is stratigraphically above Chattahoochee Landing phase levels.

The ceramic assemblage of this phase is marked by

Table 4. Bristol phase radiocarbon dates.

Yon Site, 8Li2		
DIC-95	900±120	AD 1050
DIC-114	980±105	AD 970
DIC-656	1030±105	AD 920
DIC-658	1110± 70	AD 840
CALENDRICAL CORRECTION		
DIC-95	894±124	AD 1056
DIC-114	969±109	AD 981
DIC-656	1017±109	AD 933
DIC-658	1093± 87	AD 857

Lake Jackson Plain, Pensacola Plain, Lake Jackson Incised, Fort Walton Incised, and Cool Branch Incised. Marsh Island Incised, Point Washington Incised, Wakulla Check Stamped, and Northwest Florida Cob-marked appear, but in lesser frequencies. Representative assemblages of the Cayson phase are shown in Table 5.

Five radiocarbon dates have been obtained for the Cayson phase occupation at the type site (Table 6). Based on these dates and one date from Curlee, the Cayson phase may be dated to the period A.D. 1000 to A.D. 1200.

The components of the Cayson phase, unlike those of the previous phases, are quite diverse in size. They range from the large ceremonial center at Cayson (ca. 120 acres) to the small Scholz Parking Lot site (ca. 1/4 acre). Nevertheless, these sites are quite clearly related and their ceramic assemblages quite similar.

The Sneads phase follows the Cayson phase in the Upper Apalachicola Valley. It is quite closely related to that earlier phase and the ceramic assemblages share many features. The types Lake Jackson Plain, Lake Jackson Incised, and Fort Walton Incised continue to dominate the assemblages of the Sneads phase. However, Wakulla Check Stamped and Pensacola Plain almost completely disappear (Table 7). This change is not abrupt, but rather the result of a gradual evolution in the ceramic assemblage of the Cayson phase. At the Cayson site, Pensacola Plain forms 20.9% of the plain ware in the lowest levels, with grit tempered types comprising 46.9% and sand tempered types 25.2%. In the upper levels of the site, shell tempering is found in only 7.7% of the plain ware, while grit tempering is found in 75.8% and sand tempering in 14.0%. This trend, which actually began as the replacement of sand tempering in the Bristol phase continues through the Sneads phase and into the Yon phase. A similar trend was observed at the Singer-Moye site in Stewart County, Georgia, a Rood's phase site (Knight 1978).

Table 5. Cayson phase ceramic assemblage.

TYPE	8Ja201		
	#	% Total	% Decorated
Residual Plain	282	(82.7)	
Lake Jackson Plain	1	(0.3)	(1.7)
Lake Jackson Incised	1	(0.3)	(1.7)
Fort Walton Incised	6	(1.8)	(10.2)
Marsh Island Incised	1	(0.3)	(1.7)
Wakulla Check Stamped	30	(8.8)	(50.8)
Miscellaneous Decorated	20	(5.9)	(30.5)
TOTAL	341		

Table 6. Cayson phase radiocarbon dates.

Cayson site, 8Ca3 (Brose 1975a; Brose et al. 1976)

DIC-46	770±60	AD 1180
DIC-45	840±65	AD 1110
DIC-94	900±100	AD 1050
DIC-44	940±145	AD 1010
DIC-93	1000±130	AD 950
CALENDRICAL CORRECTION		
DIC-46	775±67	AD 1175
DIC-45	839±72	AD 1111
DIC-94	894±105	AD 1056
DIC-44	932±148	AD 1018
DIC-93	988±134	AD 962

Table 7. Sneads phase ceramic assemblage.

TYPE	8Ja8			8Ja137		
	#	% Total	% Decorated	#	% Total	% Decorated
Residual Plain	1622	(69.1)		433	(82.6)	
Lake Jackson Plain	207	(8.8)	(28.5)	29	(5.5)	(31.9)
Lake Jackson Incised	101	(4.3)	(13.9)	25	(4.8)	(27.5)
Fort Walton Incised	182	(7.8)	(25.1)	11	(2.7)	(15.4)
Point Washington Incised	9	(0.4)	(1.2)	3	(0.6)	(3.3)
Cool Branch Incised	23	(1.0)	(3.2)	8	(1.5)	(8.8)
Marsh Island Incised	45	(1.9)	(6.2)	3	(0.6)	(3.3)
Pinellas Incised?	3	(0.1)	(0.3)	0	–	–
Pensacola Plain	32	(1.4)	(4.4)	0	–	–
Pensacola Incised	5	(0.2)	(0.7)	0	–	–
Wakulla Check Stamped	1	(0.0)	(0.1)	3	(0.6)	(3.3)
Cob Marked	1	(0.0)	(0.1)	1	(0.2)	(1.1)
Engraved	1	(0.0)	(0.1)	0	–	–
Miscellaneous	115	(4.9)	(16.0)	5	(1.0)	(5.5)
TOTAL	2348			524		

Sneads phase components have been identified at J-2, J-5, Coe's Landing, Yon, and North Flat Creek. One radiocarbon date has been obtained for the Sneads phase occupation at the J-5 site. The date obtained was A.D. 1389 (corrected from 534±100 B.P.) (Bullen 1958).

The Yon phase is the latest phase thus far defined in the Apalachicola Valley. To date, it has been identified only at the type site, where it is found in the uppermost levels of the midden.

The ceramic assemblage of this phase represents a marked change from those of the earlier phases. This change is seen both in ware characteristics and in type frequencies. Yon phase ceramics contain large amounts of heavy grit tempering and lack the smoothed, frequently black surfaces of the earlier phases. As noted above, this trend is seen earlier, in the Cayson phase, when Lake Jackson Plain and Lake Jackson Incised appear in grit tempered varieties. However, other types, such as Fort Walton Incised continued to appear with sand tempered pastes.

The Yon phase ceramic assemblage is dominated by complicated stamped and incised/punctated types. The complicated stamped ware occurs on a grit tempered paste. In this respect it differs from the Jefferson Stamped ceramics of the later Leon-Jefferson period in Leon County. The standard jar is the most often encountered vessel form. The most common motifs noted, thus far, are bullseyes and bullseyes with dotted crosses. Rims are frequently pinched, folded or marked with cane impressions. In general, this type closely resembles Lamar Complicated Stamped as found in the Middle Chattahoochee Valley (Broyles 1962).

Incised/punctated sherds assignable to Fort Walton Incised also appear on grit tempered paste. Rims of this type are frequently notched. Other incised sherds appear which are related to Lamar Bold Incised (Willey 1949:493). Finally, a check stamped ware similar to Leon or Mercier Check Stamped occurs. This type usually appears with large diamond-shaped checks. In general, the Yon phase assemblage appears closely related to those of the Bull Creek phase of the Middle Chattahoochee (McMichael and Kellar 1960).

One radiocarbon date, 640±70 B.P. (DIC-655), has been obtained for the Yon phase. This yielded a corrected date of A.D. 1295. Based on dates for the Bull Creek phase, and the date obtained by Bullen for the Sneads phase at J-5, it would appear that this date is slightly early, but not remarkably so. Obviously, additional determinations must be obtained. However, it is suggested that the Yon phase begins ca. A.D. 1350-

1400 in this portion of northwest Florida and later evolves into the contact period Leon-Jefferson culture found in present day Leon County.

Fort Walton development

As noted earlier, the data available for use in examining questions regarding the Fort Walton cultures were extremely limited in the 1940s. Despite this limitation, Willey was able to postulate a model of Fort Walton origins which specified a general temporal placement and mechanism. He stated that Fort Walton

> . . . was chronologically late in its arrival compared to other areas of the Southeast, and it was undoubtedly a part of the lower Southeastern spread of the Middle Mississippian intensive agriculturalists. It is postulated that a new people came into northwest Florida at this time with the Fort Walton culture. These were Muskogean peoples who, moving south through Alabama and western Georgia, dislodged the Timucuans and pushed them east into the Florida peninsula (Willey 1949:580).

This model has retained a widespread acceptance among archaeologists to the present day (*viz.* Sears 1977).

While the Willey model of a late invasion by Middle Mississippian groups has remained a popular picture of culture change in northwest Florida, more recent data have suggested alternative explanations. From very early, the close typological resemblences between Weeden Island and Fort Walton ceramics was recognized and used to suggest an evolution of Weeden Island cultures into Fort Walton. Willey and Woodbury remarked about the definite relationship of Fort Walton to the older cultures of northwest Florida (1942:238). However, Griffin was the first to use this fact to suggest an alternative model of Fort Walton origins (J. W. Griffin 1950).

Based on data derived from his excavations at the Lake Jackson site, typological analyses of Fort Walton ceramics, and comparison with other Fort Walton sites, Griffin derived a model of ". . . culture change in a more or less continuous manner, with the archaeological periods abstracted from the stream of change" (1950:111). Earlier, Griffin had proposed a model of the change from Weeden Island to Fort Walton. Again based on data from Lake Jackson, he stated

> There would seem to be enough evidence of continuity to postulate culture change under strong external influences rather than through migration and replacement of peoples, although this may be a factor as well (1949:46).

For several years, these two models remained as conflicting interpretations of rather limited data. In 1950, Bullen published the results of his survey of the Jim Woodruff Reservoir area in Florida. During the course of this survey, Bullen noted a radical change in settlement pattern from the later Weeden Island period to the Fort Walton. He felt that the observed changes were

> . . . the result of influences and people expanding from the Mississippi Valley. The presence in large quantities of Wakulla Check Stamped pottery, typical of the preceding period, indicates that the population of the valley was not entirely replaced by new people (1950:124).

In 1953, Bullen conducted additional survey work and excavations in the Woodruff Reservoir. As a result of these investigations, Bullen divided the Fort Walton period into four sequential phases (1958:349). Bullen defined the ceramic assemblages of these phases as follows:

- Fort Walton 1: Wakulla Check Stamped; Fort Walton Incised; Cool Branch Incised; and Marsh Island Incised
- Fort Walton 2: Fort Walton Incised; Cool Branch Incised; Marsh Island Incised; Lake Jackson Incised; and Point Washington Incised
- Fort Walton 3: Fort Walton Incised; Lake Jackson Incised; and Point Washington Incised
- Fort Walton 4: Fort Walton Incised; Lake Jackson Incised; Point Washington Incised; and European materials.

Thus Bullen also saw the change from Weeden Island to Fort Walton as occurring with considerable continuity.

However, all of these models viewed the various Fort Walton cultures as relatively late phenomena. Willey and Griffin, operating without benefit of radiocarbon dates, suggested a date in the 15th century for the transition. Bullen, with a date of A.D. 1400 for the Fort Walton 3 occupation at J-5 suggested a date of A.D. 1300 for the transition.

The idea of Fort Walton as a late phenomenon and the invasion model of its origin have remained in the literature as accepted pictures of the prehistory of northwest Florida. Sears (1977:175) views both the Fort Walton and the Pensacola cultures ". . . as invaders, and not as producers (*sic*) of the normal processes of in-place cultural development . . ." Sears also places this invasion very late, ca. A.D. 1500. However, among the results of the recent investigations in the Apalachicola Basin were indications that previously held models, which portrayed Fort Walton as a late phenomenon resulting from an invasion of northwest Florida by Middle Mississippian groups, were incorrect.

As Brose noted,

> It now appears that there is good reason to question those earlier suggestions of a major discontinuity between the Weeden Island and Fort Walton cultures. The excavations performed at the Cayson site and the Yon site demonstrate stratigraphically and typologically that within the Apalachicola River Valley there is considerable continuity in the material styles spanning this transition. Furthermore, the available radiocarbon dates for the early Fort Walton materials at both sites argue against a late intrusion of Mississippian peoples from either Georgia or Alabama (1975a:12).

Based on data gathered in the Upper Apalachicola Basin, Percy and Brose presented a model of the change from Weeden Island to Fort Walton. This model was essentially one of *in situ* change, brought about by competition for agricultural land.

> With continuing competition for land, the situation of many small autonomous villages

> was inadequate for controlling conflict among village groups. It was at this point that Weeden Island people began to adopt new models for social organization, presented to them by Early Mississippian communities in central Georgia, as at Macon Plateau. Details of this process are unknown, but it does not appear to have involved invitation to Weeden Island territory by Mississippian peoples. There is a great deal of continuity between late Weeden Island and early Fort Walton, and there is no evidence for an influx of new people. In Fort Walton, the community pattern seems to be strongly nucleated once again with larger villages concentrated into bottomlands and organized into temple mound communities. It can be suggested that the change from Weeden Island to Fort Walton involved two main sets of developments, both needed to solve the problem of competition for agricultural land. One was a change in farming methods, including a shift to a more intensive cultivation system and also, perhaps, the introduction of new plants such as beans, which have a less destructive effect on soils than corn. A second development was the establishment of more efficient institutions of social control; it is suggested as a general hypothesis that this involved a shift from a tribal to a chiefdom level of social organization, to use Service's terminology (Percy and Brose 1974:21-22).

Unfortunately, while the data collected in the Upper Apalachicola Basin to that date were highly suggestive, they were not sufficient to firmly establish the model proposed by Percy and Brose.

Since the presentation of the Percy-Brose model, additional excavations have been performed in the Upper Apalachicola Basin and previously collected materials have been reanalyzed. Data from this research have resulted in the formulation of the Fort Walton chronology presented earlier. The chronological framework thus generated has been combined with additional data in an examination of the timing and processes of Fort Walton development in northwest Florida. A brief overview of this examination follows.

Unfortunately, there is a great deal of difficulty in examining the models as they have been presented. Each of the models is composed of a number of components, relating to questions of:

1) the chronological placement of the change from Weeden Island to Fort Walton;
2) the location of the initial change from Weeden Island to Fort Walton;
3) the mechanism by which Weeden Island was replaced by Fort Walton; and
4) causal factors leading to the change from Weeden Island to Fort Walton.

As a further complication, not all of the published models possess all of these components.

In order to test the models, the following procedures were followed. From each model, one or more hypotheses were generated. These hypotheses, which related to the four aspects of the origin question given above, were then operationalized by forming predictive statements about certain classes of data. The operational statements thus formed were then evaluated utilizing data from the Apalachicola River Valley and other areas of northwest Florida and adjacent portions of Alabama and Georgia.

Five hypotheses relating to the chronological placement of the initial change from Weeden Island to Fort Walton were generated. These were operationalized by utilizing them to predict expected radiocarbon dates for late Weeden Island and early Fort Walton occupations, expected amounts of temporal variation in ceramic assemblages during the Fort Walton period, and indications of contact or interaction between Fort Walton cultures and other dated cultures elsewhere in the Southeast.

The results of the testing program follow. One of the most frequent arguments for a late dating of the beginnings of Fort Walton is the frequent association of European materials with Fort Walton sites on the Gulf Coast. While there is little question that the Spanish encountered one or more Fort Walton cultures during the 16th century, this has little bearing on the question of Fort Walton origins. The radiocarbon dates obtained for Bristol phase and Cayson phase occupations at Cayson and Yon indicate that ceramic assemblages considered to indicate Fort Walton occurred in the Apalachicola Valley by A.D. 950. Coupled with the association of Fort Walton types with Chattahoochee Landing phase components, it seems likely that the beginnings of Fort Walton ceramic assemblages were present in the Valley by A.D. 900. While it is considered safe to date the origins of Fort Walton ceramics to this time, there remains the problem of dating the Fort Walton culture. Although we know little about it, archaeologists generally consider the various Fort Walton cultures to have been regional manifestations of the Mississippian cultural pattern with a chiefdom type of social organization. And, there is some justification for this assumption, at least for the Fort Walton culture present in Leon County. However, the appearance of this form of social structure and the accompanying intensive agriculture economy is much more difficult to date. Nonetheless, there are some archaeological indications that hierarchical social organizations were present in the Apalachicola Valley at an early date. There are indications that pyramidal temple mounds, frequently associated with hierarchical social systems in other portions of the Southeast, appear in the Apalachicola Valley certainly by the Cayson phase (A.D. 1000 to A.D. 1400) and one construction stage of the temple mound at Cayson is dated to A.D. 1111 (DIC 45) (corrected according to Damon et al. (1974)). Additional data which can possibly argue for both an early appearance of Fort Walton ceramics and their association with hierarchical social structures are the typological resemblance between Fort Walton assemblages and early Rood's phase materials (Caldwell 1955; McMichael and Kellar 1960; Schnell and Knight 1978; Schnell, Knight, and Schnell 1978) and Bessemer phase materials (DeJarnette and Wimberly 1941; Walthall 1977) both of which are dated early.

Although the chronological framework presented in this report appears to correspond quite well to the data for the Upper Apalachicola Valley, it does not fit other areas within the Fort Walton culture area of northwest Florida. For example, several of the late sites reported by Moore—Bear Point (1Ba1), Point Washington (8Wl16), Hogtown Bayou (8Wl9), Marsh Island (8Wa1), and Chipola Cut-off (8Ga5)—do not fit this sequence (Moore 1901; 1902; 1903). All of these sites are post contact, but they bear a much greater resemblance to each other and to Moundville and other Mississippian cultures farther west than they do to the later phases of the Apalachicola Valley.

The second class of hypotheses examined is composed of those hypotheses which specify the location of the initial change from Weeden Island to Fort Walton. These hypotheses were harder to extract from the published models, as no model specified a certain location such as the Upper Apalachicola Valley, and some models did not even suggest a broad area. However, in conjunction with the results of the first phase of the study, it was possible to generate three hypotheses.

The hypotheses were operationalized by predicting which areas should yield early dates, which areas should have typologically early materials, directions of clines in the spread of artifact styles, and by identifying those areas which had prerequisites for the appearance of early Fort Walton (*i.e.* either a suitable parent population for *in situ* development or appropriate routes for diffusion or invasion). These operational propositions were tested against available data. Unfortunately, because of the uneven quality of the data from the various areas, it was not possible to determine which, if any, of the hypotheses were correct .

However, the analyses did indicate that the following conclusions are probably warranted:

1) One of the earliest centers of Fort Walton is in the Apalachicola Valley (there is a abundance of early dates, a suitable parent population, viable routes for either invasion or diffusion, and typologically similar, equally early cultures immediately up the Chattahoochee River);
2) the South Appalachian Mississippian material which appears in both the Apalachicola Valley and the Tallahassee Red Hills area is earliest in the Valley and probably originates up the Chattahoochee River in Georgia; and
3) there is a probable second center of origin in the western coastal area (this is for the Pensacola culture).

Three mechanism hypotheses were developed as the third class of hypotheses to be examined. The testing of these hypotheses indicates that the change from Weeden Island to Fort Walton in the Apalachicola Valley was probably the result of *in situ* changes in Weeden Island social structure and subsistence with subsequent adoptions of Mississippian traits, particularly ceramics.

The early dates for Fort Walton components in the Apalachicola Valley restricts the number of suitable invaders or donor cultures for diffusion to Macon Plateau, early Rood's phase, and Bessemer phase—and even these are not significantly earlier than Fort Walton. Also, there is no real 1:1 correspondence between any of these cultures and early Fort Walton. Finally, the presence of transitional sites such as Chattahoochee Landing argue for *in situ* change of Weeden Island groups.

The final class of hypotheses examined in this study relates to causal factors which led to the establishment of Fort Walton cultures in northwest Florida. Unfortunately, this aspect of the Fort Walton origin problem has been very much neglected to date. Only one of the models examined, that of Percy and Brose (1974) proposes causal factors. In their model, increased population during the Weeden Island period leads to greatly increased competition for available agricultural land. This in turn leads to conflict. Percy and Brose suggest two possible areas in which their model would have testable implications.

The first of these areas is in the realm of ethnobotany. They suggest that the change from Weeden Island to Fort Walton was accompanied by a ". . . change in farming methods, including a shift to a more intensive cultivation system and also, perhaps, the introduction of new plants such as beans . . ." (Percy and Brose 1974:22). In an effort to examine this area, ethnobotanical and palynological analysis have been, and are being, performed on materials from the upper Apalachicola Valley. While not yet completed, the analyses do suggest a change in the local environment at the Yon site during the transition. This change is seen in the results of a palynological analysis performed by Wentworth B. Clapham (Brose 1975a). The results of ethnobotanical analyses are not yet completed but to date they have not yielded sufficient data to assess the proposition.

The second area of possible test implications for the Percy-Brose model is in social organization. Unfortunately, it has not been possible to investigate this area in detail. Additional mortuary data, such as that currently being analyzed by Calvin Jones for the Lake Jackson site, are needed for both Weeden Island and Fort Walton. This is particularly true for sites of the Chattahoochee Landing phase.

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Vincas P. Steponaitis

SOME PRELIMINARY CHRONOLOGICAL AND TECHNOLOGICAL NOTES ON MOUNDVILLE POTTERY

During the summer of 1978, the University of Michigan Museum of Anthropology began a field program aimed at investigating the Moundville phase, a well-known Mississippian manifestation in west-central Alabama (Peebles 1971, 1978; McKenzie 1966). A major part of this field program was devoted to the study of existing archaeological collections from the Moundville site itself. The largest such collection is now housed at Mound State Monument in Alabama, having been gathered over a period of some 20 years of excavation by the pre-war federal relief programs and the Alabama Museum of Natural History (Peebles n.d.a, n.d.b).

Our main focus in going through the Mound State Monument collections was on the ceramics, particularly on the complete or nearly complete vessels. Over the course of the season approximately 900 vessels were measured and/or photographed, of which about 630 could be assigned to definite burial contexts. Our immediate objectives in collecting these data were fourfold: 1) to arrive at a comprehensive formal description of the Moundville phase ceramic assemblage; 2) to formulate a detailed ceramic chronology for the Moundville phase; 3) to elucidate some of the technological aspects of Moundville phase ceramic production; and, 4) to look at the patterns of inter-regional exchange in ceramics and to see how these patterns changed through time.

Once these goals are achieved—especially those relating to chronology and inter-regional exchange—we should be in a much better position to understand the processes by which the politically complex societies in this area developed, and later reverted to simpler forms of organization. The reader should bear in mind, however, that the various lines of research alluded to above are only in their very beginning stages. Hence, this paper is meant to be an interim report of work that is still in progress. The results to be presented below are preliminary in nature, and any conclusions drawn from them should be considered tentative.

Formal Description of Ceramic Assemblage

The ceramic typology traditionally used to describe the Moundville phase ceramic assemblage was initially presented by DeJarnette and Wimberly (1941) more than 35 years ago, and later was somewhat elaborated by McKenzie (1964, 1965, 1966). Their typology basically consists of six types: Warrior Plain, Moundville Incised, Moundville Black Filmed, Moundville Filmed Incised, Moundville Filmed Engraved, and Moundville Engraved Indented.

This well-known and long-standing typological scheme has unquestionably proved to be a useful analytical framework in past studies, and its status as a major contribution to the understanding of southeastern prehistory remains secure. However, in my own work I have found it useful to diverge from this scheme in two ways. First, I have adopted a type-variety nomenclature similar to the one introduced by Philip Phillips (1970) in the Lower Mississippi Valley. Second, I have decided to drop the attribute of "black filming" as a criterion for *defining* types. The latter change was made for several reasons, one of which had to do with difficulties in characterizing how "black filming" was to be consistently recognized. Surface color on Moundville vessels varies along a continuum from dark to light, and so it does not lend itself easily to discrete categorization. Moreover, it is not uncommon to find burnished bowls and bottles whose shape and decoration are clearly local in style, but which are too light in color to be easily accommodated in any of the traditional "black filmed" types. The most economical solution to these problems has been to regard "black filming" as a mode that cross-cuts a series of types and varieties, which are defined without reference to color. (Some technological aspects of black filming will be discussed in a subsequent section of this paper.)

Given these considerations, I have classified the Moundville assemblage using the four types outlined below. Each of these types is further subdivided into several varieties, which are briefly described in the Appendix.

1) *Mississippi Plain* includes all undecorated vessels tempered with shell. Vessels with burnished surfaces (some formerly considered Moundville Black Filmed) and those with unburnished surfaces (formerly Warrior Plain) are now recognized as two separate varieties.
2) *Moundville Incised* includes shell tempered vessels with unburnished surfaces that are decorated with a series of incised arches. Three varieties of this type have been recognized in the Moundville assemblage.
3) *Carthage Incised* includes shell tempered vessels with burnished surfaces that are decorated with a broad, "trailed" incision. The six varieties of this type subsume most of the vessels that were formerly classified as Moundville Filmed Incised, along with some vessels that would not have been classified as such due to their light color.
4) *Hemphill Engraved* consists of shell tempered vessels with burnished surfaces that are decorated with engraving or fine, dry-paste incision. The seven varieties so far defined include some light colored vessels in addition to those which formerly fell under the rubrics Moundville Filmed Engraved and Moundville Engraved Indented.

In the present scheme, all types are defined on the basis of temper, surface finish, and tooled decoration. Red painting, when it occurs, is simply counted as a mode that cross-cuts these types.

Chronology

Based on a preliminary seriation of grave lots of whole vessels, three ceramic periods can be recognized within the Moundville phase. For the purposes of the present paper only, these periods can be referred to as Moundville I, Moundville II, and Moundville III. As yet, no direct dates are available on the graves which make up this sequence. However, based on the estimated time range for the entire occupation at Moundville, and on dates for comparable material in eastern Mississippi (Marshall 1977), I would assign the following guess dates to each of the periods:

Moundville I A.D. 1100-1250
Moundville II A.D. 1250-1400
Moundville III A.D. 1400-1550

The ceramic complex associated with each of these periods will be discussed below, and is presented in summary form in Table 1.

Moundville I. The characteristic bottle form of this early period is the ovoid, pedestalled bottle (e.g., Moore 1905: Figs. 129, 130). Decoration on these bottles is relatively uncommon; when it does occur, the decoration is usually engraved in a very dry or fired paste. A typical motif is the 3 line running scroll with areas of excision (Hemphill Engraved, *var. Elliots Creek*). Appearing late in Moundville I (and continuing into the subsequent phase) is another pedestalled bottle form, somewhat wider and more angular in profile. Such bottles are often decorated with 4-10 line vertical scrolls; the lines making up these scrolls are incised in a dry paste and are usually about 1 mm wide (Hemphill Engraved, *var. Tuscaloosa;* e.g., Moore 1905: Fig. 39).

The distinctive bowl forms dating to Moundville I are the hemispherical bowl with lug and rim effigy (e.g., McKenzie 1966: Fig. 11c), the restricted bowl, and the shallow flaring rim bowl (e.g., McKenzie 1966: Fig. 7). Decoration on these bowls is generally carried out with a broad "trailed" incision, at least 1.5-2.0 mm wide. The Mound Place motif, a band of 3-4 lines parallel to the lip, often occurs on the hemispherical bowls with effigies (Carthage Incised, *var. Akron*); the arch motif occurs on restricted bowls (Carthage Incised, *var. Summerville*); and zones of oblique parallel incisions ("chevrons") are sometimes placed on the interior of flaring rim bowls (Carthage Incised, *var. Moon Lake*).

Jars of this period usually have two handles, but occasionally they exhibit four. The typical decoration on these jars is the arch motif of Moundville Incised (most commonly *var. Moundville*).

Table 1. Chronology of decorated types and varieties (type and variety descriptions are given in the Appendix).

TYPES/VARIETIES		MOUNDVILLE PERIODS I	II	III
Moundville Incised,	var. Moundville	X		
	var. Carrolton	X		
	var. Snows Bend	?	?	
Carthage Incised,	var. Akron	X		
	var. Summerville	X		
	var. Moon Lake	X	?	X
	var. Carthage			X
	var. Foster			X
	var. Poole			X
Hemphill Engraved,	var. Elliots Creek	X		
	var. Tuscaloosa	+	X	
	var. Maxwells Cros.		X	
	var. Havana		X	X
	var. Hemphill		+	X
	var. Taylorsville			X
	var. Wiggins			X

X - strong presence
\+ - sporadic presence
? - questionable presence

Moundville II. In this period, the ovoid pedestalled bottle is completely replaced by the form with a wider body, exhibiting either a low pedestal (e.g., Moore 1905: Figs. 35, 37, 39, 53) or a slab base (e.g., Moore 1905: Fig. 6). Decoration on these bottles usually consists of fine dry-paste incision, what we for convenience have subsumed under the rubric of "engraving." Common motifs are the windmill (Hemphill Engraved, *var. Maxwells Crossing;* e.g., Moore 1905: Figs. 30, 35), the vertical scroll (Hemphill Engraved, *var. Tuscaloosa;* e.g., Moore 1905: Figs. 39, 71), and a running scroll made up of 15 or more closely spaced lines (Hemphill Engraved, *var. Tuscaloosa;* e.g., Moore 1905: Figs. 37, 119). Representational or "cult" motifs also occur, but they seem to be relatively infrequent until the later portion of this period (Hemphill Engraved, *var. Hemphill;* motifs such as those in Moore 1905: Figs. 8, 21, 87, and 121 probably are found this early). Another frequent characteristic of Moundville II pottery is the presence of dimples or indentations in the vessel wall.

The simple, restricted, and flaring rim bowl forms that characterized Moundville I probably continue into Moundville II as well. There does occur a change, however, in the way these bowls are decorated. Unlike the earlier variants with the Mound Place motif, those falling within this period tend to have a much finer line width (less than 1.5 mm), and more lines making up the band (Hemphill Engraved, *var. Havana*). Also, it is during this period that the hemispherical bowl with a notched applique strip along the rim, sometimes called the "beaded rim" bowl, first begins to appear.

Four-handled jars become considerably more common, although the 2-handled forms continue to be found as well. The type Moundville Incised becomes either rare or locally non-existent. It seems that most jars during this and the subsequent period are undecorated.

Moundville III. In Moundville III times, bottles with pedestalled and slab bases mostly disappear. The typical bottle is subglobular with a simple, rounded base (e.g., Moore 1905: Figs. 84, 86, 112, 153). The simple, restricted, and flaring rim bowl forms continue in this period, and two new bowl forms are added: 1) a short-necked bowl stylistically related to the proto-historic "cazuela" form, and 2) a cylindrical or semi-cylindrical bowl with a single lug (e.g., McKenzie 1966: Figs. 5, 18; Moore 1905: Figs. 120, 124). The beaded rim bowl, which first appeared in Moundville II, attains its greatest frequency in Moundville III. It is also at this time that fish effigy bowls (e.g., Moore 1907; Fig. 27) and frog effigy jars (e.g., McKenzie 1966: Fig. 14) become common.

In regard to decoration, both fine-line engraving/incising and broad-line incising are found on bowls and bottles. The most common motif is the 3-4 line running scroll, with or without a crosshatched background (Carthage Incised, *var. Carthage,* Hemphill Engraved, *vars. Wiggins* and *Taylorville*). Also common are the engraved or incised "Southern Cult" motifs for which the Moundville ceramics are justifiably famous (Hemphill Engraved, *var. Hemphill,* and Carthage Incised, *var. Foster*). The fine-line execution continues to predominate on bowls with the Mound Place motif (Hemphill Engraved, *var. Havana*). Very late within this period, short-necked bowls are sometimes incised either with chevrons (Carthage Incised, *var. Moon Lake*), or with a step and semicircle design (Carthage Incised, *var. Poole*).

The number of handles found on jars increases again in this period. The typical jar has four, somewhat triangular strap handles (e.g., Moore 1905: Fig. 55); however, during the later portions of Moundville III, jars with 8 or even more handles become common (e.g., Moore 1905: Fig. 49).

It should also be noted that during late Moundville III times, a number of red on white vessels appear that are almost certainly local in manufacture (cf. McKenzie 1965:55).

Discussion. If my guess dates prove to be nearly correct, it would seem that most of the "Southern Cult" iconography on Moundville pottery dates to ca. A.D. 1350 or after, although some may be present as early as A.D. 1250. This iconography clearly shows some internal stylistic development, with some motifs (e.g., the bilobed arrow) being predominantly early, others being predominantly late (e.g., winged serpent, falcon, scalp), and some occurring both early and late with slight differences in execution (e.g., paired tails, hand and eye).

Another important point is this: The chronology outlined above should once and for all lay to rest McKenzie's (1964, 1966:49-51) idea that the Moundville phase originated with a site-unit intrusion from the Central Mississippi Valley (alias, the Northern Division of the Lower Mississippi Valley). It is now quite apparent that the Moundville ceramics with counterparts in Walls and Nodena phase assemblages—such as Hemphill Engraved, *vars. Hemphill* and *Wiggins*—occur only in the later stages of a long, *local* developmental sequence. Undoubtedly there was a sharing of ideas between Moundville and other areas, but no major migrations were involved.

Based on this chronology we can also make some statements regarding the temporal placement of the well-known Bessemer site in Jefferson County, Alabama (DeJarnette and Wimberly 1941). Judging from the ceramics illustrated in the site report (DeJarnette and Wimberly 1941: Figs. 64, 65), it appears that much, if not all, of the mound construction at Bessemer took place during Moundville I times, as indicated by the presence of an ovoid pedestalled bottle (Mississippi Plain, *var. Hale*), a flaring rim bowl with incised chevrons (Carthage Incised, *var. Moon Lake*), and a hemispherical bowl with the incised Mound Place motif (Carthage Incised, *var. Akron*). The evidence therefore suggests that Bessemer and Moundville were contemporaneously occupied in the early part of the sequence, but that Bessemer was abandoned by the time the Moundville site reached its greatest size and political importance.

Ceramic Technology

Now let us return to a subject which was brought up earlier, that is, the nature of the "black film" on Moundville ceramics. It has traditionally been maintained that "black filming" is the result of an organic paint applied to a vessel's surface. This idea was first proposed by C. B. Moore (1905:140) more than seventy years ago, based on both visual and chemical evidence:

> . . . the Moundville ware, except in the case of cooking vessels, is almost invariably covered with a coating of black, more or less highly polished on the outer surface. This coating was not produced by the heat in firing the clay, but was a mixture intentionally put on by the potters. Scrapings from the surface of a number of vessels were furnished by us to Harry F. Keller, Ph.D., who, by analysis, arrived at the conclusion that the black coating on the earthenware is carbonaceous matter. . . . From its appearance and chemical behavior, Dr. Keller concludes that it must have been applied in the form of a tarry or bituminous matter which, upon heating out of contact with air, was converted into a dense variety of carbon. Doctor Keller is of the opinion that a mixture of soot and fat or oil might produce the effect, though the numerous lustrous particles resembling graphite rather suggest the carbonization of a tar-like substance.

Considerably later, F. R. Matson did a series of experiments on black filmed sherds from the Guntersville Basin that led him to a similar conclusion:

> An examination of a group of Moundville Black Filmed sherds showed that several of them had an oxidized core buff to salmon in color, while other pieces with gray cores had an oxidized area at one or both surfaces. Upon the surfaces themselves, covering the light area, appeared the black film. That this film could not have been produced while the vessels were being fired was indicated by the oxidized region just beneath it . . .
>
> It would be possible to obtain such a black surfacing either by using a slip containing iron which when fired under reducing conditions would produce a black iron oxide coating, or by applying an organic paint that a reducing atmosphere would carbonize (quoted in Heimlich 1952:29).

Matson's experiments adequately demonstrated that the dark surface color was not the result of an iron oxide paint or slip; therefore, in part by process of elimination, he concluded that the color had to be due to an organic paint (Matson quoted in Heimlich 1952: 30-31). Furthermore, he argued that the paint had to be applied with a *second* firing, because the initial firing which produced the oxidized core in these sherds would at the same time have oxidized (i.e., burned off) any organic paint on the surface.

Although these arguments have gained some acceptance over the years, they are not as convincing as they would appear to be at first glance. The conclusions of both Keller and Matson rested on the dubious premise that the carbonaceous matter on the surface could *only* have been the residue of an organic paint applied before firing. Only by taking this premise for granted could Matson have argued reasonably for the necessity of a second firing in order to obtain a dark surface over an oxidized core.

It should be noted that there does exist a simple method of producing a "black film" apart from painting. This process is referred to as "smudging", which is described by Shepard (1956:88) as a "means of blackening pottery by causing carbon and tarry products of combustion to be deposited on it." A vessel can be smudged after firing, or smudging can take place *during* the process of firing itself. All it requires is a smoldering fire that burns with a sooty smoke, and a certain amount of care to ensure that the soot deposited on the vessel's surface is not burned away by direct contact with the flames.

Similarly, it is important to realize that the firing atmosphere need not remain constant during the course of a single firing. The burning of charcoal in an open firing tends to produce a neutral or oxidizing atmosphere; the burning of fresh fuel tends to produce a reducing atmosphere (Shepard 1956:217). Thus, it is quite possible to vary the atmosphere during open firing by manipulating the fuel supply and to some extent by controlling the draft.

These considerations raise the possibility that the "black filmed" wares owe their surface color not to an organic paint, but rather to a process of deliberate smudging and reduction in firing. The observed characteristics of these wares could well have been produced in a single firing and without the use of paint, if the following procedure were used: First the vessels could have been placed in a coal fire, which would oxidize both the surface and the core. Then, in the very last stages of firing, fresh fuel that burned with a sooty smoke could have been added; this fuel would have produced a reducing atmosphere and inevitably have brought about some degree of smudging. Both the reduction and the smudging would contribute to blackening the vessel, because reduction darkens the color of iron oxides in the clay, and smudging deposits carbon. As long as the reduction and smudging were of relatively short duration, their effects would be confined to the surface, and the core of the vessel wall would still remain oxidized. Exactly this kind of technique for producing blackwares has been documented among the native potters of the southwestern pueblos (Shepard 1956:88-90).

We can not as yet conclusively demonstrate that the above procedure was actually the one used in making the black filmed wares at Moundville. We can, however, show that it was indeed possible to produce the dark color in this way using locally available clays. As noted previously, a number of apparently local vessels at Moundville exhibit zones of red paint on a whitish surface, colors that could only have been achieved by deliberate firing under oxidizing conditions. Such vessels invariably have a few irregular patches on their surface where the whitish color has turned black. These patches of black are obviously not the result of painting; rather, they can only be interpreted as places where the surface was accidentally reduced and/or smudged in firing. Conversely, black filmed vessels sometimes exhibit patches of whitish color that have resulted from accidental oxidation. These observations clearly suggest that differences in surface color—from white to black—can be produced simply by varying the conditions under which the clay is fired. Additional confirming evidence has come from a series of replication experiments conducted by Ned Jenkins and Robert Lafferty of the University of Alabama (personal communication). Using clay from a single local source, they were able to produce both white and black-surfaced wares without paint just by changing the nature of the firing atmosphere.

If these ideas prove valid with further testing and experimentation, then it would seem that the surface characteristics of Moundville "black filmed" wares were produced in much the same manner as those of other dark-surfaced wares (such as Bell Plain) found elsewhere in the Southeast during the Mississippi period. Thus, there would be no technological grounds for insisting that the Moundville wares be given an entirely distinct typological status.

Inter-Regional Exchange

In regard to the subject of trade, our work in the next few months will include petrographic and chemical analyses designed to accurately identify trade wares, followed by distributional studies of these wares within and between Moundville phase settlements. For now, I can only offer some general statements concerning the non-local pottery types found in Moundville burials, and the probable sources of these types.

The most abundant group of trade vessels originated in the Middle Mississippi sub-area which stretched from the Middle Cumberland drainage in central Tennessee to the Cairo Lowland in southeast Missouri. Among the types thus far identified are Matthews Incised, *var. Beckwith* (4 jars) and *var. Manly* (1 jar), Barton Incised (2 jars), Nashville Negative Painted (4 bottles), Bell Plain (at least 13 bowls and bottles), and Mississippi Plain (at least 8 jars and 1 fish effigy bowl) (Phillips 1970).

The next most abundant group appears to have originated in the Pensacola style area situated along the Gulf coast of Alabama and extreme northwest Florida. The types thus far recognized include Pensacola Incised (1 bottle and 4 bowls), D'Olive Incised (2 shallow bowls), Mound Place Incised (3 bowls), and Mississippi Plain (at least 2 bowls) (Coblenz 1978).

Also present are some vessels apparently from the segment of the Mississippi Valley between southernmost Missouri and the mouth of the Arkansas River. These include three examples of Nodena Red and White (1 bowl, 2 bottles), and one jar classified as Parkin Punctated (Phillips 1970).

Two other vessels originated in the Mississippi Valley south of the Arkansas River or possibly in the drainage of the Big Black River in central Mississippi. One is a Plaquemine Brushed jar, and the other is a Leland Incised bottle (Phillips 1970).

Finally, there are several vessels from the Caddoan area, including three specimens of Holly Fine Engraved (2 bottles, 1 bowl), and one example of Spiro Engraved (a bowl) (Newell and Krieger 1949; Brown 1971).

It is interesting to note that all of the trade wares identified at Moundville come only from regions to the north, west, and south. Not a single vessel has yet been found which may have originated in the South Appalachian or Fort Walton style areas to the east and southeast.

Appendix: Abbreviated Type and Variety Descriptions

Mississippi Plain. This type includes all undecorated vessels tempered with shell. "Decoration" is here used in the narrow sense to refer to incised, engraved, punctated or painted designs. Thus, vessels exhibiting only modelled or applique embellishments are still subsumed within Mississippi Plain.

variety Hale—This variety is defined by the presence of a burnished surface. *Hale* tends to have somewhat smaller temper particles than *var. Warrior;* however, the particle size in itself is not distinctive, because the two varieties overlap quite a bit in this respect. *Hale* most commonly occurs in the form of bottles and bowls. It subsumes the previous type Moundville Black Filmed, along with numerous vessels whose surface color did not fit with the latter type (for illustrated examples, see Moore 1905: Figs. 12, 13, 69, 76, 78, 100, 129, 130, 135, 145, 150, 155; Moore 1907: Fig. 48; McKenzie 1966: Figs. 6, 7, 11c, 13, 14; DeJarnette and Peebles 1970: 97 bottom, 100 top, 114 top).

variety Warrior—This variety includes vessels which have smoothed, but not burnished surfaces. The temper particles tend to be relatively coarse, and the predominant vessel form is the jar. This variety corresponds to the old type Warrior

Plain, and also includes vessels that have elsewhere been classified as Alabama River Plain and Alabama River Applique (Sheldon 1974) (for illustrated examples, see Moore 1905: Figs. 49, 50, 55, 154; McKenzie 1966: Fig. 4; DeJarnette and Peebles 1970: 99 top, 105, 111 top, 113 top, 114 bottom).

Moundville Incised. The designs which characterize this type consist mainly of incised arches arranged end-to-end around the upper portion of the vessel. The surface on these vessels is smoothed but not burnished, the ware being comparable to Mississippi Plain, *var. Warrior*. The present definition of Moundville Incised corresponds closely to the original definition by DeJarnette and Wimberly (1941:83). The type occurs principally on jar forms.

variety Moundville—In this variety the design is embellished with a series of short incisions radiating upward from, and normal to the arch (see McKenzie 1966: Fig. 2).
variety Carrolton—The design in this variety is made up of one or more parallel arches which occur alone, not embellished with radiating incisions or punctations.
variety Snows Bend—In this variety the design is embellished with punctations above the arch.

Carthage Incised. This type is defined to include shell tempered vessels with a burnished surface that are decorated with broad, "trailed" incisions. Typically, these incisions are from 1.5 to 2 mm wide, and are U-shaped in cross-section, having been executed when the vessel was in a leather hard state of dryness. Carthage Incised subsumes most of the vessels that had previously been described as Moundville Filmed Incised. The most common vessel forms in Carthage Incised are bottles and bowls.

variety Carthage—Vessels of this variety have designs that consist of 3-4 line running scrolls. The most common vessel forms seem to be the subglobular bottle with rounded base, and the short-necked bowl (see Moore 1907: Fig. 72; Nance 1976: Fig. 32e).
variety Akron—This variety includes bowls on which the major design is a horizontal band of 2 or more lines running parallel to and just below the lip. The band of lines is commonly embellished with loops and/or folds. The most frequent vessel form is the hemispherical bowl with rim effigy (see Moore 1905: Fig. 94; McKenzie 1966: Fig. 11a; see DeJarnette and Peebles 1970: 111 bottom).
variety Foster—This variety is decorated with free-standing representational motifs, usually depicting hands and longbones. This kind of decoration has been observed to occur on the interior of flaring rim bowls, and on the exterior of short-necked bowls (see DeJarnette and Peebles 1970: 113 bottom).
variety Moon Lake—This variety is decorated with zones of parallel oblique lines, which usually occur on the interior of flaring rim bowls or on the exterior shoulder of short-necked bowls (see McKenzie 1966: Fig. 3 upper row).
variety Poole—This variety exhibits a design consisting of step motifs alternating with semicircular elements in a field that encircles the vessel. This design has only been observed on short-necked bowls (see design illustrated in Fundaburk and Foreman 1957:75, upper left).
variety Summerville—This variety is characterized by the presence of incised arches arranged end-to-end around the vessel's circumference. At Moundville, only bowls have been observed in this variety.

Hemphill Engraved. This type is defined to include shell tempered vessels with burnished surfaces which are decorated with either post-fired engraving or fine, dry-paste incision. The lines which make up the designs are always less than 1.5 mm wide, and usually are no more than 1 mm wide. Hemphill Engraved commonly occurs on bowls and bottles, and includes vessels previously classified as Moundville Filmed Engraved and Moundville Engraved Indented.

variety Hemphill—This variety is decorated with free-standing or representational motifs, most of which pertain to the iconography of the Southeastern Ceremonial Complex. These motifs usually (but not always) occur on the subglobular bottle with a simple rounded base, or on the cylindrical or semi-cylindrical bowl with a single lug (see Moore 1905: Figs. 8, 17, 21, 56, 62, 64, 84, 87, 89, 112, 114, 117, 121, 123, 146, 148, 151, 153, 156, 160; Moore 1907: Figs. 7, 9, 10, 34, 37, 39, 41, 42, 43, 45, 46, 51, 57, 60, 63; McKenzie 1966: Figs. 8b, 18, 19; DeJarnette and Peebles 1970: 99 bottom, 100 bottom).
variety Elliots Creek—The characteristic design on these vessels is a 3 line scroll with areas of excision. It has only been observed at Moundville on ovoid pedestalled bottles (see McKenzie 1966: Fig. 8a).
variety Havana—This variety includes bowls on which the major design consists of a horizontal band of 2 or more lines running parallel to and just below the lip. The bands of lines are usually embellished with loops and/or folds. The most common vessel form is the cylindrical/semi-cylindrical bowl with a single lug (see Moore 1905: Figs. 21, 51, 73, 120; McKenzie 1966: Fig. 5).
variety Maxwells Crossing—The designs included in this variety are predominantly rectilinear, although non-rectilinear motifs sometimes do occur as secondary elements. Three classes of designs are subsumed: 1) windmill motifs, 2) vertical cross-hatched bands, and 3) horizontal bands filled with zones of vertical and oblique parallel lines. These designs usually occur on subglobular bottles with pedestalled or slab bases (see Moore 1905: Figs. 30, 35, 53, 109; Moore 1907: Fig. 12).
variety Taylorsville—These vessels have designs made up of a 3-4 line scroll superimposed on a cross-hatched background. The most common vessel forms are the subglobular bottle with a simple rounded base, and the cylindrical bowl with a single lug (see Moore 1905: Figs. 20, 86, 133; Moore 1907: Figs. 15, 19).
variety Tuscaloosa—The scroll designs which typify this variety are made up of fine dry-paste incisions about 1 mm wide. The defining motifs fall into two categories: 1) vertical scrolls made up of 4-10 closely spaced lines, and 2) running scrolls made up of 15-30 closely spaced lines. The predominant vessel form is the subglobular pedestalled bottle. The two motifs have for now been lumped into a single variety because of their similarity in execution and the lack of any observable separation in time; future work may, however, necessitate placing each motif in a separate variety (see Moore 1905: Figs. 37, 39, 71, 119; Moore 1907: Fig. 47; McKenzie 1966: Fig. 22).
variety Wiggins—This variety is decorated with 2-5 line running scrolls. Occasionally, these scrolls are embellished with fill-in crosshatching or with crosshatched triangular projections. This variety usually is found on subglobular bottles with simple rounded bases, or on cylindrical bowls with single lugs (see Moore 1905: Figs. 124, 162; Moore 1907: Figs. 66, 68, 70; McKenzie 1966: Fig. 9).

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CHANGING WOODLAND CERAMIC FUNCTIONS AND TECHNOLOGIES ON THE NORTHERN GULF COASTAL PLAIN

In 1975, a site testing project was conducted on Middle and Late Woodland sites near Selma, Alabama. The research was part of an on-going program begun with excavations at the site of Durant Bend in 1970 (Nance 1976) and continued through archaeological surveys during the summers of 1971 and 1972 (Jeter 1973). The results of the 1975 field work are contained in reports by Jeter (1978) and Nance (1978) and are partially published in an article by Jeter (1977). The project was funded by U.A.B. and the Alabama Archaeological Research Association, Inc. with matching money from the U.S. Department of Interior in cooperation with the Alabama Historical Commission.

This paper presents the ceramic analysis for five sites tested during 1975, then fits this data into a general hypothesis regarding changing ceramic technologies and functions on the eastern Gulf Coastal Plain.

The ceramic analysis is essentially non-typological in approach, and deals with the attributes of surface decoration, sherd thickness, and sherd paste color. Of the five sites studied, three are from the Middle Woodland and two from the Late Woodland period. The great bulk of the sherds examined are sand-tempered and either plain or check stamped.

Several findings emerged from the study. First, for all sites, check stamped sherd proportions tend to decrease from lower to upper levels and presumably through time. This trend is summarized in Table 1. Secondly, for all sites check stamped sherds tend to have darker paste colors than plain sherds (observations controlled using the Munsell Color Chart; see Nance 1976:57). Table 2 lists by site ratios of dark to light sherds for both plain and check stamped samples. When Late Woodland samples are compared with those from Middle Woodland sites two significant differences emerge. Late Woodland pottery is thicker (Table 3) and lighter in color (Table 2) than Middle Woodland pottery. A final result of the analysis is that for Late Woodland samples, check stamped pottery is thicker than plain ware (Table 3).

Obvious questions are: how can these trends be explained, or in terms of current Southeastern research, are they even significant? The typological approach developed for Southeastern archaeology has been useful in developing regional chronologies. However, since this typology is based almost entirely on temper and the presence or absence of surface decorative techniques, other attributes generally have been ignored (with a few exceptions, such as in Wauchope 1966 and Sears 1963). As chronologies become established, perhaps the potential of other attributes and different kinds of ceramic studies can be explored. For Matson (1965), ceramics can be related functionally to other aspects of culture and to the environment. Southeastern archaeologists seem willing to take this approach in the study of lithic artifacts, letting knives and projectile points, for example, represent an index of hunting activity (Faulkner and McCollough 1973). Inquiries into changing functions of ceramics, however, are largely absent. Sherd thickness relates to the size and weight of a vessel and also to the strength of its walls. Changes in vessel size and weight could be expected with changes in settlement pattern and, specifically, duration of residence. Large vessels are difficult to transport. At the same time, a changing economy can lead to changes in various vessel functions (more or less storage relative to cooking vessels, for instance).

Another dimension of the problem is ceramic technology, and this is another matter largely unexplored in southeastern research. Aside from changes in temper or decorative techniques, how did the manufacture of prehistoric pottery change and develop? As for the study of stone tools, one cannot study changing ceramic functions without also assessing changes in manufacturing technology. Changes in vessel morphology could be due either to a new technology, new vessel functions, or both. In the last instance, functional demands might require technological changes in order to make vessels of a desired form and capability.

Returning to the data at hand, we can begin with consideration of differences in paste color, both between plain and check stamped sherds and also, in general, between the Middle and Late Woodland samples. Mentzer refired 20 sherds, five plain and five

Table 1. Ratios, check stamped to plain sand-tempered sherds by level, Middle and Late Woodland sites.

		Level											
		1		2		3		4		5		6	
Site	Period of Occupation	No.	R. [2]	No.	R.	No.	R.	No.	R.	No.	R.	No.	R.
Au 113	M. Wood.	7	.21	14	.35	11	1.22	4	.44	-	-	-	-
Ds 97	M. Wood.	1	.01	7	.10	9	.20	-	-	-	-	-	-
Ds 73 S.	L. Wood.	118	.21	171	.57	83	.53	36	.71	14	.44	11	.61
Ds 73 N.	L. Wood.	203	.21	196	.50	164	.82	74	.87	-	-	-	-
Ds 79	L. Wood.	11	.04	17	.07	24	.15	3	.08	-	-	-	-

1. Number of check stamped sherds.
2. Ratio of check stamped to plain sherds.

Table 2. Ratios, dark to light sherds for plain and check stamped sand-tempered sherds, Middle and Late Woodland sites.

		Plain			Check Stamped			
Site	Period of Occupation	Dark	Light	R. [3]	Dark	Light	R.	P. [4]
Au 113	M. W. [1]	61	31	1.97	32	4	8.00	.02 [5]
Ds 97	M. W.	135	52	2.60	15	2	7.50	.30 [5]
Ds 98	M. W.	152	67	2.27	14	6	2.33	.95
Ds 73 S.	L. W. [2]	704	410	1.72	293	140	2.09	.10
Ds 73 N.	L. W.	900	737	1.22	429	208	2.06	.001
Ds 79	L. W.	420	321	1.31	38	17	2.24	.10

1. M. W., Middle Woodland.
2. L. W., Late Woodland.
3. R., Ratio, dark to light sherds.
4. P., probability for chi-square test.
5. With Yates correction for continuity.

Table 3. Ratios, thick to thin sherds for plain and check stamped sand-tempered sherds, Middle and Late Woodland sites.

		Plain			Check Stamped			
Site	Period of Occupation	$T < 7$ mm	$T \geq 7$ mm	R. [3]	$T < 7$ mm	$T \geq 7$ mm	R.	P. [4]
Au 113	M. W. [1]	59	33	.56	25	11	.44	.80 [5]
Ds 97	M. W.	125	62	.50	13	4	.31	.30 [5]
Ds 98	M. W.	173	46	.27	10	10	1.00	.01 [5]
Ds 73 S.	L. W. [2]	307	807	2.63	86	347	4.03	.01
Ds 73 N.	L. W.	286	1351	4.72	88	549	6.24	.05
Ds 79	L. W.	311	430	1.38	10	45	4.50	.001

1. M. W., Middle Woodland.
2. L. W., Late Woodland.
3. R., Ratio, thick to thin sherds.
4. P., probability for chi-square test.
5. With Yates correction for continuity.

check stamped, Middle Woodland, and five plain and five check stamped, Late Woodland. These were refired to 850-900° centigrade in an oxidizing atmosphere, and all traces of blackness or greyness disappeared from the sherds. Mentzer concluded, therefore, that the sherds with darker paste were from vessels which had not been thoroughly oxidized during firing (following Shephard 1956:217-19), and that differences between Late and Middle Woodland sherds and between plain and check stamped sherds were due to different firing techniques for these wares. Exactly why these firing differences would have developed and been perpetuated, however, is not clear at this time.

This brings us to the matter of thickness. In Late Woodland contexts check stamped sherds are thicker than plain ones. One possible explanation for this difference might have to do with the technological (vs. the decorative) aspect of carved paddle stamping, and to explore this possibility, we will consider an ethnographic account of pottery making among the Iban of northwest Borneo.

Initially, Iban pots are not coiled but built up from a solid lump of clay using the paddle and anvil technique. While we are assuming from the rectangular sherd shapes that central Alabama pottery was coiled first and then finished with the paddle and anvil, the Iban do use a carved wooden paddle, producing complicated stamped designs, and thereby giving the account some relevance.

> Furthermore, Iban pottery beaters are distinguished in another important way; while one side of a beater commonly has a surface of plain, polished wood, the other usually carries an incised design often of some complexity. These designs, interestingly enough, have two different uses, one technical and the other aesthetic. Let me first deal with the technical use. In the modeling of a pot one side of the beater is employed and then the other beginning with the side that bears the design. Now the design is deeply incised in the surface of the beater so that with each blow it becomes clearly impressed in the soft clay in numerous tiny ridges and depressions. The beater is then reversed and the plain side of it is used to flatten out the imprinted design into a smooth surface again. In this way, by the alternate use of the incised and flat blades of the beater the wall becomes progressively thinner and the pot is gradually modeled into shape. The final shaping of the pot is always done with the smooth face of the beater, after which the pot is put to one side for a few minutes to dry.
>
> The pot is then ready to be decorated. One of the beaters is selected (a potter usually has a small collection of them from which to choose), and the incisions in it cleaned out with the blade of a knife. The pot is then taken up, an anvil stone held within it, and the patterned blade of the beater gently but firmly tapped over the entire outer surface of the pot—except for its concave neck and lip. A completed pot is thus covered, from its neck down with an over-all pattern made up of a series of slightly over-lapping impressions of the designs of the beater. This patterning is often very pleasing and there is justification for describing Iban pottery as a decorated ware (Freeman 1957: 162-63).

An important implication of this discussion for our purposes is that check stamping in the Southeast may well have had an important technological role in the final forming of vessels, particularly in the final thinning of vessel walls, and, in the case of coiled pottery, in welding the coils together. Since all Late Woodland pottery is thicker than that of the Middle Woodland, and since check stamped pottery is thicker than plain during Late Woodland times, it can be hypothesized that the largest Late Woodland vessels required carved paddle stamping in order to produce vessel walls of sufficient strength, if for no other reason, so they could stand up under their own weight.

This explanation begins to make sense when one considers the history of check stamped pottery on the eastern Gulf Coastal Plain and Late Woodland shifts in economy and settlement pattern.

Check stamped pottery became unpopular with the decline of the Deptford tradition and the advent of the Late Woodland, at least this seems to be the case for the Florida northwest coast and the Selma area, as will be discussed below. In the Selma area, surface decoration emphasis apparently shifted to limited incising and punctating near the rims of otherwise plain vessels. In northwest Florida, complicated stamping continued, but elaborate incised and punctated wares appeared as part of the new Weeden Island tradition. Around A.D. 700, however, check stamped pottery again became important in both areas. Similar developments can be seen in the St. Johns area of northeastern Florida with check stamping diminishing greatly after the Middle Woodland and reappearing after A.D. 700 in the St. Johns II period (Sears 1957).

For other areas, there is a contemporary reappearance of another form of paddle stamped decoration, cord-marking. In north-central Florida, following Deptford and Santa Rosa-Swift Creek, Weeden Island-St. Johns 1B ceramics are manifested until around A.D. 700 and the appearance of the Alachua tradition (Milanich 1971). In the Alachua period, cord-marking was the dominant decorative technique. Also, defined for sites along the upper Tombigbee River of Alabama, the Miller III phase dates between A.D. 500 and 900 (Jenkins and Curren 1975). It is currently under going further refinement, being divided into early, middle, and late sub-phases. In Early Miller III contexts, few or no Tishomingo Cord-Marked sherds are found, while for Middle Miller III levels, cord-marked sherds are often in the majority (Jenkins, personal communication, 1978).

To restate the proposed hypothesis in chronological terms, in the Selma area, the resurgence of check stamped pottery after A.D. 700 is a result of the increased size of vessels at or about that time. For the eastern Gulf Coastal Plain as a whole, it is obvious that cultural preference and diffusion would have played a role in this process, since the use of cord covered paddles would have served in much the same way as check stamping. Indeed, this is suggested for the Alachua tradition and for Tishomingo Cord-Marked pottery to the west.

We are left, then, with the matter of large vessels, and why they might have become common on the eastern Gulf coastal plain in Late Woodland times.

As will be discussed below, there is evidence in the Selma area for a great increase in the number of sites and the size of sites after Middle Woodland times. It is probable that agriculture was widely practiced by the latter half of the Late Woodland, and a greater emphasis on agriculture may account for the apparently decisive change in demography and/or settlement size and distribution. Agriculture may have led to more sedentary village life, and the increasing dependence on agriculture may have led to a greater emphasis on food storage in large ceramic containers. If these same changes occurred over a large portion of the eastern Gulf Coast Plain, this might explain the widespread reemployment of decorated paddle stamping in ceramic manufacturing.

It remains to discuss one other possibly functional-technological element found for these late wares decorated through paddle stamping. If the types discussed above are of storage vessels, it is likely that they were covered while in use. It can be anticipated, therefore, that vessel lips would be flattened or otherwise strengthened to support the weight of wooden or stone slab lids. In the Selma area, Late Woodland check stamped vessels occasionally had wide exterior rim folds not found for plain wares (Dickens 1971; Jeter 1977). Also, check stamped rim sherds more often have flattened lips than do plain rim sherds. This can be seen in rim form data from sites Ds 73 and Ds 79 (summarized in Table 4). At other sites near Selma, the correlation is statistically significant. Table 5 summarizes rim sherd (lip) forms for Late Woodland sherds classified by Jeter (1978). A similar result was obtained from the Late Woodland component at Durant Bend (Nance 1976:111). Elsewhere, other late wares which were decorated through paddle stamping have some rim flattening and/or folding (reported for Wakulla Check Stamped, Willey 1949:438; and Prairie Cord-Marked, Milanich 1971:33).

Turning to the subject of chronology, researchers in the Selma area, including Dickens (1971) and Jeter (1977), have seen post-Middle Woodland occupation beginning ca. A.D. 500 and characterized by low proportions of check stamped sherds. Sometime after this date, check stamped pottery becomes popular, and in this sense, these later Late Woodland assemblages resemble those from the earlier Deptford (Middle Woodland) sites in the area. In terms of absolute chronology, Dickens has published radiocarbon dates for two Late Woodland sites in the Selma area, A.D. 530 ± 100 and A.D. 920 ± 105. Both sites have low percentages of check stamped pottery. Radiocarbon dates have been obtained from three of the 1975 Late Woodland sites, all with relatively high check stamped percentages. These range between A.D. 730 ± 60 and 870 ± 185.

The significance of all five radiocarbon dates may be that no Late Woodland component in the Selma area with high percentages of check stamped pottery has been radiocarbon dated prior to A.D. 700. If check stamping becomes widespread only after A.D. 700 in the Selma area, this is consistent with the basic archaeological sequence for the eastern Gulf coastal plain developed by Ford (1952), Willey (1966) and others. According to this interpretation, Weeden Island I is contemporary with Baytown of the lower Mississippi Valley and therefore dates prior to A.D. 700. Weeden Island II components contrast with those of Weeden Island I through their high percentages of check stamped pottery, and are held to be contemporary with Coles Creek, thereby post-dating A.D. 700.

Therefore, for both the eastern Gulf Coast and the northern edge of the Gulf coastal plain, there may have been a post-Middle Woodland period, A.D. 500-700 with little carved paddle stamped pottery, and this may have been followed by a re-emphasis on check stamped ceramics. As far as we are aware, radiocarbon dating from neither area is incompatible with this suggestion.

Discussion now centers on the matter of settlement pattern and subsistence: Following the excavation of Durant Bend (Nance 1976) and the 1971 and 1972 surveys (Jeter 1973), marked shifts were noted in the number of sites occupied during different prehistoric periods. Of 80 sites recorded, only two produced any shell-tempered sherds. At the same time, only five sites yielded any quantity of Middle Woodland pottery, including Durant Bend and the three Middle Woodland sites tested during 1975. Most of the remaining sites are probably Late Woodland (Jeter 1973).

Along with an increase in the number of settlements, settlement size also appears to shift from Middle to Late Woodland times, with Late Woodland sites becoming larger (Nance 1978).

Regarding subsistence data from the Selma vicinity, plant remains were analyzed from two sites (Yarnell 1971), Au 7 (radiocarbon dated at A.D. 920 ± 105) and Lo 32 (radiocarbon dated to A.D. 530 ± 100). Nut shells are abundant in samples from both sites, but with the exception of a possible squash seed from Lo 32, the only domesticated plant remains, corn, came from the later site. Faunal material from Durant Bend are from the Middle, and Late Woodland and the Mississippian periods. While samples from Woodland contexts are small, there does appear to be a trend through time from an emphasis on deer hunting in Deptford times to increasing diversification in later periods (Thurmond 1976). The more diversified faunal patterns, including more small game, is also evident in remains identified by Dickens (1971) for the Late Woodland.

In summary, the Selma area data at least suggest a shift from small villages with economies based pri-

Table 4. Lip form by ware for plain and check stamped sand-tempered sherds, sites Ds 73 and Ds 79.

Frequency Expected F. Cell Chi 2	Round	Flat	Total
Plain	65 58.66 .58	53 59.34 .57	118
Check Stamped	21 27.341 1.25	34 27.66 1.23	55
Total	86	87	173

Table Chi-Square (with Yates Correction) = 3.63, 1 D.F., P = .10

Table 5. Lip form by ware for plain and check stamped sand-tempered sherds, sites Ds 84, Ds 89, Au 110, Au 118, and Au 123. Data from Jeter (1978:table 9).

Frequency Expected F. Cell Chi 2	Round	Flat	Total
Plain	96 80.82 2.85	55 70.18 3.28	151
Check Stamped	71 86.18 2.67	90 74.82 3.08	161
Total	167	145	312

Table Chi-Square = 11.88, 1 D.F., P = .001

1. Data from Jeter 1978:Table 9.

marily on hunting and gathering in Middle Woodland times to larger, more numerous villages and more emphasis on agriculture during later periods. Similar interpretations have been made for other areas on the eastern Gulf coastal plain. For the upper Tombigbee, Jenkins and Curren (1975) describe Miller III sites as large in number and of greater size compared to those of earlier phases. Also, describing a shift in site locations to soils best suited for agriculture, they interpret this as a possible reflection of growing dependency on this type economy. Milanich summarizes the Alachua tradition as follows:

> The Alachua tradition seems to have been the first ceramic culture to flourish and grow in north-central Florida, which previously was a fringe area of the Gulf and St. Johns traditions —a sort of cultural backwater where no clear cultural influence took precedence for any length of time. Probably the cultivation of corn, well suited to Alachua's clayey soil was the secret of success of the Alachua tradition (Milanich 1971:46).

Similar developments are being recorded elsewhere in the Eastern Woodlands (e.g., Munson 1976; Gibbon and Caine 1976).

The same diversification in hunting practices found for the Selma area is also described for Tombigbee River sites (Curren 1975), and this led Jenkins and Curren to see a refinement in hunting techniques by Late Woodland peoples in that locality. These parallel trends in faunal remains are not inconsistent with the interpretation of increasing human populations during the Late Woodland. An increased population, subsisting primarily on maize agriculture, might have required the extraction of more animal protein from each occupied territory.

The re-emergence of design-impressed paddle stamping in mid-Late Woodland times, then, may represent part of a new technology devised for the production of large ceramic vessels and linked to an increasing emphasis on agriculture. The point of this paper has been to present a possible working hypothesis for the attribute analysis of Woodland ceramics. As sites linked to agriculture produce thick sherds, high percentages of these paddled, design-impressed sherds, relatively thick design-impressed sherds, and high proportions of flat-lipped and folded rim sherds, particularly on these paddled, design-impressed sherds, and as these tendencies fail to materialize for contemporary or earlier non-agricultural sites, the hypothesis will be supported.

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James W. Springer and Stanley R. Witkowski

A REASSESSMENT OF SOUTHEASTERN LINGUISTICS AND ARCHAEOLOGY

A convincing synthesis of Southeastern historical linguistics and archaeology awaits a thorough genetic treatment of southeastern languages and the application of sophisticated methods for reconciling these two very different perspectives on prehistory. The present paper outlines the problems and offers some partial solutions.

The two approaches to linguistic analysis which we have employed are the genetic and the geographical. The former consists of the establishment of sets of cognates in related languages, systematic sound correspondences, and protoforms. The result is a statement of common origins, often presented as a family tree. The geographical method is based on areal influences in linguistics and other geographical factors. It analyzes historical relationships which do not depend upon a common origin for the languages being compared, namely borrowing, proximity, association with a particular habitat or adaptation, and association with an archaeological culture.

Relating linguistics and archaeology depends upon knowledge of the material culture of historically documented language groups and upon more general spatial and temporal co-occurrences. Archaeological and linguistic units cannot be expected to be isomorphic, since they depend upon completely different aspects of culture. However, there are many documented examples of broad and substantial correspondences between the two. The different character of the two bodies of information can actually be a help, since well substantiated hypotheses about archaeological change can modify our views of the corresponding linguistic changes, and vice versa.

Our work began with a review of the hypothesized genetic relationships among Eastern North American languages. The generally accepted relationships are shown in the following table. Only the Eastern families and isolates are included.

We evaluated the evidence (cognate sets and sound correspondences) for each of the relationships at the family and phylum levels and also did a limited survey of additional data from published dictionaries. The results are shown in Table 2, which expresses our conclusions as to probable genetic relationships. Again, only Eastern language families and isolates are given: Gulf is revived as a phylum, following Haas's (1951, 1952) earlier views, and it is separated from Macro-

Table 1. Genetic classification of Eastern North American Indian languages, following Voegelin and voegelin (1964, 1965).

- Macro-Algonquian Phylum
  - Algonquian Family
  - Muskogean Family
  - Natchez Language Isolate
  - Atakapa Language Isolate
  - Chitimacha Language Isolate
  - Tunica Language Isolate
  - Tonkawa Language Isolate
- Hokan Phylum
  - Comecrudan Family
  - Coahuiltecan Family
- Macro-Siouan Phylum
  - Siouan Family
  - Catawba Language Isolate
  - Iroquoian Family
  - Caddoan Family
  - Yuchi Language Isolate
- Language Isolates and Families With Undetermined Phylum Affiliations
  - Beothuk Language Isolate
  - Karankawa Language Isolate
  - Timucua Language Isolate

Table 2. Revised genetic classification of Eastern North American Indian languages. The age of divergence in years is given in parentheses.

- Macro-Algonquian Phylum (6000+)
  - Algonquian Family (includes Beothuk) (2500-3000)
- Gulf Phylum (6000 +)
  - Siouan Stock (5000)
    - Siouan Family (3000)
    - Natchez Language Isolate
    - Catawban Family (4000)
  - Muskogean Family (3000 - 3500)
  - Timucua-Tawasa Family (1000)
  - Tunica Language Isolate
  - Yuchi Language Isolate
  - Chitimacha Language Isolate
  - Atakapan Family (1000)
  - Tonkawa Language Isolate
  - Karankawan Family (2000 - 3000)
  - Comecrudan Family (3000 - 4000)
  - Coahuiltecan Family (5000)
  - Borrado Language Isolate
- Iroquoian-Caddoan Phylum (6000 +)
  - Iroquoian Family (3500 - 4000)
  - Caddoan Family (4000 +)

Algonquian. Gulf is extended to include Yuchi, Timucua-Tawasa, Karankawan, Tonkawa, Comecrudan, Coahuiltecan, and Borrado. Also added to Gulf is a Siouan Stock, consisting of Siouan, Catawban, and Natchez. Natchez had been included as an isolate within Gulf by Haas. Finally, Iroquoian and Caddoan are grouped as a phylum.

In comparing genetic groups with geography and demography, some patterns emerge (Fig. 1). Most of Eastern North America was composed of large families, occupying largely continuous areas, and divided into many languages and dialects. These include Algonquian, Iroquoian, Muskogean, Caddoan, and Siouan. A different pattern is found in the occurrence of the Gulf languages, excluding the Muskogean and Siouan Families. Here there are twelve isolates or families consisting of only two or three languages. Each family or isolate is small in both population and area. In addition, the Gulf geographic area contains a few small groups representing families of the interior, namely Siouan and Muskogean. A problem for the archaeologist is to relate this Gulf Coast pattern to his knowledge of the culture history of the area. As a first suggestion, we propose an analogy with the rich parts of aboriginal California, where agriculture was absent, population density was high by North American

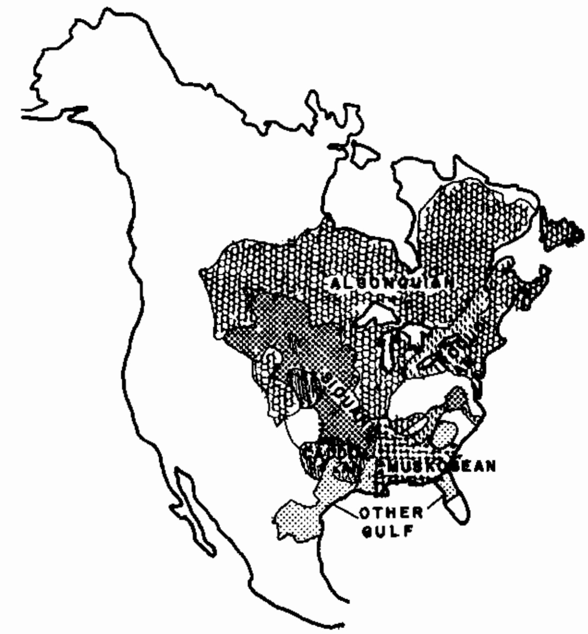

FIGURE 1. MAP OF LANGUAGE FAMILIES

MODIFIED FROM DRIVER 1961 AND 1969

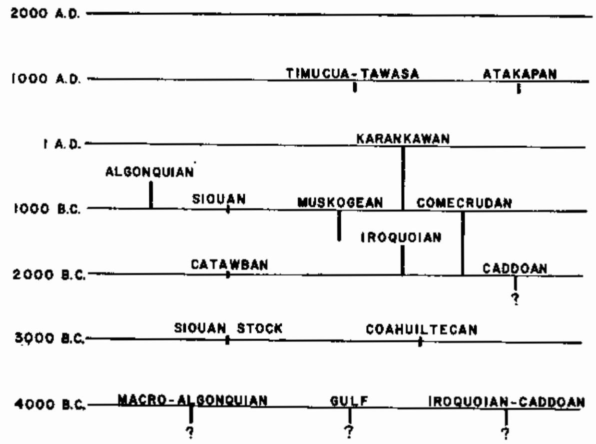

FIGURE 2. ESTIMATED DATES OF PHYLUM AND FAMILY DIVERGENCES

standards, and political and linguistic groups were small and heterogeneous. By analogy, the rich coastal environments of the Gulf, exploited largely by hunting and gathering, either favored small and isolated languages or hindered the spread of one language at the expense of others. Just why this should be so is an unexplained matter.

A second problem for the archaeologist concerns the age of the family and phylum level divergences. These dates, based on our estimates of the degree of lexical sharing and on the work of Swadesh (1955), are given in Table 2 and Figure 2, in which the vertical lines indicate the likely origins of the various groups. The major linguistic families (Algonquian, Muskogean, Iroquoian, Siouan, and Caddoan) were already in existence by 1000 B.C. The dates are critical when the spread of an archaeological culture is interpreted as the source of a language family or phylum. The population buildups and cultural dispersals of 900 A.D. and later, which are so striking in the archaeological record, occurred too late to be a manifestation of important linguistic divergence. They may have affected the distribution of already existing languages, or more likely they tended to follow existing linguistic boundaries.

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Arlene Fradkin

HOG JOWLS AND COON MEAT: AN ANALYSIS OF FAUNAL REMAINS FROM THE HAMPTON PLANTATION, ST. SIMONS ISLAND, GEORGIA

Zooarchaeological data from historic sites may aid in the further understanding of past dietary patterns by supplementing and/or complementing the partial story told by documentary records. In this paper, the faunal remains recovered from the Butler Point site on St. Simons Island, Georgia, are contrasted with the information recorded in the associated historical documents.

The site is located on the former Hampton Plantation and most probably represents the remains of a slave cabin of the early 19th century. The major written record is a journal that had been kept by the famous English actress, Frances Anne Kemble (1961), the wife of its absentee owner. She had visited his estate for a period of two months during the winter of 1838-1839. Kemble, who only learned of her husband's southern property investments subsequent to her marriage, was vehemently opposed to the institution of slavery and thus she painted a brutal and perhaps exaggerated account of slave life. Her journal is replete with the plight of the slaves and their continual petitions for food. Another journal by Frances' daughter, Frances Butler Leigh (1957), gives information on the condition of the estate after the Civil War. Finally, sources from other plantations provide a more complete, though very general, picture of slave conditions and foodways.

The faunal remains were identified by the author at the Florida State Museum, Gainesville, Florida, under the supervision of Elizabeth S. Wing. The material was quantified by three methods: enumeration of the total number of fragments of identifiable bone of each species; calculation of the minimum-number-of-individuals (MNI); and measurement of bone weights. The latter was employed in order to estimate the amount of edible meat derived from the various food animals. The assumption is made that the animal's live weight can be predicted from its skeletal weight by the use of linear regression formulas. The total live weights, in turn, were converted to the greatest possible edible meat weight totals.

The analysis of the faunal sample indicates that the slaves living at the Hampton Plantation were consuming both domestic and wild foods. The following discussion examines the relative role of such animals in the diet in terms of those protein foods distributed by the planter versus those foods that the slaves supplied for themselves. This type of classification scheme, indeed, may represent the actual folk taxonomy that had existed in the minds of the slaves (Ascher and Fairbanks 1971:11).

The Planter's Rations

The domestic portion of the slave diet was primarily derived from meat rations provided by the planter. At Butler Point, the relative bone weights of large domestic animals seem to demonstrate a surprisingly high consumption of beef. Cattle bones composed 41.3% of the total faunal weight. The cattle elements recovered indicate that the slaves were consuming inferior cuts of meat, such as the flesh from the head, backbones, carpals, tarsals, and phalanges. Meat from the upper limb bones, the humerus and femur, were occasionally eaten. The historical evidence, on the other hand, only once mentions the slaughter of cattle which was for a Christmas dinner (Leigh 1957: 223). Documents from several other plantations along the Atlantic coast also discuss the distribution of beef on holidays (Hall in Otto 1975:293).

Pigs contributed substantially to the diet, though to a lesser extent than cattle, and constituted 5.4% of the total MNI and 10.7% of the total bone weight. The evidence from the faunal remains indicates that they were using the scanty meat portions of the jowls, heads, shoulders, and lower legs of both immature and adult pigs. In addition, they probably consumed some of the internal organs such as intestines, or chittlings. Hogmeat was often used in the preparation of vegetable greens (Rawick in Genovese 1974:548). Fanny Kemble (1961:84) does mention that the slaves had been allowed to raise pigs; at the time of her visit, however, the plantation was in a state of declining prosperity, and consequently, such privileges were no longer in existence. She repeatedly tells of their numerous petitions to her for hogmeat and describes one incidence of a stolen ham from the planter's kitchen (Kemble 1961:189). The archeological remains recovered only contained one femur fragment indicating that ham was rarely consumed.

The planter occasionally may have also provided his slaves with meat from the turkeys that were kept on the estate (Kemble 1961:83) as indicated by both the archaeological and the historical records.

Although remains of domestic cat were present at the site, such animals probably were not food items and therefore were not included in the total calculations. It is suggested that they were kept in order to scare away the vermin such as rats and mice that commonly infested the slave quarters (Kemble 1961) or they may have possibly been used as fish bait (Otto 1975:356).

Food Supplements

The faunal evidence indicates that the slaves supplemented their basic rations by the hunting and fishing of wild foods. Indeed, the environs of Butler Point provided a wealth of natural resources (Kemble 1961). Major habitats noted for this region include: live oak hammocks; salt marsh and tidal creeks, such as Jones Creek; freshwater ponds; and several rivers, *i.e.*, Hampton and Altamaha Rivers (USGS 1954; Martinez 1975).

The live oak forests were the major source of terrestrial animal resources. Deer were hunted both in the fall and spring as indicated by the recovery of an antler fragment and remains of a juvenile animal, respectively.

It is interesting to note that evidence for the use of firearms is lacking in the plantation's archaeological record. Furthermore, Kemble states that the Hampton slaves were prohibited from possessing such weapons (Kemble 1961:58). At several plantations, however, archaeological excavations have uncovered firearms in slave quarters (Ascher and Fairbanks 1971:13).

Other land mammals frequently taken were raccoon and opossum. These animals are nocturnal and may have been captured with traps during the dawn and dusk hours, which were the only leisure hours that the slaves had (Genovese 1974:486-487). Several historical accounts mention that opossum were initially prepared by parboiling and then were roasted with lard or fatback. Such meats were sometimes dried and smoked in order to vary the diet (Genovese 1974: 546). The lack of burnt bones in the archaeological remains, however, indicates that the latter method of food preparation may have been used at this plantation. Rabbits were also taken and were probably fried for consumption (Genovese 1974:546). Kemble (1961: 301) does mention a gift of three rabbits given to her by several slaves.

The tidal creeks and brackish streams of the salt marsh appear to have been another important source of protein resources (Martinez 1975:40). Mention is made of the frequent gathering and consumption of oysters and prawns (Kemble 1961:257; Leigh 1957: 124). Furthermore, the slaves did possess canoes (Kemble 1961:90) which may have been used for capturing such fish as catfish, sheepshead, and drum, important food supplements. Of especial interest is an incident in which Kemble noticed the master cook at the plantation saving the internal organs of a huge drumfish that she had eaten for his fellow slaves (Kemble 1961:308).

The salt marsh is well supplied with various species of turtles, such as chicken turtle and diamondback terrapin, and alligators (Martinez 1975:41; Kemble 1961) that were occasionally collected by the slaves. Finally, birds were hunted, though infrequently. Large numbers of waterfowl, such as herring gulls, long-billed curlews, and lesser scaup ducks, often nest and feed in the salt marsh during their winter residency along the Georgia coast. Other birds, such as wood ibises, inhabit this environment during the summer months.

Several natural resources were procured from the freshwater ponds in the area. Such aquatic species occasionally exploited were both snapping, mud, and pond turtles, and ducks, such as the blue-winged teal.

The few remains of sea turtle indicate that the slaves may have taken infrequent trips to the sand beaches during the late spring and summer when these animals come ashore to lay their eggs (Martinez 1975: 37). Furthermore, historical documents state that the slaves did deep-sea fishing for bass and bluefish (Leigh 1957:43) though no such evidence was recovered in the archaeological record. Marine resources were of minor importance in the diet and the slaves probably did most of their hunting, fishing, and food-collecting activities in the natural habitats—live oak hammocks, and salt marsh and tidal creeks—immediately surrounding Butler Point.

In addition to the procurement of natural resources, the slaves themselves owned and raised domestic chickens. Frances Kemble (1961:83) also mentions that they would sell the eggs at the market in exchange for clothes. According to the archaeological remains, however, chickens formed a relatively minor portion of the diet in terms of bone weight.

Summary—Dietary Contribution of Fauna

Both the MNI and number of fragment counts indicate that the slaves' contribution, 85.7% and 75.4%, respectively, represented a significant amount while the planter's supply, 14.3% and 24.6%, respectively,

Table 1. Slave vs. planter contribution.

	MNI	NUMBER OF FRAGMENTS	BONE WEIGHT (gms)	ESTIMATED EDIBLE MEAT WEIGHT (gms)
SLAVE CONTRIBUTION	60 (85.7%)	605 (75.4%)	587.1 (17.4%)	6346.8 (17.6%)
PLANTER CONTRIBUTION	10 (14.3%)	197 (24.6%)	2779.1 (82.6%)	29777.3 (82.4%)

was of lesser importance. The calculation of bone and estimated edible meat weights, however, provide a somewhat different pattern of animal use (Table 1). In this approach, the plantation animals (82.4%) constituted the bulk of the diet and the supplementary foods (17.6%) correspondingly contributed a smaller percentage. Although the assumption is made that, of the three procedures, the bone weight method may possibly provide a more accurate assessment of the relative importance of the planter's supply, it should be emphasized that the faunal remains of both domestic pig and cattle were primarily from those skeletal portions that carry little meat. Consequently, the procedure employed for the estimation of total body weight and corresponding edible meat weight may be biased, *i.e.*, overestimation, in this study. Nevertheless, all the analytical procedures employed indeed demonstrate that the slave diet was supplemented by substantial amounts of wild resources.

Thus, it may be concluded, based on the historical documents, that the slave rations, as provided by the planter, were indeed inadequate. The archaeological record, in turn, supplements the information contained in such written records by demonstrating that the slaves took their own initiative in the procurement of additional food resources.

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Andrea Brewer Shea and Gary D. Crites

A PROCEDURE FOR ESTABLISHING A MODERN WOOD CHARCOAL COLLECTION AS AN AID IN THE IDENTIFICATION OF ARCHAEOBOTANICAL SAMPLES

The need for good comparative wood charcoal collections has become more apparent to archaeologists in the past ten years, particularly in the Eastern Woodlands where pollen preservation at open sites is very poor. Identification of wood charcoal from such sites is usually some of the best archaeological evidence of local forest composition during various time periods. For example, analysis of wood charcoals from archaeological sites in the Little Tennessee River Valley has revealed exclusively hardwood types in the Early Archaic period samples with conifers, especially pine species, steadily increasing from the Middle Archaic through the Historic periods. This trend probably reflects man's impact on the climax mixed mesophytic forest. Also, accurate identification of wood types can aid in determining prehistoric cultural bias in wood selection for cooking, heating and construction.

The wood carbonization procedure to be described was initiated as one aspect of a program to establish a comparative wood charcoal collection for the University of Tennessee Paleoethnobotany Laboratory.

The procedure involves collecting fresh wood samples of local species, drying the wood and preparing (with a bandsaw) radial, tangential and cross sections on fragments ca. 5 cm in length and 1 to 2 cm in width. Several pieces of a particular genus or species are placed in a laboratory beaker and enough sand is poured in to cover the wood. Each beaker is assigned a number or the name is written in pencil directly on the wood. The beakers are then placed in a box type muffle furnace. The furnace has a continuous operation temperature range of 66° C to 1010° C and is adaptable for 120 and 240 volt lines.

We have experimented with various time/temperature combinations and have found that cooking the samples for 6 hours at about 600° C provides a thoroughly carbonized sample without creating ash deposits or producing cellular distortion. Lower temperatures and/or shorter cooking time seem to increase the chance of incomplete carbonization, making it difficult to break the fragments by hand for use under a microscope. Cooking at higher temperatures for longer periods seems to increase the incidence of ash deposits. The time/temperature combinations we use work quite well with both hardwood and softwood species.

Obtaining clear cellular patterns on the comparative material facilitates the use of the scanning electron microscope (SEM) in attempts to distinguish very similar anatomical characters. For example, black locust (*Robinia pseudoacacia*) and osage orange (*Maclura pomifera*) charcoal are almost indistinguishable except for the inter-vessel pitting they exhibit. Black locust exhibits vestured pitting on the vessel walls and osage orange exhibits non-vestured pitting. The SEM will have to be used to separate these genera until reliable differentiating characters can be isolated with less sophisticated equipment. Use of SEM micrographs has already proved useful as a tool for distinguishing black locust and osage orange in archaeological wood samples from the Toqua site in Tennessee.

Electron micrographs of various species of a particular genus such as *Carya* (hickory) might allow species-level identification of archaeological samples. Species-specific identification could enhance our capability for reconstructing local forest community structure around specific sites, thus providing better information on how the forest influenced the human populations and how humans affected the forest through time. We are preparing experiments with such goals in mind.

Acknowledgements

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Richard A. Boisvert

FEATURE 400, ROSENBERGER SITE: AN ASSESSMENT OF PREHISTORIC KNAPPER VARIABILITY

During the summer of 1977 the University of Kentucky Department of Anthropology undertook excavations of four Archaic sites in southwest Jefferson County, near Louisville, Kentucky. This work was conducted in advance of floodwall construction on the banks of the Ohio River. The funding was provided by the U. S. Army Corps of Engineers under Moss-Bennett Act Legislation (PL 93-291) and the contract was administered by the Atlanta Office of the Interagency Archaeological Service.

Excavations at the Rosenberger site (15Jf18) revealed a large and complex site. It lies atop a long, high ridge parallel to the Ohio River, which is some 200 m to the west. Machine assisted and hand dug excavations yielded abundant prehistoric remains, including nearly 400 features, of which 178 contained human burials. Assessment of the diagnostic artifacts, burial patterns and physiology of the skeletal remains indicated the presence of a predominately Late Archaic occupation at the site, with suggestions of peripheral Middle Archaic and Early Woodland manifestations (Collins m.s.).

Approximately one third of the burials contained associated artifacts, which included ground stone axes, atlatl components, projectile points, bifacial preforms and bone awls and needles. Perhaps the most impressive of the grave goods is the cache of bifaces associated with Feature 400. Excavation of this feature revealed a series of closely spaced bifaces cached adjacent to a tightly flexed burial (Figure 1). An attempt was made to salvage the burial, however its exceedingly poor state of preservation prevented its recovery. Little more can be said of the individual buried in this feature, other than to say that it was a tightly flexed adult.

The cache consists of 38 closely spaced bifaces, with three additional bifaces which were found in a disturbed context near the cache. This disturbance was caused by earthmoving equipment passing over the feature and resulted in damage to several specimens and loss of the tips of two. Additional bifaces from the cache may have also been removed by the earthmover and not recovered. Other materials recovered from the feature, but not in immediate association with the cache, include one small core, two flakes, two fragments of turtle shell and a drum fish tooth.

Examination of the cache raised several questions concerning its manufacture and deposition in the grave. Two specific problems were eventually selected for analysis. First, were all of the bifaces essentially the same, or were there any significant subgroups present? Second, was the cache the output of a single knapper or from more than one knapper? With these problems in mind, an analysis of the metric and technological attributes of the bifaces was carried out.

The bifaces from the cache share a number of features. They are lanceolate in outline with slightly excurvate sides which converge to very acute tips. The bases are straight and the corners are normally angular, although occasionally they are slightly rounded. The widest point on the bifaces are normally one-fourth to

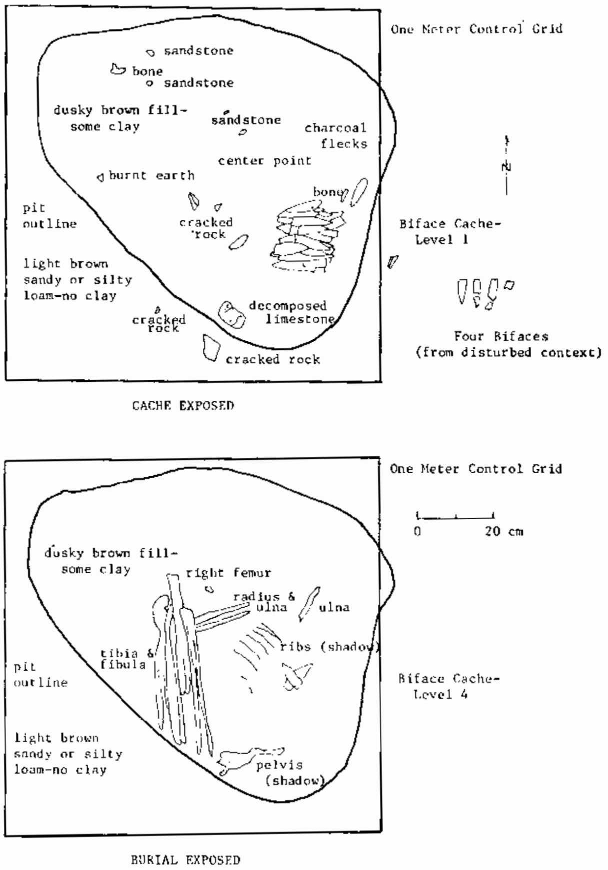


Figure 1. Plan views of Feature 400.

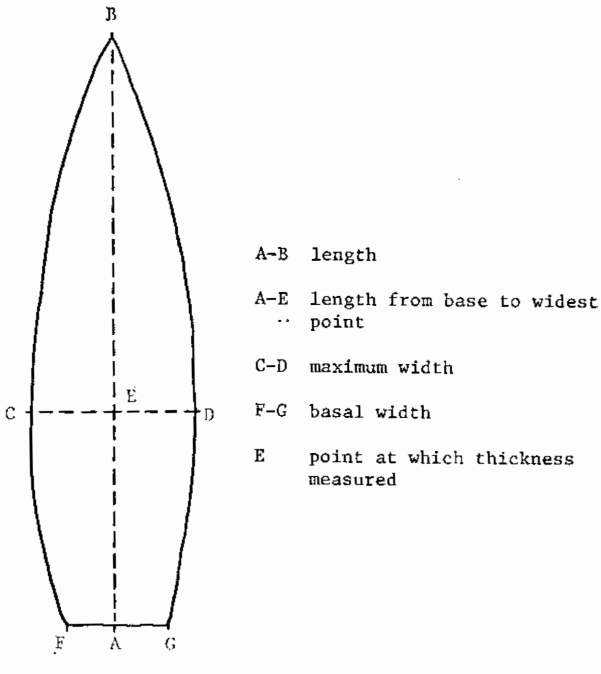


Figure 2. Measurements taken on bifaces.

one-third of the distance from the base to the tip. All specimens are symmetrical in outline and exhibit well controlled percussion flaking. Flake scars are broad and shallow, indicative of soft hammer percussion. Grinding is present on the basal portions of the bifaces and all of the specimens from the cache have been manufactured from Muldraugh chert, a locally available material.

Five measurements were taken on each of the bifaces (Figure 2). The range for each are: length 72 to 124 mm, width 28 to 35 mm, thickness 8 to 13 mm, basal width 15 to 24 mm and length from the base to the widest point on the biface 23 to 52 mm (Tables 1 and 2).

Technologically, it appears that the bifaces were all manufactured from large flakes by similar means. Initially flakes were struck from large cores. In two cases the platforms were left unprepared, while in two other cases the platforms were specifically trimmed and ground prior to striking. These remnants of these platforms constitute the basal edges of the bifaces. The flakes were large and two exhibited a slight longitudinal curvature. In addition, one specimen retains an unmodified portion of flake interior on one of its surfaces and six specimens exhibit a lateral "twist" which appears to be the result of bifacial reduction of a relatively thin flake.

Table 1. Metric attributes in mm.

Biface Number	Cluster	Length	Width	Thickness	Basal Width	Length to Midpoint
1	1	86	33	10	17	28
2	1	84	29	10	20	30
3	2	62	30	10	(19)	40
4/5		79	33	11	20	31
6	2	103	30	11	13	35
7	1	90	32	10	24	22
8	1	77	29	9	21	26
9	1	92	35	12	20	35
10	1	92	31	9	24	30
11	1	87	32	11	22	40
12	2	112	30	10	20	40
13	1	90	31	9	18	30
14	2	(124)	29	9	19	35
15	1	80	34	10	23	30
16	2	100	28	9	21	38
17	2	121	29	9	19	31
18	2	109	30	9	19	39
19	2	107	31	11	22	41
20	2	115	31	11	21	(39)
21	2	(112)	32	11	22	38
22	2	120	27	10	19	30
23	2	103	31	10	(22)	34
24	1	72	31	10	20	22
25	2	109	31	10	19	41
26	2	98	33	10	15	42
27	2	106	32	10	(24)	29
28	2	112	32	11	22	44
29	1	82	34	11	23	31
30	2	105	30	10	22	30
31	1	86	31	11	19	29
32	1	89	31	11	19	28
33	1	83	29	11	20	30
35	2	109	29	9	18	52
36	2	108	30	13	22	30
37	2	119	28	10	20	37
38	2	103	29	10	18	30
39	2	118	28	11	20	28
40	1	89	32	11	20	35
41	1	92	29	9	13	23
43	2	98	32	11	(23)	27
44	2	101	32	10	17	31

( ) estimated measurement ___ broken measurement

Note: Bifaces 4 and 5 are pieces of the same biface and have been rejoined.

Table 2. Metric attributes of measurable bifaces, Feature 400.

	Cluster 1 (N = 16)			Cluster 2 (N = 23)		
	Range	$\bar{x}$	sd	Range	$\bar{x}$	sd
Length	20	87.7	[illegible]	[illegible]	109.4	7.4
Width	7	31.4	1.9	7	30.17	1.6
Thickness	4	10.25	.9	5	10.19	.9
Basal Width	8	20.5	[illegible]	[illegible]	20.08	2.15
Length to widest point	19	29.25	[illegible]	[illegible]	[illegible]	6.29

The primary trimming of the bifaces was accompanied by platform preparation. This is evidenced by the presence of small, short hinge fractures along portions of the biface margins. These flake scars appear to be the by-product of a rasping motion to strengthen the edges as platforms. This fracturing is normally found on one surface only and occurs on 22 specimens. Secondary trimming is present on bifaces in the cache, but it is not abundant. It occurs usually only near the tips and is found on 18 specimens. Typologically, these bifaces closely resemble those defined by Anta Montet-White as Morton Lanceolate (1968:31-35).

The variation subsumed under the general characteristics just enumerated is not great, however, within the cache two distinct groups of bifaces are discernible. The distinction is based primarily upon metric and secondarily upon flake-scar attributes. Cluster analysis using the metric attributes of the 39 complete bifaces yielded a dendrogram which defined the two groups (Figues 3 and 4). The SIMINT program from the NTSYS package was used (Rohlf, Kishpaugh, and Kirk 1974). The input data consisted of the raw meas-

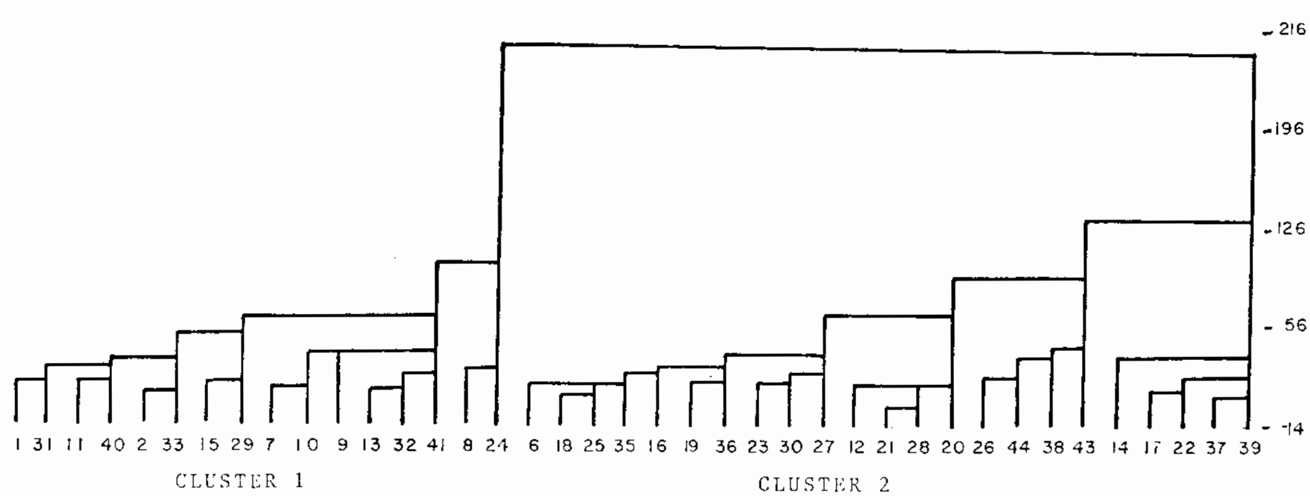
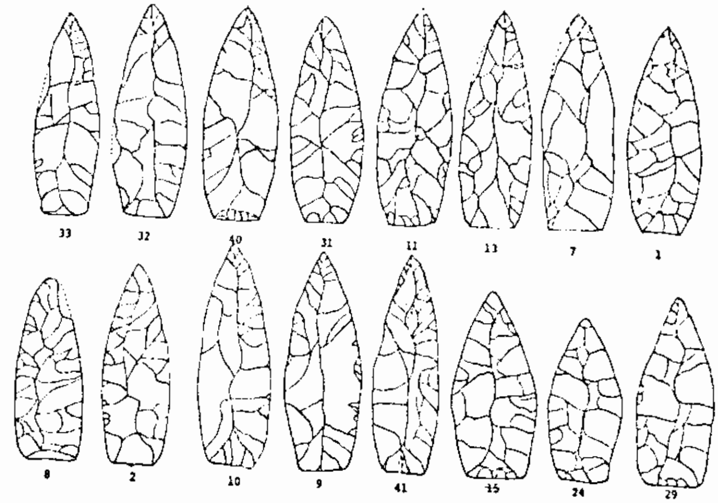
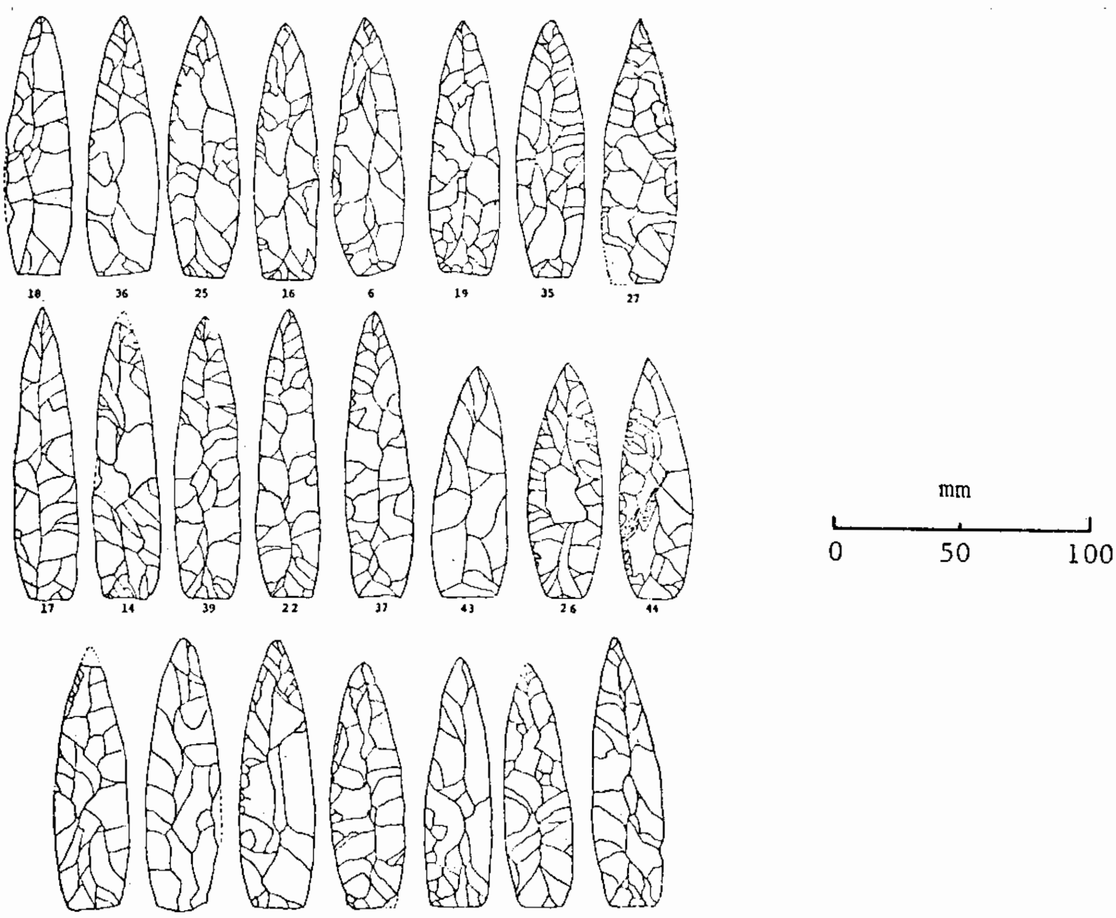


Figure 3. Relationship of bifaces in cache, Feature 400.



CLUSTER 1



CLUSTER 2

Figure 4. Bifaces from Feature 400.

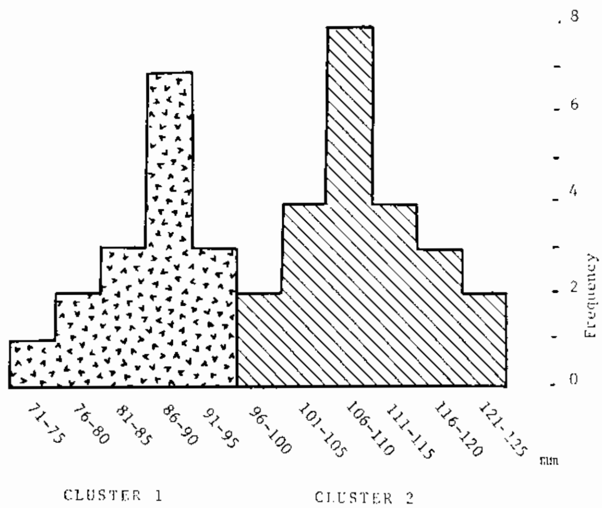


Figure 5. Length of bifaces (mm), Feature 400.

urements. Cluster 1, containing 16 specimens, is composed of short bifaces which are relatively broad. Cluster 2, containing 23 specimens, is made up of bifaces which are longer than those from the other cluster and which are, on the average, narrower. The distinction between the two clusters is most clearly seen in terms of the length of the specimens. Figure 5 illustrates the bimodal distribution of lengths.

The width, basal width and thickness of the specimens also reveal group differences (Figures 6-8). The ranges and standard deviations for both clusters are nearly equal. This is unexpected since Cluster 2 is substantially larger than Cluster 1 and might reasonably be expected to have a wider range. Cluster 2, therefore, exhibits proportionately less variability than Cluster 1.

Aspects of manufacturing technique also have patterned distributions between the two clusters. Four of the bases exhibit evidence of striking platforms. The two specimens (Nos. 7 and 29) with straight single faceted platforms are in Cluster 1 while the two (Nos. 6 and 26) which have prepared ground platforms and slight overhanging lips at the striking platform are in Cluster 2. There are six bifaces which exhibit a "twist" or cross-sectional asymmetry. Of these, five are in Cluster 2 and only one is in Cluster 1. A similar distribution of secondary retouch is also present. Cluster 2 contains 16 of 23 specimens with this retouch, while Cluster 1 contains 5 specimens out of 16 with the attribute. A Chi-square test indicates that this distribution has a probability of between .05 and .01 of being a random distribution.

Morphologically, the two groups of bifaces in the cache may be summarized as follows. One set is relatively short and broad and made from comparatively flat flakes. Secondary retouch is rare on these bifaces and they exhibit a moderately wide range of variability in terms of width and basal width. The other group of bifaces is longer and narrower and probably made of flakes struck from large bifacial cores. Secondary retouch is significantly more common in this set. They have a tendency towards curvature and slight asymmetry which is reflected in their cross-sections. Although this cluster of artifacts contains more specimens than the former cluster, it exhibits an equivalent of smaller standard deviation from the mean for the width, basal width, and thickness.

The distinction between the two groups of bifaces is also reflected in the distribution of the artifacts within the cache. Figure 9 illustrates the placement of the bifaces relative to each other in both horizontal and vertical dimensions. It is apparent that the specimens from each of the groups are not mixed randomly within the cache. Rather, they are placed in stratigraphically alternating groups. At least three and possibly four groups of Cluster 1 bifaces are interspersed between at least four groups of Cluster 2 bifaces. The discrimination between the two is most clear in the lower portion of the cache and it is less distinct in the upper portion. It appears that the upper bifaces have been compressed. This may reflect settling of fill to the lower part of the pit; it may also be partially the result of earthmoving machinery weight.

The bifaces in feature 400 are interpretable as representing two episodes of flint knapping. These are distinguished by the manner in which the parent flakes were struck from their cores, the shapes to which they were brought and the manner in which some of them were finished. Once the manufacturing process was finished, the bifaces were then placed in the grave (probably after the body was placed in it) in alternating sets; first a few bifaces were added from one group, then a few from the other, until at least 41 were put into the pit. Significantly, the lower members of the

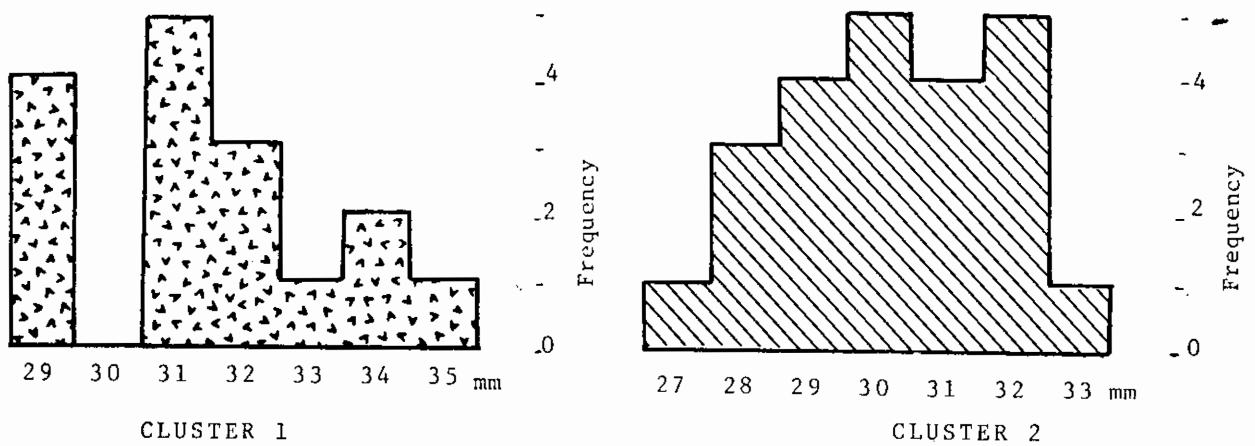


Figure 6. Maximum width of bifaces (mm), Feature 400.

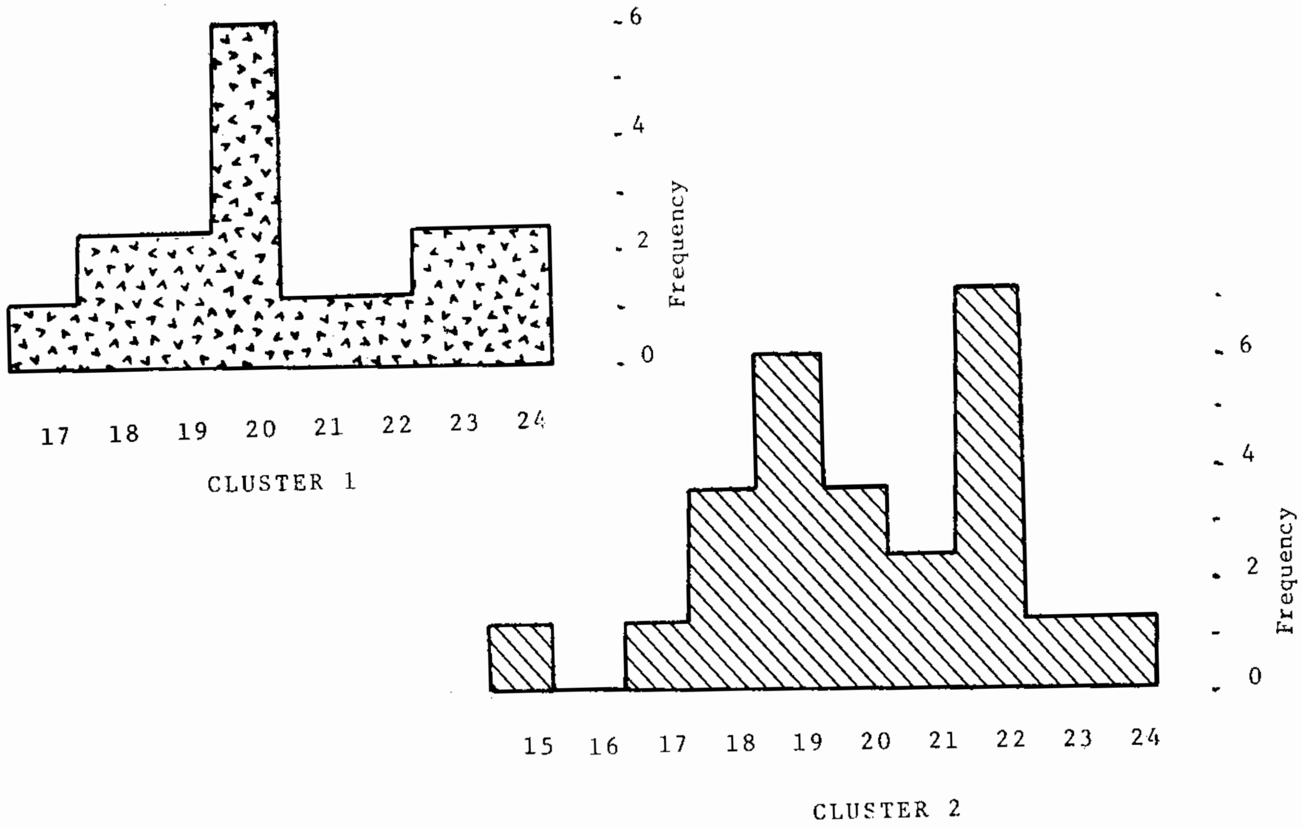


Figure 7. Basal width of bifaces (mm), Feature 400.

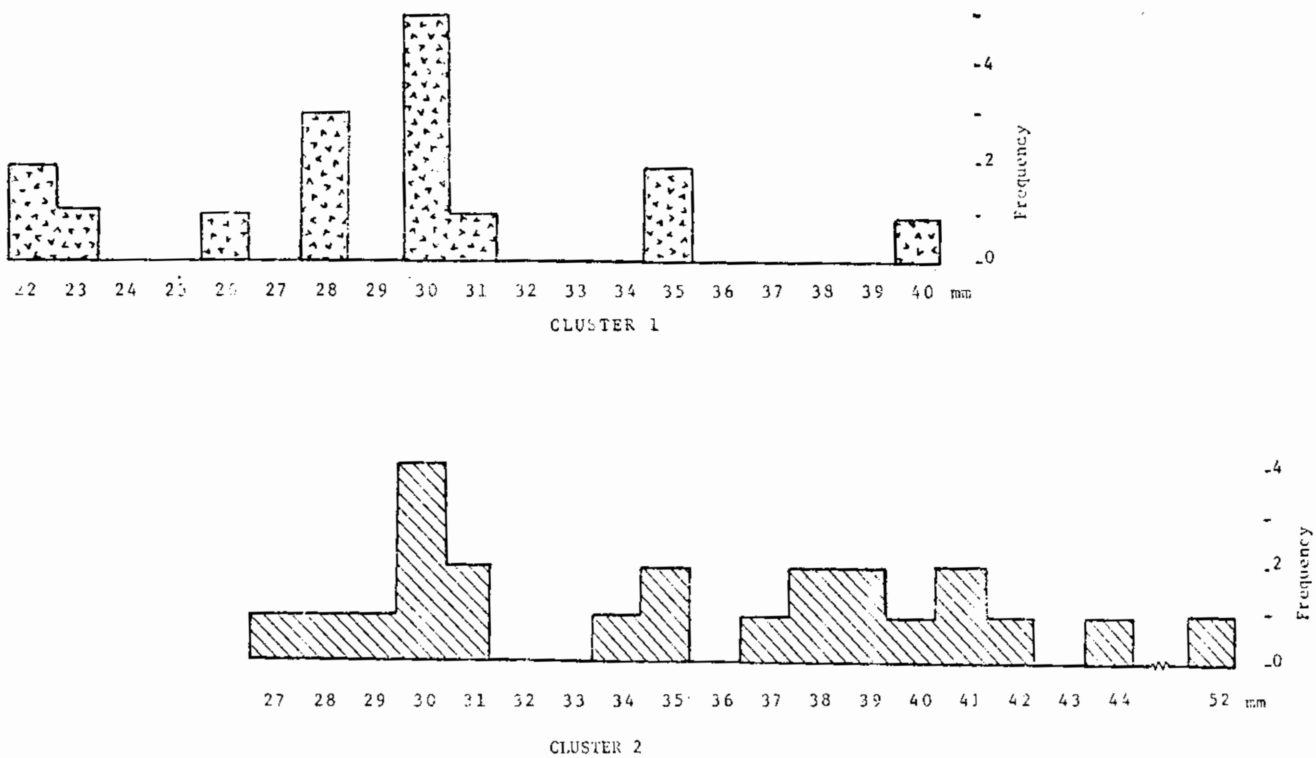


Figure 8. Length from base to widest point of biface

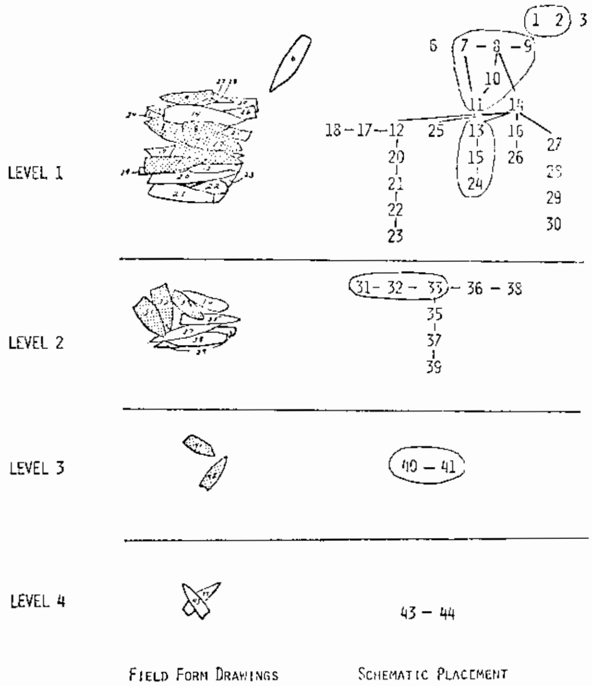


Figure 9. Horizontal and vertical placement of bifaces.

cache were separated from each other by dirt, and in fact twice the excavators indicated in their notes that all of the bifaces had been removed, only to note again that more were present. The patterned differences in the morphology of the bifaces are paralleled by patterned differences in their placement in the grave.

This leads to a final issue concerning the bifaces in the feature 400 cache: were they manufactured by one knapper or by more than one? The bifaces share many attributes—their outline is somewhat variable, but generally consistent. All evidence indicates that they were made from relatively large flakes and processed by well controlled soft hammer percussion out of the same variety of Muldraugh chert. Some of the differences observed between them may reflect differences in the shape and size of the original cores. It is feasible that one knapper may have employed different strategies on different cores in order to obtain large flakes. This could explain the bimodal distribution in length of the bifaces. However, it does not readily explain the consistent difference in width observed between the two recognized groups, nor does it offer a ready explanation for the significantly more frequent occurrence of fine retouch on the specimens in Cluster 2. These differences are more readily explained as deriving from the activities of two knappers using somewhat different approaches toward the same goal.

Joel Gunn (1972) has addressed the problem of discriminating between different knappers on the basis of analysis of metrically definable attributes and has concluded that it is possible to isolate the output of different knappers. Under experimental conditions he was able to demonstrate that experienced knappers will generate bifaces which will reflect consistent morphological patterns. This situation may be reflected in feature 400.

It appears feasible, therefore, that a number of bifaces, produced by one individual, were placed in the pit along with the burial. These bifaces were covered over with a small amount of dirt, and followed in turn by the placement of more bifaces from another knapper. The process was repeated until all of the bifaces had been placed in the ground.

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C. T. Trowell

THE OKEFENOKEE SWAMP AREA SURVEY— A STATUS REPORT: 1978

Before 1977, archaeological evidence from the Okefenokee Swamp area was limited to a few incidental comments by Georgia and Florida archaeologists and several naturalists, surveyors, and local historians. During the past two years the author has conducted an intermittent survey of the area. He has been assisted by area foresters, wildlife refuge personnel, local collectors, professional and amateur archaeologists, and students. Over 200 sites have been recorded. About 25% of these have been personally field checked. About one-half of the sites can be associated with some diagnostic artifacts from site-specific local collections, but artifact samples are very small. Limited test excavations have been conducted at two sites. The final objective of this project is the preparation of a cultural geography of the area beginning with a prehistoric cultural geography.

Several project goals have been established as a framework for investigations. They include: to collect archaeological data to assist in the conservation of sites; to record the impact of existing land use on selected sites; and to inventory site data as a basis for man-land studies of the area. Historical and geographic methods are being used to reconstruct 19th and 20th century Okefenokee. Although the evidence is meager at this point, some tentative, data-based findings can be reported.

One major goal of the survey is the investigation of known sites to determine their condition, size, and cultural components. Site clusters will be identified as archaeologically sensitive areas. By December 1978, over 200 sites have been reported by reliable sources or located by surface reconnaissance. Collections from many of these sites have been examined. Most have been photographed. On Cowhouse Island, a limited subsurface test was conducted to determine the impact of tree planting activities in the village area of a Weeden Island mound-village site (9 We 1). Subsurface features were found in the village area. Charcoal from a pit associated with a structure yielded a C-14 determination of 955 ± 105 B.P. or A.D. 995 (UGa-2136). Another limited test was made about five miles to the south at site 9 Cr 31 in the Dowling Site Complex. Features and relatively undisturbed artifacts were found in areas that had been planted in pine. Neither 9 We 1 nor 9 Cr 31 were deeply plowed and bedded with equipment currently used in land preparation in the area. Several local land managers are working with the author to avoid disturbance of archaeologically sensitive areas where they are known to exist.

Another goal is to determine the impact of tourism on sites in the area. Using a 35 mm camera and a field notebook, surface scatters of artifacts within the Okefenokee National Wildlife Refuge have been recorded. Many of these artifacts quickly disappear, despite efforts of Refuge personnel to protect them. Site 9 Cr 35 on Mixons Hammock is being monitored to determine the impact of campers in this newly opened camping area.

A third goal, to conduct an ongoing inventory of sites for future field reconnaissance, has been very successful. Many collections from the Folkston and Fargo areas have been recorded. Several collections from the Waycross-Manor area have been examined. Assisted by local citizens, over 200 sites have been plotted on U.S.G.S. 7½ minute topographic maps. As a survey technique in a wooded area, this method has been most effective. The local residents examined the area when it was exposed during tree planting operations. Some examples of site-specific collections examined include the Davis Farm Site (9 Cr 6), the Widow Lake Site (9 Cr 3), the Grooms Old Field Site (9 Cr 31) and the Alligator Creek Blister 1 Site (9 Ci 35); see Fig. 1. While this technique has proven to be effective for locating sites in this area, post-holing techniques used at 9 We 1 and 9 Cr 31 *were not effective.*

Another goal of the project is the construction of a cultural sequence for the Swamp area. Although it must be considered very tentative because of the small sample, a cultural sequence based on archaeological data has been prepared for testing as the survey continues. (See Table 1. Dates are inferred from chronologies from Florida, south Georgia, and the Georgia coast.) Little evidence of Paleo-Indian and early Archaic occupation has been found. It is possible that this evidence is deeply buried in this area. The only period of relatively dense settlement within the Swamp seems to have been during the late Woodland period. Evidence indicates that during the late Weeden Island Phase a sizeable aboriginal population settled the Swamp, but it was confined to the Swamp, its perimeter, and along the Suwannee River to the southwest. However, as the survey continues, more and more evidence of utilization of the Swamp area during the late Archaic and early Woodland period is being found. Many of the Weeden Island mound-village sites contain some fiber-tempered/semi-fiber-tempered ceramics, including Stallings Island and Satilla types. Early in the survey, fiber-tempered and semi-fiber-

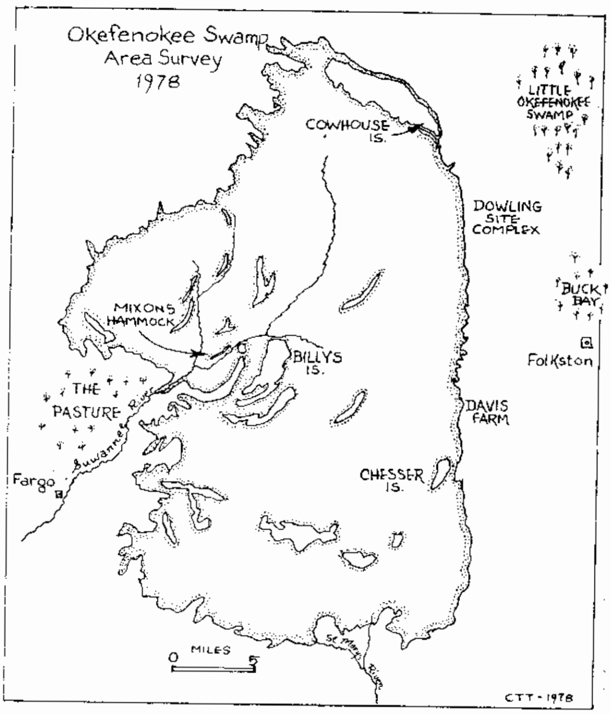

Figure 1.

tempered sherds found on disturbed mounds were assumed to have been secondary deposits by Weeden Island mound-building activity. Recently, evidence from subsurface tests at 9 Cr 31 and from low mounds in the flatwoods around the Swamp suggests the possibility of landscape engineering during the late Archaic and early Woodland periods. In general, the Okefenokee cultures seem to have been more closely related to the cultures of Florida than to cultures on the Georgia coast or to those north of the Swamp.

One of the goals of the survey is to investigate natural changes and their relationship to cultural changes. The Okefenokee Swamp is relatively young. The Swamp area was dry as recently as 7000 years ago. Evidence from peat cores indicates that the existing swamp-marsh ecosystem may be less than 5000 years old. Extended droughts are suggested for the periods 1600-1200 B.C., 700-500 B.C. and A.D. 300-500. No data are available for the A.D. 600-1200 period. Climate since 1700 was wetter than normal (Spackman *et al.* 1976; Bond 1970). The archaeological sample is too small to draw conclusions about changing cultural adaptations.

Some landscape characteristics that are associated with aboriginal occupation have been noted in Table 1. Naturalists, surveyors, and foresters have noted the tendency for "Indian relics", including mounds, to be located in hammocks. Many of the sites on the Swamp islands and on the perimeter are associated with xeric and mesic hammocks. The possibility of a symbiotic relationship between these micro-ecosystems and aboriginal activity in the Swamp is high. Wright (1932: 178) believes that many of the hammock species are not indigenous to the area, but were introduced by Indians. One question that will be investigated is *when* were these species introduced?

Many of the Swamp perimeter sites are located near springs or ponds. Are the ponds natural or were they excavated by aboriginal peoples? Are some of the

Table 1. Proposed cultural sequence/habitat preference/areal distribution: Okefenokee Swamp area, Georgia (1978).

GENERAL DATES	CULTURAL TRADITION AND CULTURAL PHASE	HABITAT PREFERENCES	AREAL DISTRIBUTION	AREAL CONCENTRATIONS
Before 10,000 BP	PALEO-INDIAN	---------	---------	
10,000-8,000 BP	EARLY ARCHAIC			
	Tallahassee	FW, FWI, RZ	EFW, WFW, Suwannee RZ	None known
	Santa Fe	FW. FWI, RZ	EFW, Satilla RZ	None known
8,000-4,000 BP	MIDDLE ARCHAIC			
	Florida Archaic	FW, FWI, RZ	WFW, Suwannee/Satilla RZ	WFW, Suw. RZ
4,000-3,000 BP	LATE ARCHAIC			
	Stallings Is./ St. Simons	FW, FWI, RZ, SP, SI	EFW, WFW, ESP, WSP, SI, EFWI, Suw./Sat. RZ	ESP, Sat. RZ
	Orange	SP	EFW	None known
3,000-2,000 BP	EARLY WOODLAND			
	Satilla (Norwood?)	FW, FWI, RZ, SP, SI	EFW, EFWI, ESP, SI, Satilla RZ	None known
	Deptford	FW, FWI, RZ, SP, SI	EFW, EFWI, ESP, SI, WFW, WSP, Satilla RZ	None known
2,000-1,500 BP	MIDDLE WOODLAND			
	Weeden Island (early?)	FW, FWI, RZ (rare)	EFW, EFWI, Satilla RZ, WFW?, Suwannee RZ?	None known
1,500-800 BP	LATE WOODLAND			
	Weeden Island	SP, SI	ESP, WSP, SI, Suw. RZ	SI, ESP, WSP, Suw. RZ
700-350 BP	SOUTHERN APPALACHIAN MISSIPPIAN			
	Lamar	SP, SI	ESP, SI	None known
After 350 BP	HISTORIC			
	Creek/Seminole	SI, ?	SI	None known
	OTHER			
3000-500 BP	St. Johns	SP, SI, RZ	ESP, SI, St. Marys RZ	ESP?
1,000-400 BP	Savannah?	SP, SI, RZ, FWI	ESP, SI, EFWI, Sat. RZ	None known
	Alachua	SP, SI	ESP (Alachua Trail), SI	None known

KEYS TO CHART

HABITAT PREFERENCES	AREAL DISTRIBUTION	
SP- Swamp Perimeter	ESP- East Swamp Perimeter	EFWI- East Flatwoods Islands
SI- Swamp Islands	WSP- West Swamp Perimeter	WFWI- West Flatwoods Islands
FW- Flatwoods	SI- Swamp Islands	Suw. RZ- Suwannee River Zone
FWI- Flatwoods Islands	EFW- East Flatwoods	Sat. RZ- Satilla River Zone
RZ- River Zone	WFW- West Flatwoods	St. Marys River Zone

ponds in the flatwoods adjacent to the Swamp also the result of Indian activity? Many of the sites in the flatwoods are associated with these features.

Many low "mounds" have been located in the flatwoods area and along the Swamp perimeter. It has not been determined if they are natural or cultural features, but many of them are associated with artifacts, especially Middle-Late Archaic projectile points and/or flint debris. A few of these features contained potsherds, especially fiber-tempered/semi-fiber-tempered and Deptford Series sherds. Two of these features that were examined carefully following land preparation activity contained Putnam projectile points, a hafted scraper, and lithic debris. The formations vary from 9″ to 18″ in height and from 35 to 60 ft in width. They are usually circular in shape and are composed of white sand. They stand out sharply in the dark sandy loam soils of the flatwoods. One small area of less than 100 acres in the pasture area west of the Swamp contains at least 17 of these features. A few pieces of flint debris were found on each feature, but no other artifacts. They also tend to occur in clusters in Buck Bay, in Long Bay, and in the Little Okefenokee Swamp to the east of the Swamp. Are some of these features related to the low mound at Waverly Creek north of Kingsland in Camden County? This low mound contained several fiber-tempered potsherds and numerous postmolds (Dwight Kirkland and Fred Cook: personal communication). Are they related to the late Archaic-early Woodland sites reported by Sears and others in Florida (Sears 1977; Prokopetz 1978; Goggin 1948; Bullen 1975)? Are they related to the Refuge Phase mounds on St. Catherines Island that are being investigated by David Hurst Thomas? (Chester DePratter: Personal Communication). Are they natural features formed in the prairie environment of the Pleistocene and early Holocene and were merely selected for use by aboriginals? Whatever their origin, these sites may contain significant evidence of man's use of the flatwoods environment at the time the Okefenokee was becoming a marsh ecosystem—and thereafter.

Finally, an ongoing search is being conducted to document the historical geography of the area during the 19th and 20th centuries. Data from reports, newspapers, maps, and other records, from aerial photographs, and from oral interviews are being collected. At least four phases have been identified. They include: (1) The Seminole Refuge phase, (2) The Subsistence Homesteader phase, (3) The Suwanee Canal Company, Hebard Cypress Company, Twin Tree Lumber Company, and King Lumber Company phase, and (4) The Okefenokee National Wildlife Refuge phase. Changing cultural adaptations and environmental perceptions during this time are being examined. The settlement patterns, transportation networks, and local political and social traditions and problems that were associated with spatial patterns are being studied. Billys Island, Camp Cornelia, and other settlements will be studied in some depth. Billys Island, a lumber camp of 600 people located in the center of the Swamp, has already been mapped using archaeological remains and by visiting the site with local residents who lived there during its heyday in the decade prior to 1927 when it was vacated and burned.

Any information or suggestions relating to the Okefenokee area will be welcomed. Several research reports are being prepared as working papers. They will be distributed to research laboratories in Georgia and Florida and to researchers working in the area, upon request.

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Ned J. Jenkins

CERAMIC CHRONOLOGY IN THE GAINESVILLE RESERVOIR

The general intent of the mitigation and research program in the Gainesville Reservoir has been to collect and treat data in a manner allowing an approximation of the successive lifeways during the reservoir area's 12,000 year prehistory. By lifeways is meant the relation or interaction of a cultural group or system within its ecosystem. To adequately characterize these cultural systems, an integrated analysis of the major classes of data, ceramic, lithic, floral, faunal and osteological, is being conducted. Subsequent interpretations are formulated within the conceptual scheme of the natural environment, a precise temporal framework, and a meaningful body of anthropological theory.

Thus, one of the primary concerns of research has been obtaining precise temporal control. During the Archaic Stage, the burden of temporal control falls solely on the lithic analysis. However, with the introduction of ceramics, around 1,000 B.C., the plasticity and greater consistent morphological variability of the ceramic fabric allows for a finer temporal scaling, once the ceramic variability is documented.

This chronology may then be used to document temporally the changes which occurred in the lithic, floral, and faunal assemblages, as well as in house types and settlement and demographic patterns over a 3,000 year period.

The general strategy used to construct the ceramic chronology consists of three major steps: (1) To analyze using a type-variety nomenclature, all sherds which will not pass through a 1/2 inch mesh. Those ceramics which do pass through the 1/2 inch mesh are counted or weighed by temper group. (2) To seriate selected pit features into a relative sequence. (3) Place the seriation in the context of an absolute temporal framework by C-14 dating of selected features.

The rules followed for type-variety analysis and nomenclature are those detailed by Phillips (1970: 26-31). In the present study, the ceramic assemblages are segregated into varieties which are formulated on the basis of specific recurrent combinations of attributes or modes. Certain varieties may, in turn, be grouped into types on the basis of certain stated common modes or attributes. It is hoped that the selected varieties of a given type will account for the temporal and morphological variation in a type allowing us to document stylistic change.

Varieties which are consistently associated in features and feature complexes are to be seriated into a sequence of ceramic complexes using a technique of matrix ordering (Brainerd 1951; Robinson 1951). Ideally, this technique produces an ordering of units and thus provides a continuous measure of the degree of similarity or disimilarity between these units based on type-variety covariation. This scaling may then be temporally interpreted by several means including C-14 dating.

Also greatly facilitating creation of the relative chronology are numerous nonlocal "trade" ceramics which appear as a result of interaction with neighboring groups. The presence of these sherds is a valuable index for determining the local sequence when they occur in consistent association with local types.

Although at the present time the matrix ordering has not been completed and our C-14 dates are not available, a fairly accurate version of the ceramic sequence can be postulated. It is a refinement of chronologies presented by previous researchers (Nielsen and Jenkins 1973; Rucker 1975; Jenkins 1975a; Jenkins *et al.* 1975; Blakeman 1976; Blakeman *et al.* 1976). The cornerstone on which this chronology was built, however, was the Miller sequence originally defined by Jennings (1941, 1944). The refinements presented in this paper are based primarily on the association of non-local or "traded" sherds found in consistent association in approximately 500 features excavated at four sites in the Gainesville Reservoir during 1976 and 1977.

Summary of Chronology for Gulf Formational Stage

At approximately 1200-1000 B.C. ceramics were introduced into western Alabama and eastern Mississippi in the form of the fiber tempered Wheeler series. These ceramics and the succeeding Alexander ceramics of the Henson Springs phase have a southern origin. They are products of a long ceramic development in the southern Coastal Plain referred to as the Gulf tradition (Caldwell 1958; Bullen 1970, 1974). The genesis of this ceramic tradition is traceable to Atlantic Coast components of the Stallings Island culture (Fairbanks 1942; Stoltman 1972), the Orange culture of Florida (Bullen 1972) and possibly to the Bayou la Batre culture of the Mobile Bay area (Wimberly 1960). The developmental process of the Gulf ceramic tradition has been referred to by Walthall and Jenkins (1976) as the Gulf Formational Stage. It represents a stage intermediate between the Archaic and Woodland Stages, and is divided into three sequential periods—early, middle and late. The Early Gulf Formational period is represented in the eastern Coastal Plain only, by the Stallings Island and Orange cultures. In the central and upper Tombigbee drainage the Wheeler culture is the regional manifestation of the Middle Gulf Formational period and is followed by the Alexander culture of the late Gulf Formational period.

Broken Pumpkin Creek Phase

The fiber tempered Wheeler series is the earliest ceramic to appear in the Tombigbee drainage. These ceramics are decorated with a variety of punctation treatments similar to those found in Stallings Island ceramics, dentate stamping similar to that found in Bayou la Batre ceramics, and simple stamping. The majority of Wheeler ceramics, however, are plain. In the western Tennessee Valley, at site ILu°59 the punctate decorations are dominant in the lower three feet of the ceramic bearing zones, while in the upper three feet, dentate stamping is the most numerous and simple stamping increases from one percent to 4%. The total number of decorated ceramics also increases from 45% to 70% in the upper levels (Haag 1942: 525). In the Tombigbee drainage, no such sequence can be documented, primarily because no deep ceramic bearing middens have been located, nor have numerous pit features, which could be seriated, been found.

The primary vessel shapes in the western Tennessee Valley and the Tombigbee drainage are simple round based bowls and flat based beaker forms (Haag 1942; Jenkins 1972). Jenkins (1975b) has hypothesized an origin and developmental sequence for the Wheeler series. It is estimated that this phase dates between 1000 B.C. and 500 B.C.

Henson Springs Phase

Sometime around 500 B.C., Alexander ceramics appeared in the central Tombigbee drainage area. Because most of the attributes which form the Alexander series date as early as 1000 B.C., the time and area those attributes first coalesced to form an Alexander-like complex is not certain. Jenkins (1975a) and Walthall and Jenkins (1976) have hypothesized an origin(s) for this ceramic series.

Alexander ceramics in the Gainesville area are decorated almost exclusively by incising and pinching. The incised motifs are primarily rectilinear and consist of chevrons, chevron filled triangles, diamonds formed by crosshatching, hexagons, and parallel lines. Curvilinear design elements occur rarely in conjunction with a predominantly rectilinear motif. The most common vessel form found in the Gainesville Reservoir appears to be the flat based breaker with or without podal supports. Several rounded bases with podal supports have also been found, but entire vessel shapes cannot be determined. These vessels often have a band of bosses punched through from the inside, just below the lip. It is estimated this phase dates from 500 B.C. to 100 B.C.

Woodland Stage

At approximately 100 B.C., the appearance of fabric marked pottery, and soon thereafter cord marked pottery, most vividly signals the arrival of the Miller culture. The appearance of these surface treatments constitute a pronounced change from the preceding continuum of Gulf tradition ceramics.

The immediate origins of fabric and cord marked pottery, referred to by Caldwell (1958) as the Northern and Middle Eastern traditions, are north of the Coastal Plain, where they consistently occur earlier. Although a northern parent complex for the early Miller culture, Miller I phase, has not been identified, Miller I ceramics appear to be most similar to some of the Crab Orchard ceramics of southern Illinois as described by Maxwell (1951). However, it seems that the idea of cord marking may have been introduced into the Tombigbee drainage around A.D. 1 from northwest Alabama where Flint River Cord Marked is a major type produced by a Middle Woodland culture which constructed stone mounds (Jenkins 1978). Future research in northern Alabama and Mississippi should test this hypothesis.

The Miller culture sustained a long continuum of 1100 years, 100 B.C.-A.D. 1000. This continuum has been divided by Jennings (1941, 1944) into Miller I, II, and III. Present excavations have greatly supplemented Jennings' and Cotter and Corbett's (1951) work and we can now further divide the Miller sequence into subphases. Although cord marked, plain, and fabric marked were the major surface treatments for 1100 years, there were changes in the percentages of these treatments through time, as well as changes in ceramic temper, and minority and traded types.

Miller I Phase

The Miller I phase is divided into three subphases. During the early Miller I subphase the only ceramic types which appear to have been made were Baldwin Plain and Saltillo Fabric Marked. This subphase is best represented at Mound D at the Bynum site (Cotter and Corbett 1951:24) and at site 22Le53 (Jennings 1941). The estimated date for this subphase is 100 B.C.-A.D. 1.

A middle subphase of the Miller I phase can be defined by the appearance of Furrs Cord Marked as a minority type along with Baldwin Plain and Saltillo Fabric Marked. The appearance of Furrs Cord Marked is best dated at the Pharr Mounds site. Here a vessel of Marksville Incised *var. Marksville* was found sitting on the surface of the burial platform in Mound E while a vessel of Furrs Cord Marked was found in a feature dug from the surface of the platform. Furrs Cord Marked was also a minority type, 5% of the total, beneath the old humus of Mound E (Bohannon 1972: Tables 1-2). Marksville Stamped *var. Marksville* is securely dated between A.D. 1 and A.D. 200 in the Lower Mississippi Valley (Toth 1974). Excavated components of this Miller I subphase are best demonstrated at the Pharr Mounds, and Mounds A and B at the Bynum site. It is during this subphase that the Miller culture is most actively participating in the Hopewellian sphere of interaction. The estimated date for this subphase is A.D. 1 to A.D. 200.

After the initial appearance of Furrs Cord Marked, it increases in frequency through time until it becomes a major type. By the late Miller I subphase, Furrs Cord Marked was a major type, although it was still outnumbered by Saltillo Fabric Marked. At Site 1Gr2, in the Gainesville Reservoir, Furrs Cord Marked accounts for approximately 20% of the late Miller I ceramic complex. A few sherds of Marksville Stamped *var. Manny* and Marksville Incised *var. unspecified* were found in association with this complex (Jenkins 1975a: 108). In the Lower Mississippi Valley, Manny Stamped is dated from A.D. 200 to A.D. 400, in the late Marksville (Toth 1974) period. It is estimated that the late Miller I subphase dates from approximately A.D. 200 to A.D. 400.

Miller II Phase

The Miller II phase is defined as beginning when both Baldwin Plain and Saltillo Fabric Marked decline in favor of Furrs Cord Marked. Baldwin Plain is the dominant type, followed by Furrs Cord Marked. At the end of this phase, Baldwin Plain continues to increase in frequency, however, Furrs Cord Marked decreases dramatically.

The Miller II phase is divided into two subphases. The best excavated example of an early Miller II subphase component is at the Miller Mound site (Jennings 1941). At this site 34% of the ceramics are Furrs Cord Marked, while only 11% are Saltillo Fabric Marked. The other 54% of the sand tempered ceramics are plain. It is estimated that the early Miller II subphase dates from A.D. 400 to A.D. 550.

By the late Miller II subphase, Miller ceramics have begun one of the most dramatic changes of the Miller continuum and numerous non-local ceramics occur in the features. Approximately 70% of the local Miller ceramics are plain. Furrs Cord Marked now comprises only approximately 5% of the local ceramic complex. A narrow dowel variety of Saltillo Fabric Marked, (*var. China Bluff*) which had always been an obscure minority, now comprises as much as 23% of the local ceramics. Large loop handles, which range between 3 and 4 cm in diameter also occur. It is difficult to determine on which variety these handles are found, since all but one specimen is broken where the rivet attaches to the body. The unbroken example appears to be Baldwin Plain. Grog tempered pottery appears for the first time as a major ware and increases in frequency until the beginning of the Miller III phase, when the dominance of grog tempering marks the beginning of the early Miller III subphase.

During the late Miller II subphase Baytown Plain comprises approximately 70% of the grog tempered ware, Mulberry Creek Cord Marked 20%, and Withers Fabric Marked about 5%. Rare grog tempered types which also appear at this time are Gainesville Complicated Stamped and an early variety of Wheeler Check Stamped. The complicated stamped pottery consists of sloppy concentric circles and appears to be a grog tempered copy of Late Swift Creek Complicated Stamped. The check stamped pottery appears to be a rectangular to linear check, grog tempered version of McLeod Linear Check Stamped.

Also during the late Miller II subphase numerous non-local ceramics occur in excavated pit features. Limestone tempered ceramics, more common to northern Alabama, include Mulberry Creek Plain, Wright Check Stamped, and Pickwick Complicated Stamped. These types are believed to have been produced by the late Middle Woodland Copena culture (Walthall 1973). McLeod ceramics occur in the same late Miller II features as the Copena and Miller ceramics. The major McLeod types consist of McLeod Check Stamped and McLeod Simple Stamped. Minority types include Mound Field Net Marked, Weeden Island Red Filmed, Late Swift Creek Complicated Stamped and Keith Incised. This appears to be an early McLeod complex because none of the rims are folded. The McLeod complex occurs more commonly along the lower Tombigbee River and Mobile Delta (Wimberly 1960). It is estimated that the late Miller II subphase dates from A.D. 550-A.D. 700.

John O'Hear and T. L. Conn (1977) have obtained radiocarbon dates of A.D. 560 and A.D. 715 from a late Miller II component on upper Mackeys Creek, which lies in the extreme northern portion of the Tombigbee drainage only about three miles from the Tennessee-Tombigbee divide. Although many of the ceramics from this site were eroded, the assemblage is very similar to the late Miller II complex in the Gainesville Reservoir, except for the absence of grog tempered pottery. However, because of the association of the Tennessee Valley late Middle Woodland limestone tempered complex with the late Miller II complex in the Gainesville Reservoir it appears that grog tempering does not reach the Tennessee Valley and extreme upper Tombigbee until at least 100 years after it comes into the central Tombigbee area. That is to say, the presence of this limestone tempered complex in the late Miller II pits seems to indicate that limestone tempered pottery was still in vogue in the Tennessee Valley for a short while after grog tempering was introduced into the Tombigbee drainage.

Miller III Phase

Currently the early Miller III subphase is separated from the late Miller II subphase by the dominance of grog tempering in early Miller III. However, further study should reveal a more precise division based on percentages of ceramic types and varieties.

The largest excavated complex of early Miller III features is from site 1Pi61. The local Miller ceramics in these features consist of approximately 75% grog tempered and 25% sand tempered ceramics. A small amount of limestone tempered pottery also occurs. Of the grog tempered ware, approximately 62% is Baytown Plain, 28% is Mulberry Creek Cord Marked and 9% is Withers Fabric Marked. Other minority types include the rectangular check variety of Wheeler Check Stamped, and Yates Net Impressed. Of the sand tempered ware, 62% is Baldwin Plain, 34% is Furrs Cord Marked and 3% is Saltillo Fabric Marked *var. China Bluff*. A small amount of McLeod pottery also occurred in these features. It is estimated that this subphase dates from A.D. 700 to A.D. 800.

The middle Miller III subphase is characterized by a dramatic rise in cord marking at the expense of plain pottery. Local sand tempered ceramics, as well as McLeod pottery, are no longer found. All of the ceramics are grog tempered. By this time Baytown Plain comprises 16% of Miller ceramics. However, Mulberry Creek Cord Marked accounts for 75% of the total, while Withers Fabric Marked still constitutes about 8%. Minority types such as Yates Net Impressed, Solomon Brushed, and Alligator Incised constitute less than 1% of the total complex. Larger components of this subphase have been excavated at sites 1Gr1x1 and 1Gr2. Also the Cofferdam site fits nicely within this subphase (Blakeman *et al.* 1976). A series of radiocarbon dates from this site average around A.D. 800. It is estimated that this subphase dates from A.D. 800 to A.D. 900.

The late Miller III subphase is characterized by almost equal percentages of plain and cord marked pottery. Baytown Plain constitutes approximately 42% of the total ceramic count while Mulberry Creek Cord Marked accounts for 41%. Withers Fabric Marked has increased to approximately 17%. Minority types, such as Yates Net Impressed, Solomon Brushed, Alligator Incised, Gainesville Cob Marked, Gainesville Simple Stamped, Evansville Punctate, Avoyelles Punctate, and a variety of Wheeler Check Stamped with large rhomboidal checks, comprise about 1% of the total ceramic count.

Large components of the late Miller III subphase have been excavated at sites 1Pi61 and 1Pi33. It is estimated that this subphase dates between A.D. 900 and A.D. 1100.

Gainesville Phase

The Gainesville phase or subphase (see Fig. 1) is nothing more than late Miller III with the addition of a few Mississippian attributes. Ceramically it is very similar to the late Miller III subphase except that a very small amount of shell tempered pottery is added, usually amounting to not more than one to two percent of the total pottery in a feature. Grog tempered loop handles occur infrequently. Also at this time the house form changes from round to rectangular. It is at this time that the small semi-subterranean house appears. Furthermore, at this time the burial position changes from tightly flexed with no consistent orientation to semi-extended on the back or side with heads oriented to the east.

It should be emphasized that this phase is included in the Woodland Stage of development (Fig. 1). Faunal and floral analysis indicates that Gainesville phase people were sustained primarily by a hunting and gathering technology. Corn occurs infrequently and apparently accounts for no more than a supplement in the diet of these people. Although burial offerings occur a little more frequently than during the Miller III phase, there is little evidence of a ranked society.

Perhaps the most crucial problem of this time period is understanding the relationship of the Gainesville phase to the early Mississippian manifestation which Marshall (1977) refers to as the Tibbee Creek phase. The one available radiocarbon date for this phase is A.D. 1130±65 years. Ceramically there is little evidence for a development from the fabric and cord marked Miller ceramics into the incised and engraved Early Mississippian forms. Current evidence suggests that initially there may be a distinct Woodland population and an intrusive Mississippian population sometime between A.D. 1000 and A.D. 1100 and possibly slightly later. During this time period the Woodland culture develops, through the process of acculturation, to the Mississippian lifeway. Future mitigation and research along the Tennessee-Tombigbee Waterway should test this model.

Mississippian Stage

When and how the Mississippian stage began within the Tombigbee drainage is not well understood, nor is the relationship between Miller III and Mississippian. At approximately A.D. 1000 a small amount of plain shell tempered pottery first appears as an addition to the late Miller III ceramic complex. At the same time, the late Miller III burial position changes from tightly flexed to semi-extended with heads to the east. Concurrent with this, the first rectangular structures appear, and are very similar to those being made during the Fairmount phase of the Cahokia area (Hall 1975).

We have a fairly detailed knowledge of Late Woodland ceramic development and we cannot document an evolutionary sequence from the late Miller III ceramic complex into an early Moundville complex. When Moundville ceramics first appear they constitute a developed complex very different from the preceding cord and fabric marked Miller ceramics. Furthermore, along with this new ceramic complex comes a more efficient subsistence base, with different food storage technology, a different settlement system, mound building, ranked society, and probably the chiefdom. This certainly does not mean that a screaming horde of Mississippians conquered and displaced the local late Miller III population. The most logical hypothesis is that the late Miller III population was quickly acculturated by an intrusive population which possessed a much more efficient technology. Such an acculturation process seems to have resulted in what has been termed the West Jefferson culture, located in the Warrior River Valley just 35 miles east of the Tombigbee River (Jenkins and Nielsen 1974; Jenkins 1976). The appearance of the West Jefferson culture in the Warrior Valley is complicated by the fact that there seems to be no preceding Late Woodland developmental sequence in the Warrior Valley.

It is therefore hypothesized that the West Jefferson population moved into the Warrior Valley from the Tombigbee Valley. This claim is supported by the following facts: (1) *no* large early or middle Late Woodland sites have been found in the Warrior Valley by recent surveys (Nielsen, O'Hear and Moorehead 1973; Curren n.d.). (2) There is a long Woodland developmental continuum in the adjacent Tombigbee Valley, represented by a population that grows substantially through time. (3) The same ceramic types are found in the West Jefferson complex as in the late Miller III complex, only there is more plain and less cord marked in the West Jefferson complex. (4) In late Miller III times plain ceramics start increasing in frequencey at the expense of cord marked pottery. Therefore, in order to understand Mississippian development in the Tombigbee or Warrior valleys, it is necessary to simultaneously view both of these areas as their populations interacted and developed into a mature Mississippian culture.

Moundville Culture (Phase?)

As we currently understand Moundville ceramics in the Tombigbee Valley, it seems that they first appear as a developed ceramic complex. One of the earliest excavated Moundville components in the Tombigbee Valley is a cemetery at site 1Pi33. Almost all of the ceramic types and varieties as well as the other burial paraphernalia from that site are duplicated at the site of Moundville, in the Warrior Valley. Another site in the Tombigbee Valley which appears to contain an early Moundville component is the Kellogg site. This site contained a cemetery very similar to that at 1Pi33. Although there is not as much ceramic variability in the Kellogg cemetery, the ceramics are identical to those from 1Pi33 and Moundville.

At this point it seems appropriate to ask, "Do the 1Pi33 and Kellogg cemeteries belong in the Moundville phase?". It is clear that the answer to that question is entirely systematic, because the material remains from Moundville-like components from the Tennessee Valley southward to Mobile Bay are very similar. Furthermore, current research is continually changing our conception of what a Moundville phase is. However, it is clear that there are four regions where distinctive "Moundvilleoid" components can be found. From south to north they are: (1) Bottle Creek and the Mobile Delta-Bay area; (2) Moundville and the Warrior Valley; (3) Lubbub Creek and the central Tombigbee Valley; and, (4) Kogers Island and the western Tennessee Valley. There are minor differences between these areas, but they are far outweighed by the similarities. It seems logical, therefore, to refer to these components together as the Moundville culture. Furthermore, it would seem most appropriate to define the regional variants, i.e. Moundville, Bottle Creek, Tombigbee Valley and the western Tennessee Valley as phases, with each region's temporal variants defined as subphases.

Marshall (1977) has tentatively defined a sequence of Phases-Tibbee Creek, Lyon's Bluff, Sorrells, and Mhoon, for the central Tombigbee region. The 1Pi33 and Kellogg cemeteries therefore may fit most comfortably in the latter part of the Tibbee Creek phase or the earlier part of the Lyon's Bluff phase at approximately A.D. 1200-A.D. 1300. Future research in

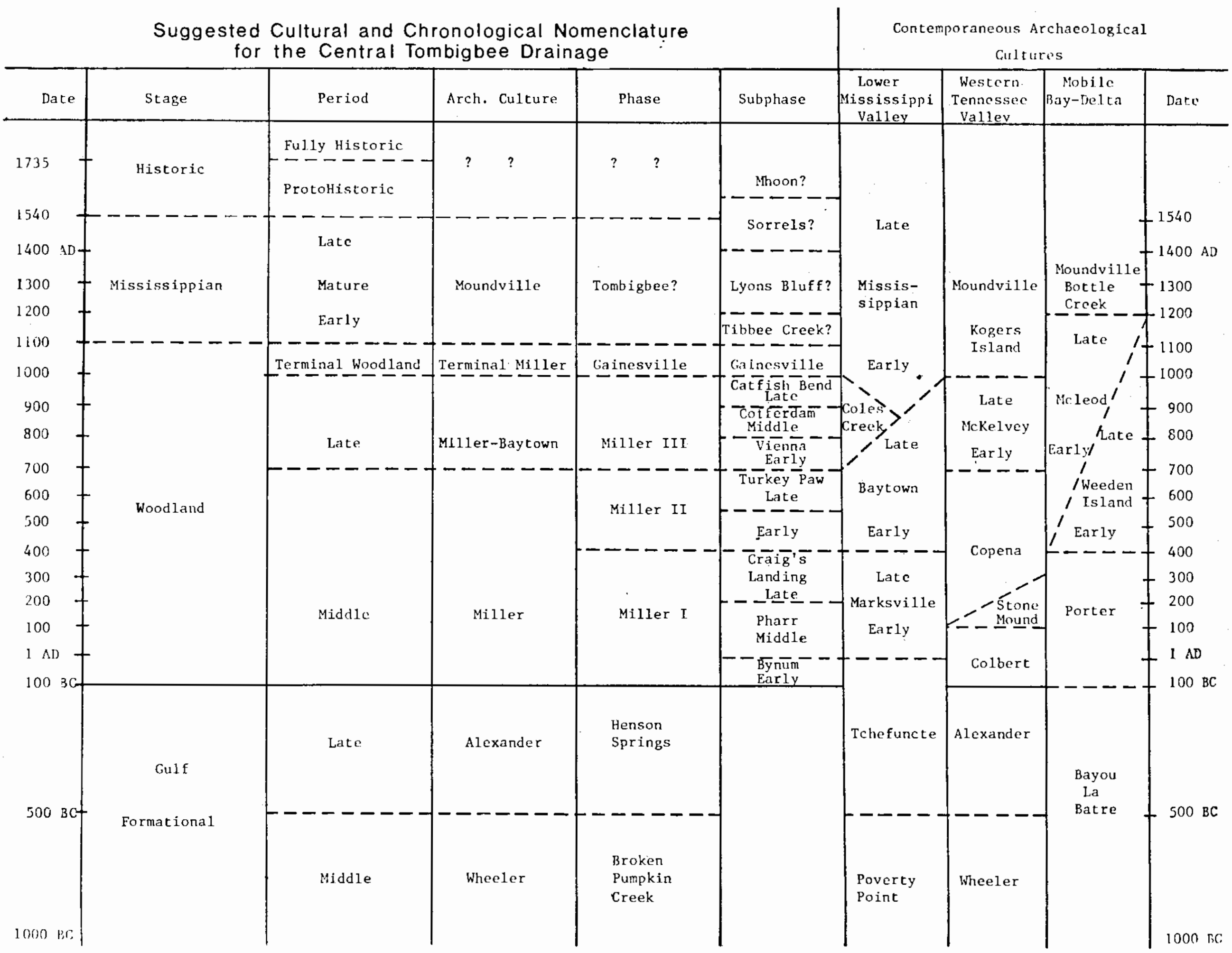

Figure 1.

the central Tombigbee Valley should determine how closely the excavated components within the Tenn-Tom waterway fit Marshall's (1977) phase definitions and possibly incorporate them as a regional subphase sequence of the Moundville culture.

Summary

This paper summarizes 2500 years of ceramic development in the Gainesville Reservoir and Central Tombigbee Basin. It has been stated that there are two major discontinuities in the ceramic sequence—one at the beginning of the Woodland Stage (100 B.C.) and the other at the beginning of the Mississippian Stage (A.D. 1100). Future research along the Tennessee-Tombigbee Waterway should test the models which are offered to explain these discontinuities.

Also it should be made clear that this paper is a preliminary summary. We are currently still tabulating many of the ceramic counts from the recently finished analysis. The percentages of ceramics diagnostic of each of the subphases are tabulated from a representative sample of features. However, these perecntages should not change drastically by the time the final report is finished. When this paper was written we had not received any of our 18 radiocarbon dates from the Gainesville Reservoir. However, the day the paper was being typed five dates were called in. These dates required that the Late Woodland sequence be moved up 100 years later than originally thought. The temporal subphase estimates which appear in this report and Figure 1 are based on those dates. The final version of this chronology, which will be explained in more detail, should be completed by mid-summer of 1979. It should be available from the Mobile District of the Corps of Engineers soon thereafter.

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Anne Woodrick

A PRELIMINARY REPORT ON THE FAUNAL REMAINS FROM THE GAINESVILLE RESERVOIR PROJECT

Identification and analysis of the faunal material from the Gainesville Reservoir Project is yet to be completed. This paper is only a preliminary report describing the procedures and objectives used in the analysis. Included in the faunal analysis are the control block squares and selected features from the sites 1Gr1x1, 1Gr2, 1Pi61 and 1Pi33. Pits chosen for analysis were those which did not have discernable intrusions and which contained ceramics from predominantly one cultural phase or subphase. Burials and postmolds were excluded as their fill cannot as clearly be assigned to a specific cultural phase. Fill was washed through a 1/4 inch mesh screen underlain by a 1/16 inch mesh screen. Faunal material was caught in both screens.

Due to the volume of faunal remains, a computer coding form and program is being developed to integrate the data. Following Whatley (personal communication) and Anderson (personal communication), information to be coded on bone recovered from the larger screen will include taxon, element, symmetry, portion, completeness, modification, gnawing, association, preservation, burning, fracture age, sex, epiphyseal union, estimated age at death, tooth and antler state, weight, and when appropriate, reconstructed length. For the invertebrates, the length and width measurements of the valves will be recorded on samples from selected features. In addition, the volume, the cultural phase, and the fill and debris description will be recorded for each excavation unit.

An aspect of faunal reports not often adequately dealt with has been the analysis of the 1/16 inch debris. Struever (1968) argued that 1/4 inch mesh screen was not small enough to recover the full size range of debris. For example, at the Apple Creek site in Illinois, Parmalee, Paloumpis and Wilson (1972) demonstrated that in the analysis of such small bone, the quantity of fish bone doubled and the frequency and size of fish remains was altered.

The problem with the 1/16 inch debris is twofold: sampling and time. The debris is first completely washed to prevent miscalculations due to the presence of dirt in the sample. Dirty samples also tended to minimize the effects of the zinc cloride flotation process. The material is dried, weighed and then all or part of it, depending upon the total weight of the sample, is chemically floated to separate the light fraction botanical remains from the heavy fraction, bone, lithic and ceramic remains. Once the heavy fraction dries, the faunal remains must be picked from the other debris. The time involved in this separation is great, about five hours per feature (about 100 gm). The faunal material is then identified, which involves another three to five hours. A heavily concentrated solution of zinc chloride was used in an attempt to separate the faunal remains from the other debris. This, however, was not effective—fired clay fragments floated as often as did faunal material.

In the quantification of 1/16 inch debris, I was especially concerned with the large features where only a 1% to 5% sample was analyzed. For one of these large features in which the estimated 1/16 inch bone weight was 1850 gm, I examined four 1% samples. I found that these four samples closely approximated each other in their representation of the various animal classes (mammal, fish, reptile, amphibian, and unidentifiable). In the occurrances of fish and small mammal bones, the number of total elements for each species was consistent, but the elements varied. It would seem that an estimate might be made for the total elements of each species in the 1/16 inch debris, but unless more than one example of a specific bone is present, it would be unwise to assume that any single element will be represented more than once.

Thirty-eight features have had 1/16 inch bone analyzed. The following information will be lost if this material is not taken into account: (1) all the fish sizes will not be recorded and the occurrence of fish bone in a pit may be completely overlooked; (2) some skeletal elements of the small animals: frogs/toads, squirrels, rabbits, etc., will be missed, probably affecting the minimum number counts; and, (3) bone density of the pit or level will be less accurate. Obviously, taking the weight of the 1/16 inch debris into account increased the overall bone density of each pit. Sometimes it doubled this density, when the faunal remains in the pit were those of predominantly smaller animals; while it did not increase the bone density by more than 5% when large animal remains were mainly found.

The majority of the faunal remains analyzed are associated with the Miller II and Miller III phase occupations. Only a very small portion (6% by count) of the faunal material was found in an Archaic, Miller I, or Mississippian context. Therefore, research shall focus upon: (1) faunal exploitation during the Middle and Late Woodland periods; and, (2) changes that may have occurred in the subsistence system from Early Miller II through Late Miller III subphases.

For the purpose of discussing the subsistence activities during the specific phases, I have divided the features into two groups: primary and secondary pits. The secondary features are those pits which I believe have a greater probability of containing faunal material that was not purposefully thrown into them. In the case of multicomponent sites, this means that bone from earlier periods could be unintentially included in later pits. Of course, this could be said for all features, but I contend that it is much more likely to be the case with these secondary pits. This would be an especially important consideration when considering the distribution of elements and species on a site during a specific phase. The bone found in these secondary pits is generally characterized as unidentifiable and burned, often calcined. In all cases, no more than 50 pieces of bone are present and the weight of bone is less than 20.0 gm. Pits in this category usually fall into one of two types. Either they are shallow bowl shaped pits with a low volume or are rather large, deep pits with a relatively high volume. Please note that this distinction of secondary features applies only in reference to faunal remains. Several of these secondary pits contain concentrations of other materials such as charred nuts, corn cobs and ceramics.

Primary pits on the other hand, account for over 97% of the analyzed bone by count. Fifty-seven % of all the features examined were classed as primary. It will be these features which will provide the raw material for most of the analysis. However, in comparing sites to each other for consideration of questions pertaining to resource availability around the sites, the secondary features will be included.

Crucial to the understanding of prehistoric subsistence is a knowledge of the past physical and biological environment. Gloria Caddell has completed a map depicting the reconstructed prehistoric environment of the Tombigbee riverine area within a six mile radius around each site. Caddell (personal communication) has delineated three major vegetational zones prior to extensive disturbance in historic times. These are: (1) a swamp-forest complex along the major streams; (2) a prairie-forest mosaic characterized by patches of grassland interspersed with oak-hickory forest west of the Tombigbee River and roughly corresponding to the Black Belt; and, (3) an oak-hickory forest complex east of the Tombigbee River, containing two patches of prairie. She has further broken these major zones down into micro-environments. The probable animal species that would have occurred in this area prehistorically have been researched. Although all of the sites are located along the river and have areas of each zone within the designated radius, the proportions of the various zones are different. One research objective is to see whether or not this is reflected in the types and percentages of species found at each site.

Bone and shell fragments represent species of animals present on a site which were specifically selected and brought to the site for various reasons (Daly 1969). It is hoped that the reasons for this variability, both spatially and temporally, can be identified. The following statements are preliminary observations based on the faunal material identified to date.

About 30% by count of the bone material recovered could be identified. By this I mean that I could place these bones into one of the following categories: white-tailed deer; mammal-other, identified to at least the genus level and usually to species; turtle, identified to family or genus and occasionally species; bird, either turkey or other; and fish, identified to family, genus and species levels. The majority of the unidentifiable bone probably consists of mammal fragments, primarily deer.

When comparing faunal remains between sites, a consistent pattern is discernable. Deer account for a little over 1/2 of the identified elements. Turtle bone represents about 27% and the remaining categories, mammal-other, bird and fish, each fall between 2% and 9%. What is less consistent is the comparison between Miller II and Miller III.

It has been stated that during the Late Woodland Period in the Central Tombigbee River area there was a substantial increase in the indigenous population (Jenkins *et al.* 1975; Blakeman 1975, 1976). Such an increase could create an imbalance between the population and local resources. This imbalance is viewed as population pressure by Cohen (1975) who has identified several population growth indicators based upon changes in food refuse and food processing implements. Concurrently, the increase in population from Miller II to Miller III may have caused the changes observable in the subsistence base and exploitative patterns from Miller II to Miller III.

There appears to be a trend from Miller II to Miller III in which the exploitation of deer decreases, while the exploitation of small mammals, fresh water mussels, and fish increases. In Miller II, deer represent 60% of the identified bone; in Miller III, only 52%. The density by weight of deer bone drops 10% from Miller II to Miller III. The skeletal elements of the deer represented on the sites do not change at all from the earlier period to the later. All parts of the deer are represented indicating that the entire animal was brought back to the site for processing.

In Miller II, nine species of animals other than deer are present in the sample. Rabbit and raccoon are the most frequently found animals in this group with (in decreasing order of occurrence): beaver, opossum, squirrel, skunk, grey fox, black bear and dog, also represented. This group accounts for only 2% of the identified bone. In Miller III, the number of animals represented in the mammal-other category increases to 14 accounting for 6% of the fauna. Rabbit, raccoon, opossum and squirrel are the most frequent followed by grey fox, beaver, skunk, dog, mountain lion, muskrat, bobcat, black bear, porcupine and mole.

Fish increases from 5% in Miller II to 10% in Miller III while the density of mussel shell increases by 300% in the Miller III period over Miller II. Not only are these trends observable for the sites as a whole, but individual features follow the same pattern.

Although disequilibrium between population and resources can be caused by a variety of factors other than an increase in population, it is possible that: (1) the increase in exploitation of niches previously ignored or rarely used; (2) the increase in the number of species exploited; and, (3) an increase in the concentration on water based resources relative to land based resources could be explained by the population growth in the reservoir area.

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Eugene M. Futato

CHIPPED STONE BIFACE MANUFACTURE IN THE BEAR CREEK WATERSHED

Methods and Goals of the Analysis

The analysis of the lithic materials from recent work in the Bear Creek Watershed has been generally guided by two principles. The first of these is the basic nature of lithic artifact manufacture. It is a subtractive procedure in that it is performed by the continued selective removal of matter which, once removed, is not easily replaced. A corollary is that one artifact may serve as the raw material for a second, necessarily smaller, artifact, and the reformation processes may remove all traces of the former state. As an additional consequence, it is often difficult to determine when a chipped stone artifact is "finished", at least in the sense of, "when did the maker of an artifact feel that some process was completed and some object represented a "finished tool" as opposed to an intermediate step in the process?". In pottery manufacture, the manufacturing process may in one real sense be considered finished when the pot is fired. There are exceptions, such as engraving, but these are readily detectable. Chipped stone artifacts frequently have no such guidelines, and the result is seen in such problems as the differentiation between preforms and knives to cite one common example.

The second principle that guided the analysis was the recognition that artifacts are the products of organized human behavior, and that one of the goals of analysis should be to account for that behavior. This, of course, ties in with the relationships of specimens or categories with respect to manufacturing processes mentioned in the above paragraph.

With these principles and problems in mind, an organizational framework for the lithic analysis was developed which attempts to create and order categories of chipped stone material within a logical sequence of possible manufacturing steps. This sequence is considered to be possible rather than absolute because a specimen may have passed through all the prior steps, but is not required to do so. In fact, in many cases, there is evidence that the latter is the case. There are many possible alternative procedures at different steps in the manufacturing procedure, and it is the consistent selection of one alternative, or set of alternatives, that is a major factor in the variability of lithic technologies.

It is important to identify the flint knapping techniques used in the various stages of the manufacturing process since this is another obvious source of technological variability. However, the identification of the techniques used in the production of the Cedar Creek materials has thus far met with limited success. The existing literature on the subject is largely subjective, dealing with the experiences of contemporary flint knappers. While there is usually an empirical basis for such observations, it is difficult for another person to interpret them. Problems also arise from an inability to determine the sample specificity of such observations, and to evaluate them across a broad range of raw materials or cultural traditions. It is hoped that future work on samples of raw materials used in the Cedar Creek drainage will permit more certain identification of chipping technique.

The end product of analysis directed along the lines indicated above will be the generation of a series of transformations concerning the manufacture of chipped stone artifacts. Such statements should specify starting points, operations, and outcomes, which account for the observed materials. This is certainly a very large and difficult task, and no claims are advanced that these goals will be fully met, but these goals reflect the overall concepts within which this analysis was conceived, and the end to which it has been directed. This paper concerns itself with some of the initial steps toward formulating these transformations.

Within this framework, use was not a criterion in the establishment of artifact categories, even though some of the selected taxa, such as "drill", imply use. Once the sorting of materials was complete, evidence of use is sought within the categories. The result is that the analysis progresses along the following lines: the establishment of categories reflecting manufacturing operations and outcomes, ordering certain of these in a logical sequence, sorting the specimens into the categories; attempting to determine the use or uses for the artifacts in the categories.

Four hierarchial terms will be used in relation to manufacturing processes. From least to most inclusive they are: operation, step, practice, and technology. This use, and the definition of some of these terms was developed for ceramic analysis by Richard Krause (personal communication), but is applicable to flint knapping as well. As defined below, the terms should be appropriate for any manufacturing process.

The lowest order term is *operation,* defined as the minimal combination of hand, or hand and tool movements producing an observable result. Examples in flint knapping would be a blow with a hammerstone or a stroke with an abrader. Any combination of a single repeated operation or set of operations is a *step.* An example of a single repeated operation would be the shaping of a core with a hammerstone, while a repeated set of operations would include such things as the serration of a blade edge using pressure flaking and edge abrasion. A manufacturing *practice* is the set of all operations and/or steps in the manufacture of an artifact or artifact type. *Technology* is the most inclusive term and is defined as any set of related practices. Technology is thus a very flexible concept as practices may be considered related by one or more of many criteria including use, form, raw material, method of manufacture, cultural associations, etc.

Results of Analysis:
Ordering of Biface Categories

In order to develop a set of transformations to account for the manufacture of the biface implements, it is first necessary to show that the specimens can be placed in a sequence logically consistent with the proposed manufacturing sequence. The sequence proposed for the biface materials recovered in the excavations to date is: raw material, core, Preform 1, Preform 2, biface blade, Projectile Point/Knife, then drills, hafted end scrapers and other artifacts which may be made from reworked PP/K's. Brief descriptions of these categories follow.

Core. The category core contains pieces of chert from which flakes have been removed, and with insufficient modification to conform to another category. Most of the cores are cobbles of chert from the locally available Tuscaloosa gravels, or angular pieces of the fossiliferous chert which also outcrops in the area. The artifacts in this group probably result from a number of activities including the production of flakes for use or for further modification, the initial stages of biface manufacture, and the examination of the flaking qualities of chert. Though not usually classified as bifaces, cores are so included here as being one potential step in the sequence of biface manufacture.

Preform 1. The Preform 1 category contains thick artifacts with rough ovoid to triangular outlines. The artifacts show no, or minimal, secondary flaking. The size and thickness of the detached flakes and the large observed negative bulbs of percussion indicate flaking by direct percussion with a hard hammer. Unflaked areas are usually present on one or both surfaces.

Preform 2. These artifacts are similar to those in the above category but with some secondary flaking. As a result of this flaking, they tend to be thinner and more regular in outline. Unflaked surfaces are present but less common than in the above group.

Biface Blade. This group contains thinned, retouched, ovoid to triangular bifaces. Edges are regular and unflaked surfaces are rare.

Projectile Point/Knife. The category Projectile Point/Knife (PP/K) contains two types of artifacts which are distinguished from the above category in two different ways. The first type contains those PP/Ks which have a haft element as defined in the attribute list for projectile point analysis in the report on the Bellefonte site (Futato 1977). The second group contains the PP/K's without haft elements. They are separated from the biface blades on the basis of size and shape or by flaking. The latter criterion is less objective but may be characterized as the presence of small, regular, retouch flaking on the edges, probably done by pressure.

Drill. Drills are tools with a long narrow bit, suitable for hafting and use in a rotary motion. Most are apparently reworked PP/K's.

Hafted End Scraper. These artifacts are apparently reworked PP/K's with a steeply retouched transverse working edge.

At this time it should again be made clear that this is a potential sequence through which artifacts may pass, and there are alternatives. One of the most common alternatives encountered in the Cedar Creek material is that in each step in the process, a flake of suitable size and shape could be used as the starting point. For example, a Preform 1 may be flaked from a core or a suitable flake; a Preform 2 may be flaked from a Preform 1 or a suitable flake, and so forth.

This examination of whether or not the specimens can be logically placed in the proposed order deals mainly with the preforms and biface blades. The two initial steps, production of cores and of Preform 1's, can be inferred from the prior characterizations of the categories. If a piece of stone (raw material) has had flakes removed with no modification sufficient to permit further classification, by definition, it is a core. It is also logically stated that if a Preform 1 is the first recognized state in biface manufacture, at some previous time, when less flaking had occurred, specimens in this category would have been classified as cores. These steps have therefore been deleted from the following discussion.

The steps in the process after biface blade are also not dealt with in detail. The presentation of the sorting criteria for PP/K's given in the descriptions of lithic categories summarizes their relationship to the biface blades, and inspection of the metric data shows the size of the specimens in the two categories is consistent with the proposed relationship. The final steps, manufacture of drills, etc. is not considered because in most cases these may be described as specialized blade modifications of PP/K, and individual exceptions could be discussed as they arise.

If the artifact categories Preform 1, Preform 2, and biface blade do represent an order of manufacture, certain predictions may be made about the relationship of the artifacts in the categories. Because flint knapping is a subtractive process, we may predict that size will continuously be reduced. For this analysis size will be measured by maximum length, width, and thickness, in millimeters, and by weight, in grams. The second prediction is that the artifacts should become less variable within each successive category, reflecting increasing standardization of the products of the flint knapping processes. The variability of the specimens in the categories will be measured by the standard deviation of the measurements given above. These two predictions may now be stated in a testable format.

> Hypothesis 1. The mean and the range of the length, width, thickness, and weight become successively smaller for the artifacts in the categories Preform 1, Preform 2, and biface blade.
> Hypothesis 2. The standard deviation of the length, width, thickness, and weight becomes successively smaller for the artifacts in the categories Preform 1, Preform 2, and biface blade.

Testing the two hypotheses will require the same data, and the two will be tested together. Sites 1Fr311 and 1Fr590 both excavated during the 1976 season in Cedar Creek Reservoir, each produced samples of artifacts large enough to test the hypothesis, and the material from each site will be treated independently. The metric data on the intact specimens in each category was used, and is presented in Tables 1-2. Summary statistics for the data are given in Tables 3-4.

The summary statistics were initially prepared for two classes of specimens from each site; intact specimens, having all measurements preserved, and measurable specimens, possessing two or more measurable variables. Specimens with less than two measurable variables were classed as fragments and excluded from analysis. One Preform 2 from 1Fr590 with all linear variables preserved, but not the weight, was included in the intact class for analysis of the linear dimensions.

The t ratio was used to compare the intact to measurable specimens for each variable within each site in order to determine whether the intact specimens were characteristic of the whole sample, or had been biased by factors such as differential breakage of thinner specimens during flint knapping, or rejection of certain examples considered unsuitable by the flint knapper. The t ratio was computed by the formula given in Spense *et al.* (1968) using a program written

Table 1. 1Fr311 preform and biface blade measurements.

Category	F.S.#	Length mm.	Width mm.	Thickness mm.	Weight g.
Preform 1					
	650-41	86	56	24	104
	651-6	52	44	28	60
	651-10	67	50	28	76
	652-37	51	48	25	70
	652-55	64	55	32	110
	652-56	65	43	19	55
	652-59	53	41	21	39
	653-14	86	49	26	80
	653-19	59	24	22	28
	654-26	68	47	23	76
	654-30	51	49	19	52
	659-16	65	52	25	66
	661-4	70	57	28	111
	662-4	81	49	23	84
	662-5	52	45	31	67
	671-2	48	40	12	28
	673-18	71	50	21	61
	677-10	74	46	21	75
	677-12	68	53	33	103
	707-13	43	34	21	27
	708-5	81	46	28	100
	715-6	101	61	29	175
	718-4	55	38	17	30
	721-13	72	64	23	83
	724-12	46	39	20	29
	732-20	61	47	25	52
	737-5	68	50	21	69
	739-10	77	34	22	46
	742-11	63	45	25	74
	751-13	81	46	20	84
	751-14	62	46	15	32
	757-11	56	48	24	65
	758-10	68	47	32	81
	802-2	59	40	21	56
	808-9	47	41	18	25
	811-8	52	44	17	37
	828-1	67	33	27	47
	833-3	45	40	15	27
	874-5	51	48	23	46
Preform 2	654-25	77	43	26	78
	680-6	70	50	18	54
	695-1	48	39	16	23
	703-9	58	39	18	35
	732-3	60	35	20	40
	740-5	55	30	13	20
	742-7	65	45	12	40
	742-8	57	35	13	20
	747-14	42	31	16	20
	795-13	75	42	29	70
	800-2	66	37	16	49
	818-20	56	37	17	31
	833-4	60	47	15	33
	834-2	70	49	17	46
Biface Blades					
	650-1	60	30	10	18
	650-36	81	37	15	37
	650-37	57	29	9	14
	652-1	52	30	13	17
	654-14	56	29	19	23
	699-4	48	48	13	32
	704-6	42	29	11	14
	720-2	47	24	6	8
	744-2	36	26	9	8
	744-3	44	16	8	8
	758-1	41	22	8	6
	772-2	55	36	9	14
	805-1	50	28	13	17
	806-1	49	28	9	11
	819-1	53	35	9	16
	847-1	107	39	16	45
	855-2	54	25	7	9
	877-1	46	23	10	8

in the lab for use with a programmable calculator. t did not reach significance at the five percent level in any instance, and was greater than 1.0 in only one case. The assumption was made, therefore, that the intact specimens were characteristic, and further analysis continued with these only.

Table 5 gives the evaluation of the data relevant to the two hypotheses. Figures 1-4 show the relationships of the data for each variable for the sample from 1Fr311 in a graphic format. Graphs for 1Fr590 are similar.

Concerning Hypothesis 1, changes in the mean and range for each variable closely follow the predicted pattern, as can be seen in the figures and Table 5. The only exceptions from 1Fr311 are the ranges of the length and width of the biface blades. This is due to the presence of a few unusually large biface blades

Table 2. 1Fr590 preform and biface blade measurements.

Category	F.S.#	Length mm.	Width mm.	Thickness mm.	Weight g.
Preform 1					
	1-1214	75	43	25	76
	1-1263B	65	55	24	91
	4-991B	47	46	30	55
	13-9	73	55	21	76
	17-30	66	44	22	58
	17-31	58	42	24	52
	17-32	74	45	23	71
	17-33	67	41	19	49
	20-6	47	47	25	64
	24-35	54	47	37	76
	24-36	43	31	16	15
	24-37	49	31	23	37
	24-39	36	27	17	15
	26-2	53	39	23	41
	29-43	77	49	35	139
	29-44	85	51	22	108
	29-52	47	29	14	16
	29-53	44	30	17	18
	31-13	65	47	27	73
	31-497	60	44	30	89
	33-794	55	41	23	51
	39-11	67	45	22	58
	39-18	58	45	31	75
	42-2	66	52	36	113
	45-4	59	40	25	47
	31-14	54	39	18	39
Preform 2					
	4-989	49	35	16	27
	17-35	52	31	20	29
	22-19	80	43	21	56
	24-31	52	32	20	33
	24-32	44	30	14	15
	29-51	53	33	15	--
Biface Blades					
	1-1255	68	27	14	20
	2-228	60	36	12	27
	13-8	56	37	14	24
	20-4	62	43	13	33
	24-33	54	32	10	14
	25-10	70	32	13	30
	30-246	61	39	10	29
	30-247	58	31	12	19
	31-12	69	36	11	30
	35-1	68	25	13	20

as may be seen in Figure 1 and 2. The means all change as predicted, and except for the change in length, all are significant at the one per cent confidence level.

In the 1Fr590 data there are two measurements contrary to the confirmation of Hypothesis 1. The range of width and the mean length of the biface blades increases. The most convenient explanation for these anomalous results, and a likely one, is sampling error. There were very few Preform 2's recovered from 1Fr590, and most were rather small in relation to the rest of the sample. A bias in the Preform 2 category to smaller specimens would cause the observed result. At least, the results contrary to the prediction did not

Table 3. 1Fr590 preforms and biface blades, summary of metric data.

	No.	Max.	Min.	Range	Mean	S.D.
Length						
Preform 1	26	85	36	49	59.4	12.0
Preform 2	6	80	44	36	55.0	12.7
Biface Blade	10	70	54	16	62.6	5.8
Width						
Preform 1	26	55	27	28	42.6	7.8
Preform 2	6	43	30	13	34.0	4.7
Biface Blade	10	43	25	18	33.7	5.5
Thickness						
Preform 1	26	37	14	23	24.2	6.0
Preform 2	6	21	14	7	17.7	3.0
Biface Blade	10	14	10	4	12.2	1.5
Weight						
Preform 1	26	139	15	124	61.7	31.0
Preform 2	5	56	15	41	32.0	15.0
Biface Blade	10	33	14	19	24.6	37.8

Table 4. 1Fr311 preforms and biface blades, summary of metric data.

	No.	Max.	Min.	Range	Mean	S.D.
Length						
Preform 1	39	101	43	58	64.0	13.2
Preform 2	14	77	42	35	61.2	10.0
Biface Blade	18	107	36	71	54.3	16.3
Width						
Preform 1	39	64	24	40	45.9	7.7
Preform 2	14	50	30	20	39.9	6.3
Biface Blade	18	48	16	32	29.7	7.3
Thickness						
Preform 1	39	33	15	18	23.5	4.6
Preform 2	14	29	12	17	17.6	4.8
Biface Blade	18	19	6	13	10.8	3.4
Weight						
Preform 1	39	175	25	150	64.9	30.9
Preform 2	14	78	20	58	39.9	18.1
Biface Blade	18	45	6	39	16.9	10.9

reach significance, while the majority of the results were as predicted, and most often were significant at the one per cent level of confidence. All in all, I think it is fair to consider Hypothesis 1 confirmed.

It is interesting that there was never a loss of length significant at even the five percent level. Within certain reasonable limits, a longer cutting edge is a more efficient cutting edge, and there may have been attempts to make the finished tool as long as possible. (It would be difficult to exceed the reasonable limits cited above given the limits of the available technology.) This observation must now be considered only a possibility for additional research, not a result of the current study. The observed relationship is at least in part a function of the short Preform 2's from 1Fr590, and the unusually long biface blades from 1Fr311. Thus, there is some question about the validity of the observation which must remain until further study.

Returning to the current question, the evaluation of Hypothesis 2 is a little more difficult than the evaluation of Hypothesis 1. The predicted decrease in standard deviation occurs in eleven cases but not in five. The two major exceptions, deviating more than 1 mm from the prediction, correspond to the two situations already discussed. The presence of several long biface blades at 1Fr311 increased total deviance as did one long Preform 2 at 1Fr590 where most were exceptionally short (Table 3). The other, smaller, increases in the standard deviation of the variables may or may

Table 5. Comparison pf preforms and biface blades.

	Change Range	Change Mean	Change S.D.	t	df	P
1Fr311						
Preform 1 to Preform 2						
Length	-23	-2.8	-3.2	0.799	51	-
Width	-20	-6.0	-1.4	2.793	51	.01
Thickness	-1	-5.9	+0.2	3.866	51	.01
Weight	-92	-25.0	-12.8	3.524	51	.01
Preform 2 to Biface Blades						
Length	+36	-6.9	+6.3	1.429	30	-
Width	+12	-10.2	+1.0	4.100	30	.01
Thickness	-4	-6.8	-1.4	4.342	30	.01
Weight	-19	-23.0	-7.2	4.054	30	.01
1Fr590						
Preform 1 to Preform 2						
Length	-13	-4.4	+12.7	0.714	30	-
Width	-15	-8.8	-3.1	3.286	30	.01
Thickness	-16	-6.5	-3.0	3.611	30	.01
Weight	-83	-29.7	-16.0	3.027	30	.01
Preform 2 and Biface Blades						
Length	-20	+7.6	-6.9	1.267	14	-
Width	+5	-0.3	+0.8	0.108	14	-
Thickness	-3	-5.5	-1.5	3.841	14	.01
Weight	-22	-7.4	-8.9	0.952	13	-

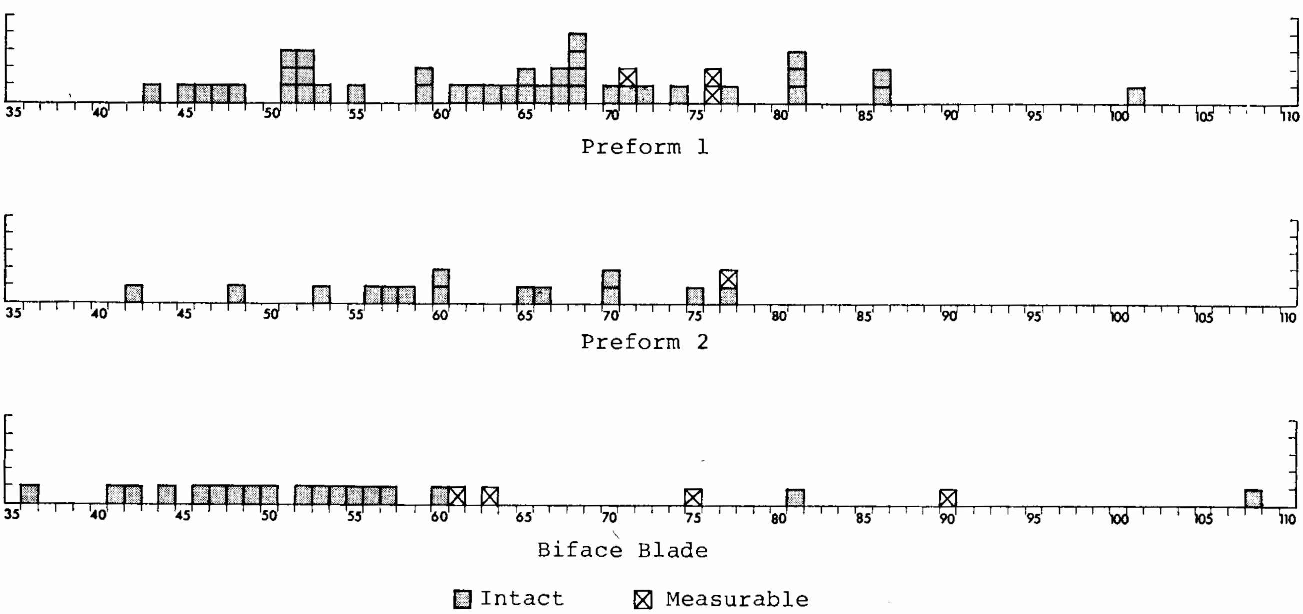

Figure 1. 1Fr311, length of preforms and biface blades, in millimeters.

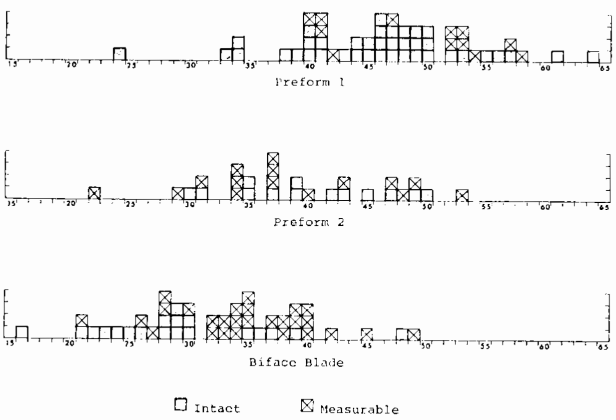

Figure 2. 1Fr311, width of preforms and biface blades, in millimeters.

not be significant. The data do not strongly confirm Hypothesis 2 but do generally support it.

In summary, the length, width, thickness and weight show a regular decrease in mean and range from Preform 1 to Preform 2 to biface blade. In most cases *t* ratios show the change to be significant at the one percent confidence level. The standardization in size of the artifacts, as measured above, tends to increase from Preform 1 to Preform 2 to biface blade. As a result, it is felt that these artifact categories do represent potential steps in a manufacturing sequence, and may be considered as much in the series of transformations.

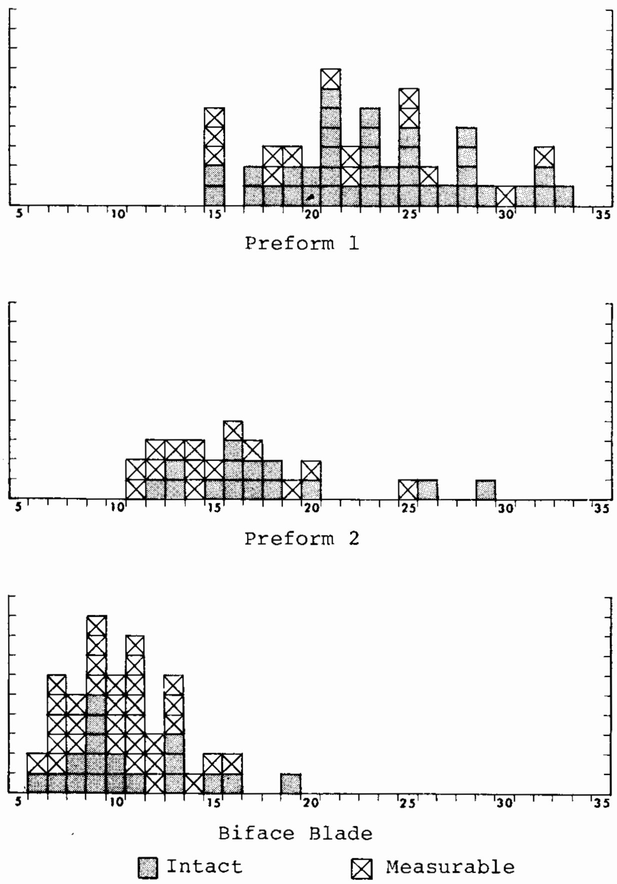

Figure 3. 1Fr311, thickness of preforms and biface blades, in millimeters.

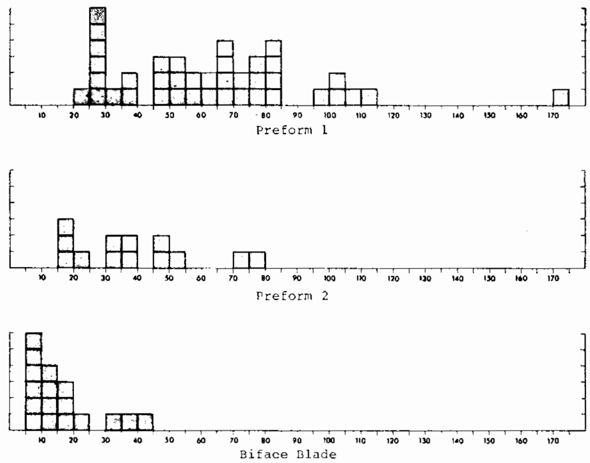

Figure 4. 1Fr311, weight of preforms and biface blades, in grams.

Results of Analysis:
Heat Treatment of Yellow Chert

In a summary of the work done in the Little Bear Creek Reservoir on the main tributary of Cedar Creek, Oakley listed some preliminary observations concerning the heat treatment of lithic materials in the Bear Creek Watershed (Oakley and Futato 1975:274-275). One of the goals of the Cedar Creek research has been a closer examination of this practice and its overall relationship to the lithic technology of the aboriginal inhabitants of the area including its temporal boundaries and position in the sequence of manufacturing operations.

One of the major constituents of the Tuscaloosa gravels in the Bear Creek Watershed is a yellow chert, also called yellow jasper, which occurs in cobbles up to about 15 cm long. The suitability of this material for flint knapping ranges from good to impossible. When heated, the material undergoes dramatic changes in color, often accompanied by changes in texture of flake scars. The range of color shifts from cream/yellow ochre to pink/rusty red, the former roughly corresponding to the highest values and chromas of Munsell 7.5YR and 10YR, but more tan; and the latter similar to the high chromas of 7.5R and 10R (Munsell Soil Color Chart, 1975 Edition). Scars of flakes removed after heating are often glossy and rippled, those before flaking are matte and not rippled. Experiments by Blaine Ensor on similar stone from the Middle Tombigbee River Valley have shown that the changes are fairly well advanced after six hours at 250°C and severe damage to the stone occurs after six hours at 400°C. Samples of yellow chert and other cherts to be collected during the 1977 field season at Cedar Creek will be used for controlled experiments at a later time.

The artifacts from 1Fr311 and 1Fr590 classified as preforms and biface blades were examined for evidence of heating. The examination was limited to the red and yellow cherts because identification of heat treating on the other major chert types is not yet secure. The presence or absence of heat treating was classified as one of three possible alternatives: Not Heated, Probably Heated, and Heated. The first class contains artifacts of yellow chert, unheated, or at least not heated enough to produce macroscopic changes. The probably heated class contains artifacts with the traits indicative of heating red color and/or glossy or rippled flake scars. This indicates that these artifacts have been heated, but not necessarily as part of the manufacturing process. The final class contains those artifacts which show evidence of being heated during the manufacturing process, i.e. after some flaking had occurred. This evidence was taken to be the presence of surfaces flaked before heating, and contrasting with surfaces exposed either by breakage or flaking, after heating. Once all surfaces exposed prior to heating are removed by subsequent flaking, it is no longer possible to classify artifacts as belonging to the Heated class. This class was used as a check mechanism to evaluate the possible occurrence of heating of chert either pre- or post-manufacture by natural or accidental causes, or those causes incidental to artifact use.

This study was limited to the preforms and bifaces for this seemed to be the step at which heating took place. Familiarity with the materials indicated that nodules or cores were not being heated, and support was later gained for this. On the other hand, unheated Projectile Point/Knives of yellow chert are rare, two were found at 1Fr311, and none at 1Fr590. The same bifurcation of chert types by artifact type has been noted before for the Bear Creek Watershed and nearby areas using similar raw materials (DeJarnette *et al.* 1975; Hooper 1968; Josselyn 1965:5; Nielsen 1971:68; Stowe 1970). The classification of the preforms and biface blades with respect to heating is given in Table 6.

Assuming that the Heated and Probably Heated classes both represent artifacts heated during manufacture, the data in Table 6 may be grouped in a four cell matrix for each site; heated and unheated, preforms and biface blades. At 1Fr311, half of the 52 preforms are heated and half are not, but only one biface blade out of twenty-four has not been heated. Two-thirds of the preforms from 1Fr590 have been heated (19 of 29). The sample of biface blades contains only two specimens, both heated. (This low figure is caused in part by the large number of fossiliferous biface blades on the site, 71% compared to 31% at 1Fr311. The significance of this difference is not yet known.)

During the analysis, no instance was found of an artifact classified as a Preform 1 heated prior to the manufacture of the Preform 1, confirming the previously stated observation. Unless contrary evidence is found in later excavations, it is safe to assume that raw material was not being heated, nor were cores.

Additional qualitative evidence for the heating of preforms is found among the debitage. During sorting of debitage, examples of flakes were noted which were

Table 6. Heat treating of yellow chert, preforms and biface blades.

1Fr311

Category	Heated	Probably Heated	Not Heated	Other Chert
Preform 1	6	6	20	39
Preform 2	4	10	6	32
Biface Blade	1	22	1	63

1Fr590

Category	Heated	Probably Heated	Not Heated	Other Chert
Preform 1	4	4	10	25
Preform 2	11	0	0	27
Biface Blade	0	2	0	53

removed after heating, from artifacts previously flaked before heating.

Considering all the data, it seems that the heat treating of yellow chert was an integral part of the lithic technology in the Bear Creek Watershed. It enters the transformation sequence as an optional step after flaking the Preform 1. This option was apparently chosen in most cases. After flaking the Preform 2, heat treating is a conditional step, in that if performed before it is omitted here, or if omitted above is performed here. Now that a model technological framework for heat treating is available, additional work may be directed at analysis of variance from this. This may yield data on the time of introduction of the technique, and possible changes in the method and scope of its application.

Summary

This paper has presented the results, thus far, of analysis of lithic materials from the Bear Creek Watershed. The basic elements of a transformation sequence accounting for the materials have been outlined; including the artifact categories, their ordering, and the role of heat treatment. Much remains to be done, however, and the fine detail of the sequence may never be completely specifiable. For example, the model as presented herein, considers only the primary product of each transformation. It would probably be possible to approximate the kinds and relative amounts of debitage produced at each step. Also, the exact operation(s) *i.e.* flint knapping technique, performed at each step is not yet known. Experimental replication could provide data on the above two topics.

While still incomplete, the model has benefited research in several ways. First, it has permitted a meaningful classification and organization of materials within the context of manufacturing practices. Second, it has acted as a source of stimulus for additional potential research by pointing out areas where such research might be productive.

Acknowledgements

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AN EVALUATION AND SYNTHESIS OF CHANGING LITHIC TECHNOLOGIES IN THE CENTRAL TOMBIGBEE VALLEY

The purpose of this paper is to describe, evaluate, and synthesize what is known to date concerning prehistoric lithic technologies in the central Tombigbee Valley. These successive technologies represent 10,000 years of prehistoric adaptation to the geologic, biological, and social environments present in this area over that time span.

In order to properly evaluate the different lithic technologies, they must first be recognized and described. This will constitute a major portion of the present analysis. Secondly, technological practices must be conceived of in a broad geographical context. In this manner, cultural groups occupying adjacent physiographic and environmental zones must be studied in conjunction with data from that of a single area. Consequently, to more appropriately evaluate and interpret lithic technological practices in the central Tombigbee Valley, data from adjacent areas will also be presented.

Geology of the Central Tombigbee Valley and Regional Distribution of Lithic Sources

In its macro-setting, the geology of west-central Alabama must be placed within the Coastal Plain physiographic province to the south and west and in the Cumberland Plateau-Fall Line Hills province to the north and east (Jones 1939; Copeland 1968). Geologic processes of ontogenesis, subsequent erosion and deposition have created the major physical divisions of Alabama. The older Cambrian, Ordovician, and Pennsylvanian beds are found primarily in the northern and eastern parts of the state. Large Cretaceous seas, once present in southwest Alabama, have eroded and covered these strata. Beds of Pottsville sandstone and underlying dolomite formations dip to the south and are completely covered by Cretaceous and Tertiary deposits south of the Fall Line (Copeland 1968). This contact between the Paleozoic strata and the Cretaceous marine deposits is jagged in west-central Alabama; a transition zone existing in many of the valleys.

Pleistocene and Holocene alluvial deposits stretch over the central Tombigbee floodplain, forming numerous terraces. Generally the floodplain averages one mile in width. The meandering Tombigbee River has cut numerous oxbow lakes into the alluvium, exposing numerous gravel bars. Downcutting and channel shifting have caused gravel bars to be exposed in the present river channel. These gravel bars are composed of redeposited Tuscaloosa gravel, remnant sediments from the Cretaceous period. In turn, these Cretaceous sediments derive from probable Paleozoic formations to the north and west (Marcher and Stearns 1962).

The natural composition of these chert gravels will be discussed under a following section. These gravels represent the only source of siliceous stone within a 50 mile radius of the Gainesville Reservoir.

Regional sources which were utilized periodically by the prehistoric inhabitants of the central Tombigbee Valley occur both to the north and to the south of the Gainesville Reservoir proper. The closest source is that of Tallahatta Quartzite, some 50 miles to the south (Dunning 1964). This material outcrops over a wide area of southwest Alabama and southeast Mississippi. Beds are quite thick in some areas and one quarry site is known in Choctaw County, Alabama.

To the north of the central Tombigbee Valley, Tuscaloosa gravels outcrop in Lamar and Franklin counties in Alabama. Although these gravels are identical in origin and structure to the reworked gravels found in the alluvium of the central Tombigbee Valley, they are much larger in the northern part of the state.

In addition to these large Tuscaloosa gravels, numerous outcroppings of Ft. Payne and Bangor cherts occur in northern Alabama and Mississippi. The nearest these cherts outcrop to the central Tombigbee Valley is in the Franklin and Lamar county sectors of Alabama. This material occurs in both tabular and nodular form.

In summary, the aboriginal inhabitants of the central Tombigbee Valley had access to chert on the local level in the form of small cobbles and pebbles. They also had regional sources available to them at some distance. These distant sources were utilized a good deal by some cultural groups throughout prehistory, especially during the Archaic and Gulf Formational stages. The discussion will now turn to an examination of the physical and structural properties of local chert sources. Particular attention will be given cultural practices involved in transforming this material into a usable product.

General Description of Local Cherts and Results of Thermal Alteration Experiments

Perhaps the most striking feature of Woodland lithic material in the central Tombigbee Valley is the presence of enormous quantities of fire cracked chert. This material is very distinctive and is recognized through the presence of numerous pot lid fractures, jagged edges, and a deep red color. This material differs greatly from the naturally occurring chert gravels found in the Tombigbee River. Rather than accept published references concerning the physical properties of chert which has been thermally altered, it was felt that empirical verification should be obtained if possible.

Accordingly, four gravel bars within the Gainesville Reservoir were collected for chert samples. Twelve specimens from these localities were selected for thermal treatment. Initially, each cobble was separated into 5 pieces by hard hammer percussion. One piece was labelled control and the other 4 were subjected to a series of heat runs. The 12 samples were heated for 6 hours at temperatures of 250°C, 300°C, 350°C, and 400°C. The specimens were placed directly in an electric glazing kiln with no heat transfer medium other than air. Temperature was increased slowly until the desired reading was reached. Variation around the desired temperature was permissible to 5°C either way. After 6 hours the kiln was turned off and the pieces were allowed to cool overnight.

Tables 1 and 2 give the results of the thermal alteration experiment. Colors given are those which most closely fit those given in Munsell Soil Color Chart, 1975 edition.

These data may be summarized as follows. Naturally occurring cortical color varies from a light yellowish-brown to a dark yellowish-brown. Cortex thickness averages 1 mm. Cobble size ranges from 1-10 cm in diameter with an average of 5 cm. Internally, the colors range from a pale yellow to a yellowish-brown. Textural differences are common from cobble to cobble and within individual cobbles. Numerous quartz-filled fissures impregnate otherwise homogeneous matrices. These cobbles are usually fine grained. Some cobbles were coarse grained and noticeably lacking in internal fissures and weathering planes.

Color changes were dramatic in all but one of the samples run. Colors ranged from weak yellowish-reds to dark reds depending upon the degree of heat applied. Much of the material possessed lustrous flake scars at 400°C. Table 2 shows the relative amount of luster occurring after each heat run. A numerical value of 1 was assigned to dull surfaces, 2 was designated as lustrous, and 3 signifies a highly lustrous flake scar.

Most samples turned only a mottled yellowish-red on the inside and yellowish-red on the outside when heated to 250°C. However the 300°C run produced marked changes from yellowish-reds to deeper yellowish-reds in most specimens. Subsequent temperature runs of 350°C and 400°C produced a deepening to a red color. Minimal thermal explosion occurred during these tests. Some thermal cracking was noted at the 400°C level but was rare. This may be explained by the slow elevation of temperatures throughout the experiment.

Although these experiments produced effects which matched the lithic material being utilized by Middle Woodland Miller II phase groups: Late Woodland Miller III phase lithic materials were not so easily replicated. The majority of Miller III phase lithics are extremely fire cracked and crazed, exhibiting numerous pot lid fractures and discolored surfaces. In an attempt to replicate this phenomenon, unaltered cobbles taken from the Tombigbee River were subjected to a temperature run of 550°C for 6 hours. The temperature was raised quickly and an intense thermal explosion occurred. The thermal spalls produced by this technique were identical to those which literally cover many Miller III sites. The color produced at this temperature was a consistent dark red. Subsequent flaking experiments verified the highly lustrous quality of materials so processed. In addition, knapping experiments by the author show that hard hammer flaking quality is enhanced. Pressure flaking is also made much more predictable and efficient with the application of heat (Mike Wilson, oral communication, October, 1978). As expected, point tensile strength is sacrificed with these improvements in flaking quality.

Table 1. Changes in cortical color occurring during four temperature runs on chert samples from the Gainesville Reservoir.

Sample	250°C.		300°C.		350°C.		400°C.	
	BF	AF	BF	AF	BF	AF	BF	AF
1. Locale 1	10YR5/4	2.5YR5/4	10YR5/4	10R4/4	10YR5/4	10R4/4	10YR5/4	10R4/4
2. Locale 1	10R4/4	5YR5/6	10YR4/4	2.5YR2.5/4	10YR4/4	10R3/4	10YR4/4	10R3/4
3. Locale 1	10YR6/4	5YR4.5/6	10YR6/4	2.5YR3/4	10YR6/4	2.5YR3/6	10YR6/4	7.5YR5/4
4. Locale 3	10YR6/4	7.5YR5.5/6	10YR6/4	5YR5/4	10YR6/4	2.5YR5/6	10YR6/4	5YR6/6
5. Locale 3	10YR3/4	2.5YR2.5/2	10YR3/4	2.5YR2.5/2	10YR3/4	10R3/4	10YR3/4	2.5YR3/6
6. Locale 3	10YR4/6	2.5YR2.5/4	10YR4/6	10R3/3	10YR4/6	10R3/2	10YR4/6	10R3/4
7. Locale 4	10YR4/6	2.5YR2.5/4	10YR4/6	2.5YR3/4	10YR4/6	10R3/4	10YR4/6	10R3/4
8. Locale 4	10YR3/4	5YR3/4	10YR3/4	2.5YR2.5/4	10YR3/4	10R3/4	10YR3/4	10R3/3
9. Locale 5	10YR6/4	2.5YR4/4	10YR6/4	*	10YR6/4	10R4/4	10YR6/4	10R4/4
10. Locale 5	10YR4/6	2.5YR4/4	10YR4/6	2.5YR3/6	10YR4/6	10R3/6	10YR4/6	10R3/6
11. Locale 5	10YR5/4	5YR5/6	10YR5/4	2.5YR4/6	10YR5/4	10R3/6	10YR5/4	10R4/4
12. Locale 5	10YR5/6	2.5YR3/6	10YR5/6	10R3/3	10YR5/6	10R3/3	10YR5/6	10R3/6

*Color indeterminable.

Table 2. Changes in internal color and luster occurring during four temperature runs on chert samples from the Gainesville Reservoir.

Sample	250°C. BF	250°C. AF	Luster B	Luster A	300°C. BF	300°C. AF	Luster B	Luster A	350°C. BF	350°C. AF	Luster B	Luster A	400°C. BF	400°C. AF	Luster B	Luster A
1. Locale 1	10YR8/1	10YR8/1	1	1	10YR8/1	10YR8/1	1	1	10YR8/1	10YR8/1	1	1	10YR8/1	10YR8/1	1	1
2. Locale 1	2.5Y4/4 10YR5/6	*	-	-	2.5Y4/4 10YR5/6	10R4/6	1	1	2.5Y4/4 10YR5/6	10R3/6	1	3	2.5Y4/4 10YR5/6	10R3/6	1	3
3. Locale 1	10YR5/4 2.5Y8/4	10R4/4 10YR8/4	1	1	10YR5/4 2.5Y8/4	5YR7/6 10R4/3	1	1	10YR5/4 2.5Y8/4	10R4/3	1	1	10YR5/4 2.5Y8/4	10R4/3	1	1
4. Locale 3	10YR7/4	5YR6/6	1	1	10YR7/4	10R5/4	1	1	10YR7/4	10R5/6	1	1	10YR7/4	10R5/6	1	1
5. Locale 3	2.5Y8/4	5YR5/4 7.5YR6/4	1	1	2.5Y8/4	*	1	1	2.5Y8/4	10R4/3	1	2	2.5Y8/4	10R4/6	1	2
6. Locale 3	10YR6/6	2.5YR6/6	1	1	10HR6/6	10R5/6	1	1	10YR6/6	10R4/6	1	1	10YR6/6	10R4/6	1	1
7. Locale 4	10YR6/6	7.5YR7/6	1	1	10YR6/6	10R4/6	1	2	10YR6/6	10R5/6	1	2	10YR6/6	10R5/4 10R5/6	1	2
8. Locale 4	10YR6/4	2.5YR4/4	1	1	10YR6/4	10R5/4	1	2	10YR6/4	10R5/4	1	2	10YR6/4	10R5/4	1	2
9. Locale 5	10YR5/6	2.5YR4/4	1	1	10YR5/6	10R3/6	1	1	10YR5/6	10R3/6	1	2	10YR5/6	10R3/6	1	2
10.Locale 5	10YR5/8	5YR5/6	1	1	10YR5/8	10R4/6	1	2	10YR5/8	10R4/6	1	2	10YR5/8	10R4/6	1	3
11.Locale 5	10YR5/6	7.5YR5/6	1	2	10YR5/6	10R3/4 5YR5/8	1	2	10YR5/6	10R4/6	1	2	10YR5/6	10R3/6	1	3
12.Locale 5	10YR5/8	*	1	1	10YR5/8	10R3/6	1	2	10YR5/8	10R3/6	1	2	10YR5/8	10R3/6	1	2

*Color indeterminable.

The results of these experiments show that Woodland and Archaic groups were practicing thermal alterations of siliceous stones in the central Tombigbee Valley. Further, it was shown that local chert becomes more tractable upon heating. The strength and presumably use durability decreased with this practice. Finally, thermal explosion was shown to occur when cherts are quickly heated to high temperatures. Minimal cracking occurred when materials were subjected to slowly rising temperatures of a moderate nature.

The implications these results have for interpreting the Gainesville prehistoric lithic sequence will be discussed below. Figure 1 depicts the current cultural and historical integrative terminology in use in the Gainesville Reservoir.

The Archaic Cobble Tradition and Bipolar Technology

Material evidence from three sites in the Gainesville Reservoir, 1Gr1x1, 1Gr2 and 1Gr50, have produced Early through Late Archaic lithic artifacts from sealed strata. Dalton, Kirk, Big Sandy, Bifurcate Base, Pickwick, Little Bear Creek, Cotaco Creek and Wade components were present on one or more of these sites. No visible stratigraphy was present in these Archaic strata. Occupations were spatially spread out and diffuse in nature at these sites. Therefore during the limited amount of time allotted to the excavation of these zones, only a small sample of the Archaic remains were recovered from each site. Nevertheless, interesting observations were made concerning the establishment and persistence of a stone working technology from Dalton to Late Archaic times. This technology, an adaptation to the small size of local cobbles, relied heavily upon bipolar percussion flaking. The extreme toughness of the local non-heat treated chert has been verified through knapping experiments. The tool kits present in the Archaic strata of the Gainesville Reservoir sites reflect this tenacity. Specialized tool forms which are manufactured from local unaltered chert are rare.

The earliest evidence for this particular bipolar technique occurs at site 1Gr1x1 and is associated with Dalton projectile points. In the Early Archaic zone, Daltons were recovered along with cobble and flake tools. These tools consisted of unifacially flaked side scrapers and hafted end scrapers, uniface cobble scrapers, bipolar cores, bipolarly retouched uniface cobbles, and splintered wedges (pieces esquillees). All of these tools including the projectile points were manufactured from non-heat treated local chert.

At site 1Gr2, Kirk and Bifurcate Base projectile points were found in the Early Archaic zone. These were associated with uniface cobble scrapers (Jenkins 1975), bipolar cores, bipolarly retouched uniface cobbles, and splintered wedges (pieces esquillees). A bifacially flaked hafted end scraper and bifacial knife were also found in the Bifurcate Base and Kirk levels. Again, all of the cobble tools and bipolar cores are manufactured from local non-heated chert. Most of the projectile points are manufactured from either exotic or thermally altered stone.

In the Archaic zone at site 1Gr50 bipolar cores, bipolarly retouched cobbles, and splintered wedges (pieces esquillees) predominate along with hammerstones and anvilstones.

All of these assemblages reflect low diversity in terms of morphology. Flake tools other than utilized flakes are rare in the present sample. Variations in cobble core morphology account for most of the assemblage diversity throughout the Archaic stage. Along with these modified tool assemblages, debitage consists of numerous primary, secondary, and tertiary flakes

Date	Stage	Period	Arch. Culture	Phase	Subphase
1735	Historic	Fully Historic / Protohistoric	? ?	? ?	Mhoon?
1540					Sorrels?
1400 A.D.		Late			
1300	Mississippian	Mature	Moundville	Tombigbee?	Lyons Bluff?
1200		Early			Tibbee Creek?
1100					
1000		Terminal Woodland	Terminal Miller	Gainesville	Gainesville
900					Late Catfish Bend
800		Late	Miller-Baytown	Miller III	Middle Cofferdam
700					Early Vienna
600					Late Turkey Paw
500	Woodland			Miller II	
400					Early
300					Late Craig's Landing
200					
100		Miller	Miller	Miller I	Middle Pharr
1 A.D.					
100 B.C.					Early Bynum
500 B.C.	Gulf Formational	Late	Alexander	Henson Springs	
		Middle	Wheeler	Broken Pumpkin Creek	
1000 B.C.			Little Bear Creek		
2000 B.C.			Pickwick		
3000 B.C.		Late			
4000 B.C.			Benton		
5000 B.C.	Archaic	Middle	White Springs-Sykes; Morrow Mountain?; Eva?		
6000 B.C.			Bifurcates		
7000 B.C.		Early	Kirk; Big Sandy		
8000 B.C.			Dalton		

Figure 1. Suggested cultural and chronological nomenclature for the central Tombigbee drainage.

resulting primarily from bipolar and direct free hand percussion flaking of local unaltered chert. Exotic and heat treated materials are also represented in a small but consistent proportion to the local unaltered cherts. Approximately 95% of the local material has not been heated prior to flaking. Significantly, most of the exotic and heated flakes are products of either bifacial thinning or retouch.

The predominance of non-heat treated local material at these sites during Archaic times further exemplifies this basic adaptation to local chert sources. The use of exotic and heated stone is restricted to the manufacture of specialized tools. The Dalton points and a few early Kirk forms appear to be the only exceptions to this practice.

Apparently, unaltered local materials were well suited for heavy percussion flaking and the manufacture of heavy duty tools such as cobble core scrapers, cobble choppers, and splintered wedges (pieces esquillees). Conversely, more delicate knapping techniques such as soft hammer percussion and pressure flaking were made easier or possible through the use of thermal alteration or the procurement of exotic stone. Figure 2 shows representative Archaic period lithic artifacts.

Middle to Late Gulf Formational and Early Middle Woodland Lithic Technologies

Following the Archaic, Middle and Late Gulf Formational periods ceramics were introduced into the central Tombigbee Valley (Jenkins 1975). Some 1000 years later, Miller I (early Middle Woodland) ceramics were introduced (Jenkins 1975).

There appears to be somewhat of a demographic hiatus during this time span. Consequently, data from the Gainesville Reservoir excavations concerning lithic continuity and change from Late Archaic is limited.

The best data we have on this comes from site 1Gr2. Here it appears that the basic Gulf Formational lithic technology is a direct continuum from the Archaic. This is inferred through the predominance of local non-heated stone as the major form of debitage in excavation levels associated with Wheeler and Alexander ceramics. The use of exotic stone, Tallahatta Quartzite in particular, appears to remain constant from the preceding Late Archaic period, perhaps even becoming more frequent.

Data are also scanty concerning Miller I lithic technology. It is apparent, however, from excavation levels at site 1Gr2, that a new stone technology is being utilized by Miller I peoples. It appears that Miller I cultural groups established thermal alteration as an integral and basic part of their adaptation to local chert materials. The use of heat to improve flaking quality became commonplace in both projectile points and other tool forms. The use of exotic stone appears to drop dramatically in the Miller I phase although it is still utilized to some degree.

The change in extent of thermal alteration practices from Late Archaic to Middle Woodland is illustrated in Figure 3. This graph is based on excavations at site 1Fr50. Levels 1 and 2 contained Miller II and Miller III sherds. Level 3 contained a few Woodland sherds and steatite bowl fragments. Levels 4, 5, and 6 were preceramic. Chert types are designated as follows: OE—Other Exotic; TQ—Tallahatta Quartzite; YC—Yellow Chert; MISC—Miscellaneous; RC—Red Chert (thermally altered); DRC—Dark Red Chert (thermally altered).

The apparent decline in numbers of components during Gulf Formational and Miller I times in the Gainesville Reservoir makes interpretations concerning continuity and change in these lithic technologies tenuous. The hypotheses concerning these technologies should be taken as educated guesses until more confirmative or negating data are forthcoming.

Late Middle Woodland Lithic Technology

In the preceding Middle and Late Gulf Formational and early Middle Woodland periods, data concerning differing lithic technologies was limited. However, in the ensuing Miller II phase (late Middle Woodland), there is no doubt that a major change has occurred. Bipolar flaking has almost completely died out. Only occasionally are cobble cores found which exhibit the characteristic opposed edge crushing and sheared force cones.

The Miller II peoples produced medium-large straight to contracting stemmed projectile points with tapered shoulders (see Fig. 4). These were manufactured from heated cobbles and large flakes drawn from cobbles. Although some projectile points and tools were not heated, over 95% of the debitage is heated and shows preliminary heating of cobbles prior to flaking. The major flaked tool groups produced by the Miller II peoples include unifacial and bifacial edge trimmed cobbles and heat spalls, utilized flakes and heat spalls, and unifacial flake perforators.

From the large size of the projectile points, as well as numerous cores, blanks, and cobble preforms, it appears that the Miller II peoples were heating their raw materials at temperatures ranging from 300°C to 400°C. This inference is based on the thermal alteration experiments. Although thermal spalls are common in Miller II phase assemblages, the main focus appears to have been on altering entire cobbles for further manual reduction practices.

Late Woodland Lithic Technology

The use of thermal alteration practices continues into the succeeding Miller III phase. A distinct technological change is apparent, however. The change has to do with the intended function of heat application. Miller II peoples were heating much of their chert at relatively low temperatures, evidently to avoid thermal explosion. Such heat spalling and cobble reduction caused by quick, intense heat would make the manufacture of large projectile points difficult. Thus Miller II peoples were somewhat restricted in their use of heat.

Miller III groups were heating chert gravels to temperatures in excess of 500°C based on the thermal alteration experiment. The results of this practice produced an enormous amount of heat spalled materials as mentioned before and appears to be an intentional reduction practice. This hypothesis is supported by several facts: (1) the reduced size of Miller III projectile points over Miller II projectile points, making heat restriction unnecessary; (2) the almost complete absence of cores in Miller III phase assemblages; (3) the differential color and luster changes from Miller II to Miller III, most Miller III lithics being more lustrous and a deeper red; (4) the overall reduction in flake size from Miller I to Miller III, suggesting the reduction of smaller objective pieces.

The above facts have been substantiated through the use of experimental controls and quantification of Miller II phase and Miller III phase lithic assemblages. Those quantifications are based on ceramic seriation and the ordering of lithic assemblages thereby.

The Miller III assemblage is most different from the Miller II assemblage in terms of projectile point morphology. The large stemmed points of Miller II give way to medium-small triangular forms during early Miller III. By middle Miller III times the small triangular points are established over the medium sized forms (see Fig. 4).

Mississippian Lithic Technology

With the emergence of Mississippian lithic technology in the central Tombigbee Valley, we see both continuity and change from the preceding Miller III phase. Miller III phase thermal alteration practices were carried on by the Mississippians. However, a new

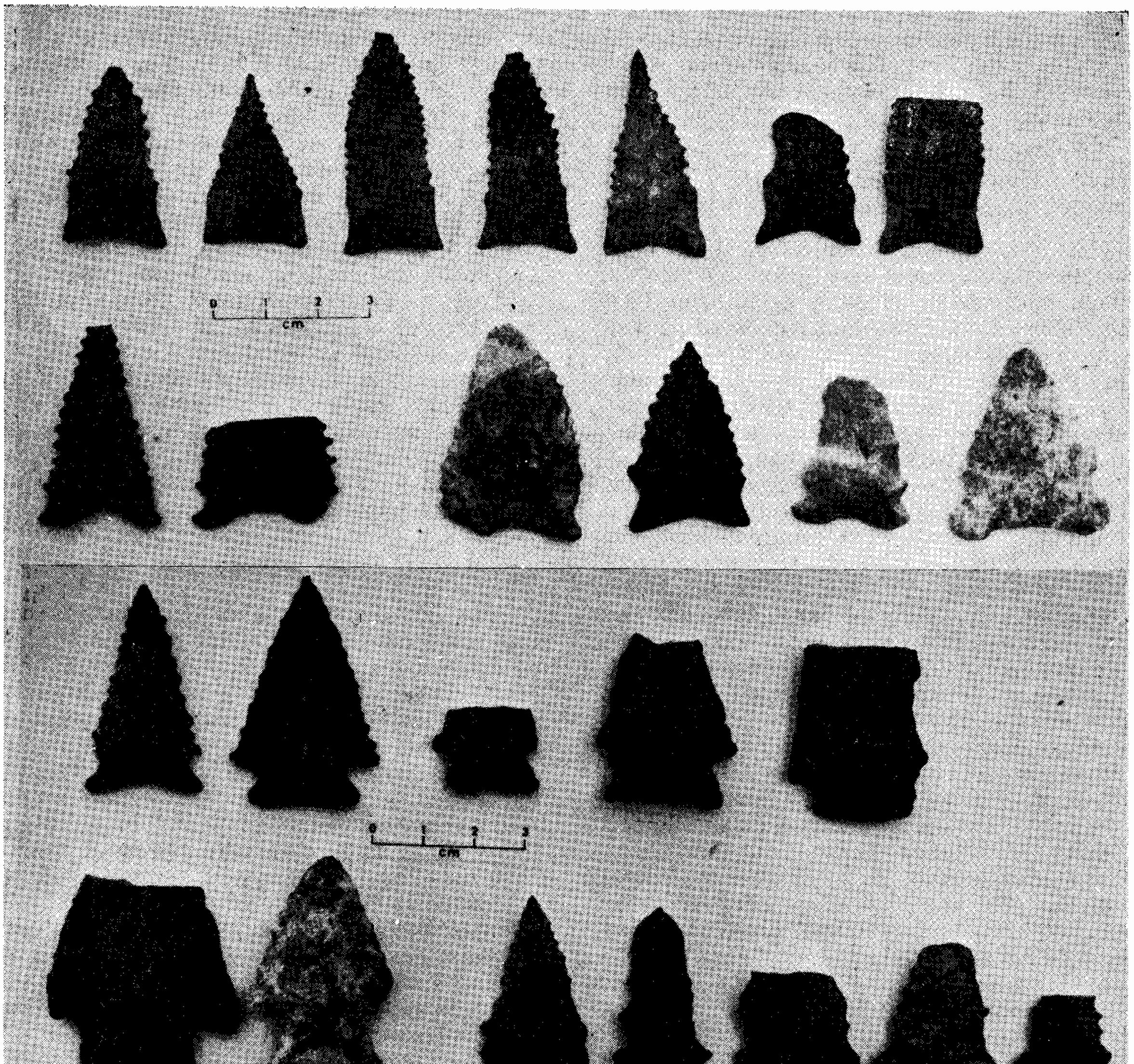

Figure 2. Top row, Dalton points; 2nd row, Hardaway-Dalton points; 3rd-4th rows, Kirk points; 5th-6th rows, Archaic bipolar points and pieces esquillees.

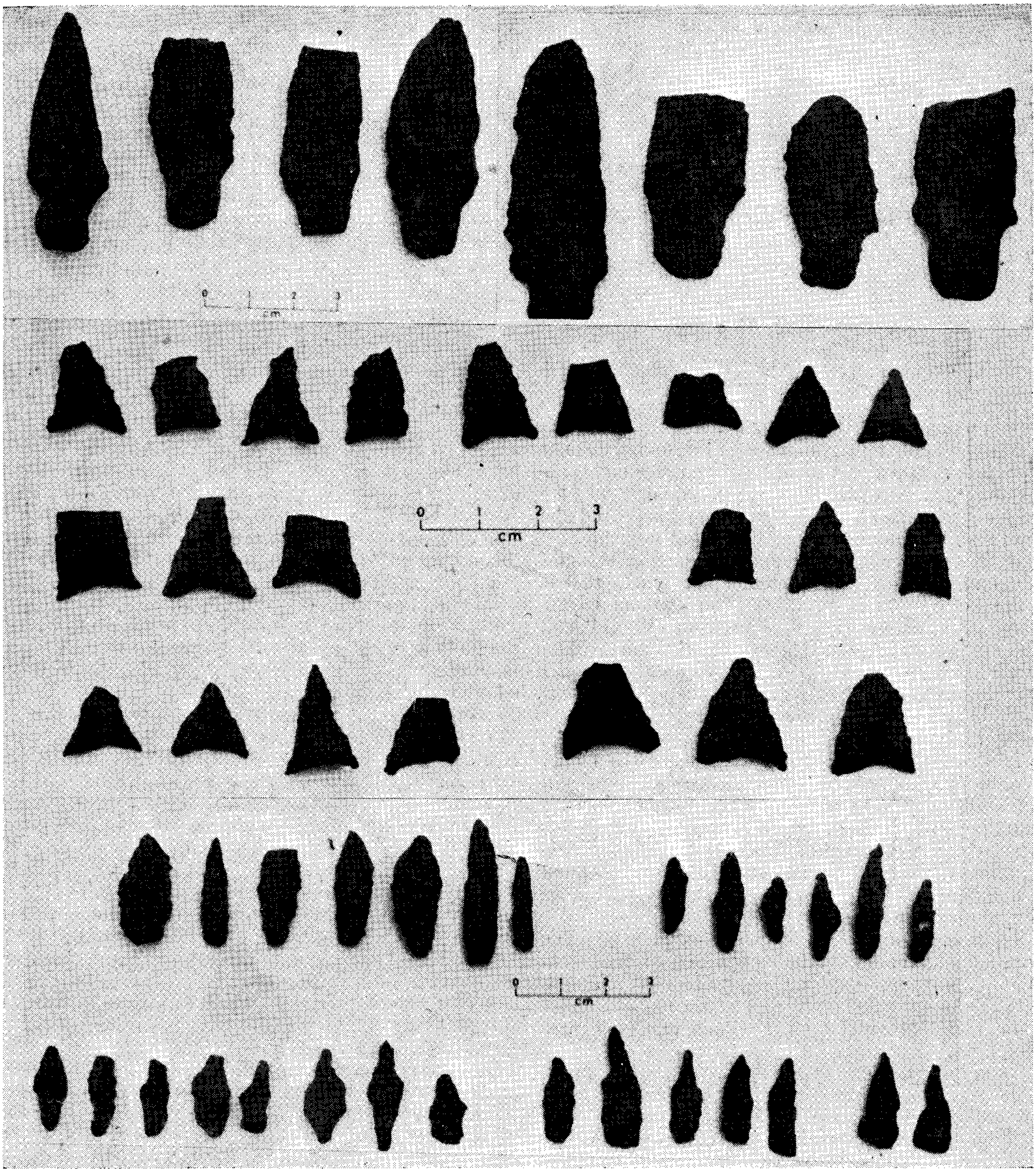

Figure 4. Top row, Miller II points, thermally altered; 2nd-4th rows, Miller III arrow points, thermally altered; 5th-6th rows, elements of Mississippian microlith industry.

technique is employed which is reminiscent of Miller II thermal alteration practices. Low temperatures were being used on certain local materials to facilitate the production of cores. These cores are then used as objective pieces for drawing thick trapezoidal blades. The blades are then bifacially pressure flaked to produce microlithic drills. Many of the bifacially flaked blades are broken and represent various stages in microlith manufacture (see Fig. 4).

Thus, in Mississippian technology, we have a dual treatment of local stone. Apparently two separate thermal alteration practices existed contemporaneously; one to produce general utilitarian tools, the other to produce more specialized forms.

Summary Remarks

Throughout the prehistory of the central Tombigbee Valley stone working practices varied. Two basic adaptations to local chert sources occurred, one emphasizing the use of non-thermally altered cobbles and the other thermal alteration. Specific technological practices occurred within these two traditions.

During the Archaic, local cherts were used to manufacture much of the tool kit. Exotic stone and thermally altered local cherts were used to manufacture projectile points and specialized tools. Inherent within this dichotomy is the supposition that the more expensive cherts, those which had to be obtained through

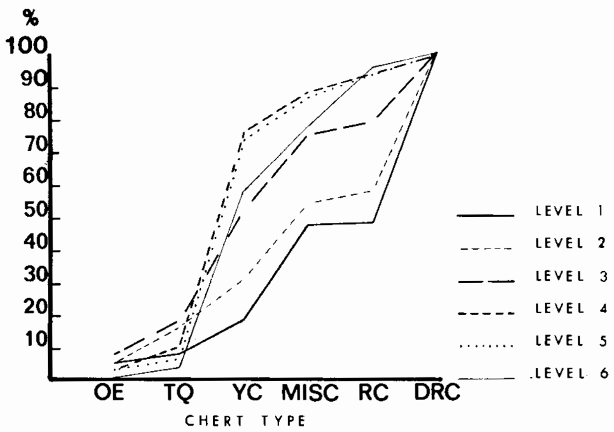

Figure 3. 1Gr50, cumulative percentage graph by level and chert type.

extensive travel, had more than just technological significance. The social significance of the Archaic exotic stone procurement is probably of much greater importance than is usually thought of in Early to Late Archaic societies. The underlying reasons behind the use of non-local materials may be related to technological factors or they may vary independently of this and be more concerned with totemic ties and aesthetic preference (Gould *et al.* 1971). The presence of numerous exotic stone caches of preforms, blanks, and aesthetic projectile points in Middle to Late Archaic burials (DeJarnette *et al.* 1973; Webb and DeJarnette 1942) indicates social inequality. Likely, both technological and social factors are involved.

In order to answer these questions several lines of research must be pursued: (1) What are the conditions under which exotic (more expensive) stone will be incorporated into a local lithic technology? (2) What are the geologic (raw material) parameters under which technological innovation (bipolar flaking, thermal alteration) will occur? (3) How does the procurement of long range resources relate to the maintenance of a society?

These are all questions for which we have very few answers at the moment. The recognition of dual technologies operating both synchronically and diachronically throughout the prehistory of the central Tombigbee Valley provides a basis for research into these problems.

Interestingly, there appears to be a definite correlation between Tuscaloosa gravel size and regional lithic technologies. Futato (1977) and DeJarnette *et al.* (1975) have noted a distinct lithic reduction sequence in the Cedar Creek and Buttahatchie drainage systems of northwest Alabama. In this Archaic sequence, large unaltered Tuscaloosa gravels are bifacially flaked into preforms. Thermal alteration is applied to these preforms and final reduction into finished implements then takes place. No such evidence exists in the Gainesville Reservoir for such a practice. No bipolar materials are associated with the Cedar Creek assemblages (Eugene Futato, oral communication, October 1978). Thus these occurrences of contrastive uses of structurally similar materials appears directly related to cobble size.

Acknowledgments:

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Janet E. Rafferty

SURFACE COLLECTIONS AND SETTLEMENT PATTERNS IN THE CENTRAL TOMBIGBEE VALLEY

In the past five years, several large-scale site surveys have been done in the central Tombigbee River valley in Mississippi and Alabama. These have produced a good deal of information on site location and distribution in relation to natural features such as topography, soil types, vegetation, and water sources. The survey reports are mainly descriptive, with little analysis of the surface collections beyond that required to identify the components present at each site and make a descriptive list of artifacts found. Blakeman (1975, 1976) attempted to correlate topography and soil types with cultural components, but since the vast majority of the areas surveyed and the sites found are on the terraces, little information on changes in settlement pattern was obtained.

Artifacts in surface collections made during site survey are often used only for component definition, then ignored. Such collections should have considerable potential for illuminating site function, at least in the sense of allowing identification of different kinds of occupations in a settlement pattern. These different kinds of sites may turn out to be correlated with environmental variables in a meaningful way, allowing some hypotheses about settlement pattern change to be generated for testing on excavated materials.

Before attempting this kind of analysis, a series of assumptions must be made. One is that the surface collections are comparable; a second is that they are representative in a general way of the entire contents of the components identified in them. This is not to say that the surface collections will be treated as representing the entire range of occupations that may be present at a site, but only that if a component can be identified from the surface collection, then non-diagnostic artifacts from that component should be equally well-represented in the assemblage. A third assumption is that most sites, even when multicomponent, produce collections that reflect site function in a patterned way. This would most obviously be true of a site that was used for similar purposes throughout its occupation span, but even sites which have changed in function, if they have changed in patterned ways, would adhere to the stipulation. In other words, it is assumed that if the artifacts are placed in categories believed to reflect function, the statistically-valid differences seen in the analyses will be the result of functional patterning. It is true that none of these assumptions is totally justifiable even when dealing with the best controlled data. However, they must be adopted provisionally before the argument can proceed.

The analytic categories used in this study were those applied to assemblages described in the various survey reports issued by Mississippi State University in the last several years, including Rucker (1974), Blakeman (1975, 1976), and Atkinson and Elliott (1978). The lithic categories used in these reports are uniform and the collection methods for prehistoric material were fairly comparable. It is possible that systematic biases were introduced into the data in collection and analysis because of the number of people and amount of time involved. However, given the level of generality of the current study, this was not felt to be likely to have a major effect on the results.

The analysis was restricted to lithics in order to increase comparability between preceramic and ceramic components. The initial analysis involved only assemblages with 50 or more lithic artifacts which were described in the two reports by Blakeman (1975, 1976). The assemblages were divided into five general types on the basis of differences in the frequencies of the lithic artifacts, as shown in Table 1. The types were defined intuitively, using the lithic categories that seemed to best discriminate among collections.

In order to add more assemblages and also in an attempt to verify the assemblage types, two discriminant analyses were performed, first on the already-classified assemblages and then to assign unclassified collections to the previously-defined types. The SPSS sub-program Discriminant (Nie *et al.* 1975:434-467) was used with five groups and ten variables; the groups

Table 1. Assemblage type definitions.

Assemblage Types	Artifact Categories: Unutilized Flakes	Utilized Flakes	Cores	Other Shaped Flaked Tools	Sandstone Chunks
Type I	>70%				
Type II	25-70%	>15%		>3%	
Type III	25-70%		>15%	P	
Type IV	25-70%	P		P	>10%
Type V	25-70%	5-15%		P	

P-present.

were the five assemblage types previously defined, while the variables were the lithic categories used in the classification. In the discriminant runs, four functions were derived to separate the five groups (Table 2). The first three of these have a significance level of better than .001 and among them account for 98.15% of the cases. Cores, sandstone chunks, utilized flakes, and pebbles/broken rock were the most important discriminating variables, with projectile points and other shaped lithics of less importance.

The results of the discriminant re-classification of the previously-assigned assemblages were excellent, with 92.86% of the assemblages assigned to the correct class (Table 3). The program was then re-run to classify previously-unassigned assemblages, using all collections with at least 15 lithic artifacts. Discriminant analysis will assign each case to a class, so it provides a measure of the probability that a member of that class would fall as far from the class center as the case under consideration does. All cases with values less than .1 were removed from the analysis at this point. In all, 201 of 274 collections were classified or verified in this way (Table 4). The remaining unclassified collections either represent different kinds of site functions or were too small to be assigned with a high probability of correctness.

Although the five assemblage types were verified by the discriminant analysis as recognizeable patterns in the data, their meaning was not clarified. The type definitions may help somewhat to suggest what the

Table 2. Standardized discriminant function coefficients for previously-classified assemblages.

Artifact Categories Compared by Percentages	Function 1	Function 2	Function 3	Function 4
Whole and Broken Pebbles	-.17928	.14456	.31713	-.70329
Unutilized Flakes	.05925	.01568	.00464	-.27672
Utilized Flakes	-.31696	-.49853	.88490	.49556
Cores	.67546	.13659	.83357	.02150
Projectile Points	.04461	.08977	.17037	.34583
Other Shaped Lithics	-.08263	-.02419	-.06014	-.74987
Hammerstones	.00930	-.12819	.06565	.10081
Nutstones	.01389	.02093	.08986	-.10495
Sandstone Chunks	-.36782	.73844	.58483	.21175
Ground Stone Tools	-.07503	-.01860	.06759	-.35343

Table 3. Prediction results, discriminant analysis of assemblages previously assigned to Types I-V.

PREDICTION RESULTS -

ACTUAL GROUP	NO. OF CASES	PREDICTED GROUP MEMBERSHIP GP. 1	GP. 2	GP. 3	GP. 4	GP. 5
GROUP 1 TYPE 1	12.	12. 100.0%	0. .0%	0. .0%	0. .0%	0. .0%
GROUP 2 TYPE 2	15.	0. .0%	13. 86.7%	0. .0%	0. .0%	2. 13.3%
GROUP 3 TYPE 3	17.	0. .0%	0. .0%	17. 100.0%	0. .0%	0. .0%
GROUP 4 TYPE 4	16.	0. .0%	0. .0%	0. .0%	14. 87.5%	2. 12.5%
GROUP 5 TYPE 5	24.	1. 4.2%	1. 4.2%	0. .0%	0. .0%	22. 91.7%

PERCENT OF "GROUPED" CASES CORRECTLY CLASSIFIED: 92.86%

site functions may have been, although they are too generalized to offer detailed answers. All of the typed collections contain fairly large numbers of unutilized flakes, with the preponderance of such flakes being the distinguishing characteristic of Type I assemblages (Table 1). This seems likely to represent some specialized activity, perhaps tool finishing or resharpening or some kind of flake use that did not leave obvious traces of wear on the flakes.

Type II assemblages are remarkable chiefly because they contain relatively high percentages of utilized flakes and shaped tools other than projectile points (Table 1). This suggests either that a greater diversity of activities occurred at these sites or that both unshaped and shaped tools were being used for the same activities. In contrast, Type III assemblages contain a large number of cores but relatively few utilized flakes or tools (Table 1). This indicates that flake production and tool manufacture were the main activities. If this is the case, Type III sites would be expected to be associated with sources of pebble chert.

Type IV assemblages were distinguished by the relatively large quantities of sandstone chunks they contain. These are often associated with hearths and are thought to represent cooking and/or food processing activities (House 1975:68). Type IV assemblages also consistently contain utilized flakes and shaped tools, indicating a greater diversity of activity than is reflected in the other assemblages. The defining artifacts suggest that Type IV sites were used for habitation rather than some limited activity.

The assemblages placed in Type V are similar to Type II except that they have proportionately fewer utilized flakes and shaped tools. Also, Type V assemblages always contain some sandstone chunks, making them somewhat similar to Type IV. Indeed, in examining the discriminant analysis reclassification (Table 3), it is apparent that the main discrepancies resulted

Table 4. Number of sites, typed assemblages, and components in each ecosystem.

Ecosystems	# of Sites	# of Typed Assemblages Types: I	II	III	IV	V	# of Typed Assemblages with Identified Components	# of Components
Divide Hills	25	9	2	2	3	3	11	17
Eutaw Hills	54	10	1	8	9	11	31	80
Sand Hills	156	21	33	10	9	41	94	233
Prairie	39	25	1	0	1	2	23	56
Total	274	65	37	20	22	57	159	386

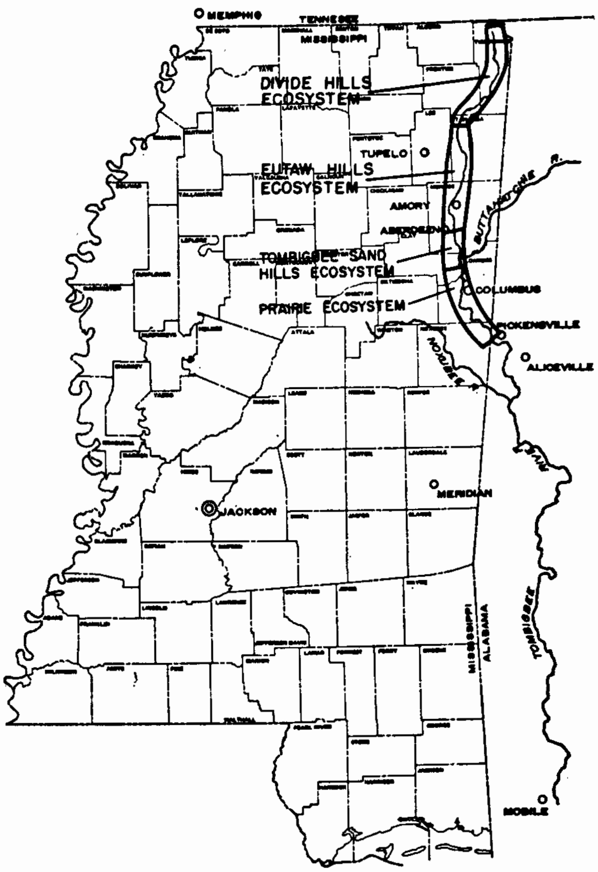

Figure 1. Ecosystem locations along Tombigbee River. From Blakeman (1976).

from the incorrect assignment of Type II and IV assemblages to Type V. Type V sites may be another kind of habitation site, as suggested by the diversity of lithic artifacts that characterize them.

Once the assemblages were classified, the next step in the analysis was to plot the different kinds of assemblages by component and environment to determine if patterns of change were evident. The components used were those identified in each collection, from Early Archaic through Mississippian. The ecosystems defined by Miller *et al.* (1973) for the Tombigbee Valley provide a good starting point for environmental description. Working from north to south, the Divide Hills is the first ecosystem (Fig. 1). It is composed of deeply eroded Upper Cretaceous sediments. Various kinds of oaks make up much of the upland vegetation, while the bottoms contain birch, alder, and sweetbay. The second ecosystem is the Eutaw Hills, with fairly large riverside terraces, especially on the east side of the river; cypress and tupelo are present, along with hickories and southern red oak. Farther south along the Tombigbee River is the Sand Hills ecosystem, with a large terrace on the east side of the river and a bluff on the west. Cypress and tupelo are common and in places there are ox-bow lakes and meander scars. Farthest south is the Prairie, with broad river meanders and rich calcareous soils. Natural grasslands interspersed with oak woods once occupied the areas bordering the river bottom, while the bottomlands commonly contain oak-hickory and cypress associations.

Graphs showing the percentages of different components represented in the five types of assemblages have been plotted, with the three southern ecosystems plotted separately when they contained enough components to do so (Figs. 2-6). Relatively little of the

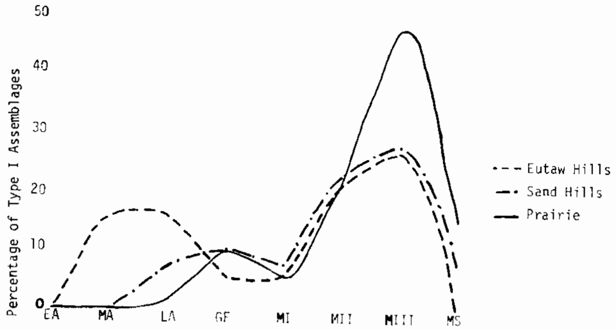

Figure 2. Frequency of components in Type I assemblages in the Eutaw Hills, Sand Hills, and Prairie ecosystems. EA=Early Archaic. MA=Middle Archaic, LA=Late Archaic. GF=Gulf Formational, MI=Miller I, MII=Miller II, MIII=Miller III, MS=Mississippian.

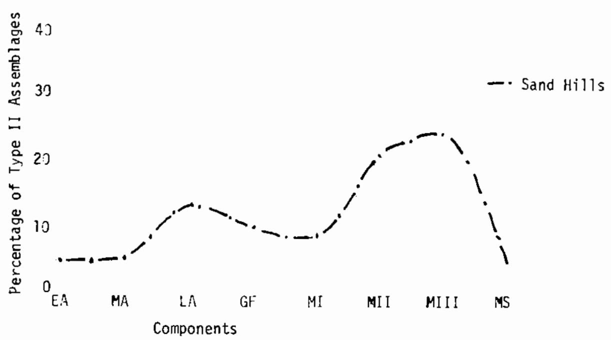

Figure 3. Frequency of components in Type II assemblages in the Sand Hills ecosystem.

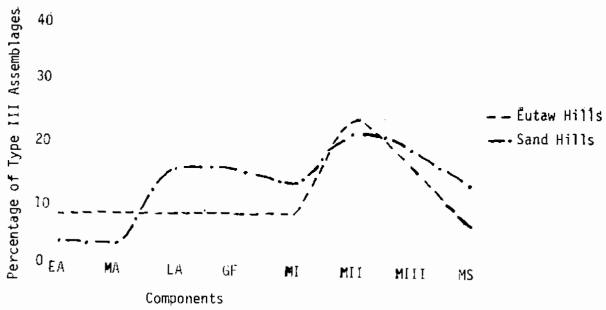

Figure 4. Frequency of components in Type III assemblages in the Eutaw Hills and Sand Hills ecosystems. Letters same as Figure 2.

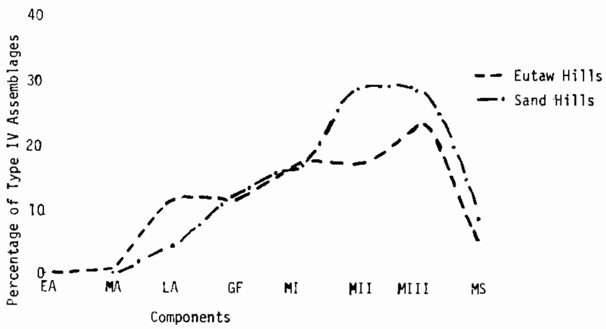

Figure 5. Frequency of components in Type IV assemblages in the Eutaw Hills and Sand Hills ecosystems.

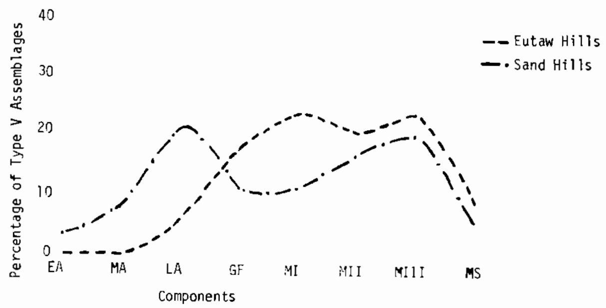

Figure 6. Frequency of components in Type V assemblages in the Eutaw Hills and Sand Hills ecosystems. Letters same as Figure 2.

Divide Hills was surveyed by Mississippi State University, so there were too few sites with identified components to produce meaningful patterns. The Eutaw and Sand Hills show fairly similar patterns of change through time in all the assemblage types, with peaks in Middle to Late Archaic times and again in Miller II-III periods in all except Type IV.

There are considerable differences in the distribution of each type of assemblage in the four ecosystems (Fig. 7). Type I assemblages decrease steadily in frequency from the Divide Hills south, then increase dramatically in the Prairie. Most of the Type I sites in the Prairie show Miller III components (Fig. 2). At the same time, during Miller II-III, the Sand and Eutaw Hills displayed peaks in all other types of assemblages (Figs. 3-6), perhaps indicating that the Prairie was used during this time mainly for some special purpose that resulted in Type I assemblages, while the other areas were used for habitation and other activities as well. Blakeman (1975:109-110) suggests that increased use of tropical cultigens might have led to greater use of the prairie ecosystem during Late Woodland and Mississippian times. Perhaps Type I

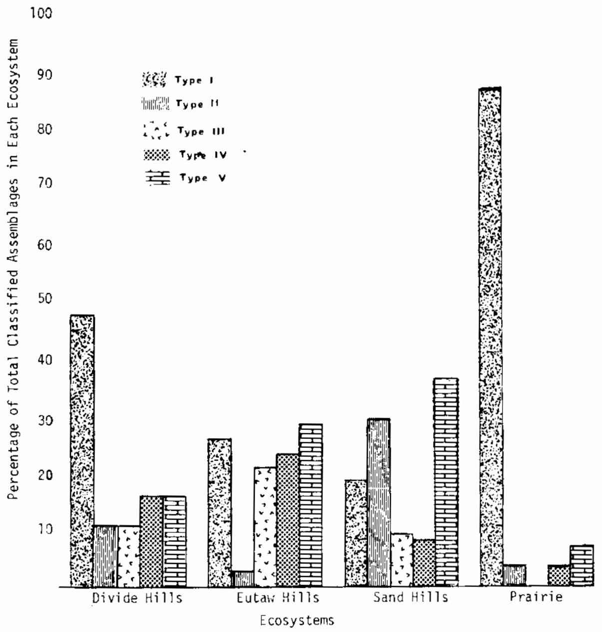

Figure 7. Percentage of assemblages in each ecosystem in Types I-V.

sites represent agricultural farmsteads; they did produce more ceramics, an average of 30 sherds per site, than any other assemblage type except Type IV.

Type II assemblages were found in all ecosystems (Fig. 7), but the vast majority of them came from the Sand Hills (Fig. 3). The main components identified were Late Archaic and Miller II-III. Pottery was sparse at the sites, with an average of fewer than eight sherds per collection. Type II sites are concentrated south of the town of Aberdeen, Mississippi in an area with extensive old river channels. Although these were probably not active when the sites were occupied, they contain water and support swamp/wetland vegetation and fauna which may have served to attract people to them. The high proportion of utilized flakes in Type II assemblages indicates an activity producing heavy wear.

While all other ecosystems contain some sites that produced Type III assemblages, the part of the Prairie that was surveyed had none (Fig. 7). This supports the earlier suggestion that these assemblages, which contain a high proportion of cores and unutilized flakes, represent flake and tool production activities, since beds of pebble chert which would serve as the raw material for such activities are rare in the Prairie (Lowe 1920:21). None of the Type III sites had any midden accumulation noted in the surveys.

Type IV assemblages were more common in the Divide and Eutaw Hills than in the Sand Hills and Prairie (Fig. 7). This type does not show a decrease in frequency in Gulf Formational-Miller I times (Fig. 5), as all other types in all other ecosystems do. The overall decrease in sites occupied during this period in the hills has been attributed to the beginning of native cultigen use (Blakeman 1975:107-108), since this might be expected to cause population to shift to the prairie or grow faster there than in the hills. Although there probably were more sites occupied in the prairie during this period than previously and fewer in the hills, this does not explain why Type IV assemblages were the only kind to increase in frequency in the hills. It has been suggested (Rafferty 1978) that the development of sedentariness can explain the increase, since fewer and less specialized occupations, such as those represented by Type IV assemblages, would be expected to be one result. Midden was noted as present at almost half the Type IV sites found in the surveys, which tends to support the hypothesis that they were used mainly for habitation. They also averaged the largest number of potsherds per collection, 32. It is proposed that Type IV sites represent the earliest kind of sedentary settlement.

Type V assemblages predominated in the hills, especially the Sand Hills (Fig. 7). They are unusual in showing two equally prominent frequency peaks, with the first occurring in the Late Archaic in the Sand Hills and in Miller I in the Eutaw Hills (Fig. 6). Their function is not clear; the collections contain moderate amounts of pottery, with an average of 24 sherds per site, and midden is present at some Type V sites. These data support the hypothesis that Type V assemblages represent some kind of habitation, without clarifying what their place in settlement pattern change might be.

All five kinds of sites decrease in frequency in Mississippian times in all ecosystems (Figs. 2-6). This could represent a population decrease or a population shift out of the hills ecosystems into the prairie, as suggested by Blakeman (1975:109). However, even in the prairie the number of sites occupied declines in Mississippian times. Another possible explanation for this change is nucleation of population into fewer but larger settlements.

Although it is not possible to assign specific functions to sites on the basis of the surface collections from them, it has been shown that it is possible to divide assemblages into types with some functional meaning and to use that information to generate hypotheses about changes in settlement patterns through time and space that can be tested during excavation. The settlement types may also be useful in designing excavation programs and choosing sites to be excavated during them.

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B. Lea Baker

AN EVALUATION OF THE RESULTS OF TESTING METHODOLOGICAL APPROACHES AT THE EAST ABERDEEN SITE

The East Aberdeen site was located just east of the town of Aberdeen in Monroe County, Mississippi. It was in the Tombigbee River Multi-Resource District and lay between the Aberdeen Lock and Dam and the new Aberdeen Bridge, both of which are currently under construction. The site was initially recorded as a result of a 1976 survey conducted by Mississippi State University and in early 1978 it was selected for mitigative archaeological investigations. The investigations were conducted in 1978 by Mississippi State University under contract with Interagency Archeological Services-Atlanta and were funded by the United States Army Corps of Engineers-Mobile District. The project is now in the report preparation stage.

During the course of the archaeological investigations at the East Aberdeen site, a number of different methodological approaches were employed with the goal of evaluating their effectiveness at that site and their potential utility at other sites, particularly those which will be investigated along the Tennessee-Tombigbee Waterway. Five of these approaches are examined in this paper: alternate methods of surface preparation for controlled surface collection, augering as a method of evaluating sub-surface stratigraphy, metal detector survey as a method of locating historic features, slope-cuts versus deep test units for obtaining information on deep stratigraphy, and box-scraping to find historic features.

Alternate Methods of Surface Preparation for Controlled Surface Collection

One of the first data recovery activities conducted at the site was a controlled surface collection undertaken to accomplish the following goals. First, a measure of the areal size of the site was needed. Second, within that area a sample of the cultural materials present was needed in order to: draw tentative conclusions as to the cultural components present at the site, assess the extent of sub-areas of cultural concentrations within the site, and guide decisions as to where to focus further investigative efforts. To accomplish these goals it was decided to prepare and collect all areas of the site into which it was possible to get a tractor for purposes of clearing. This resulted in the selection of eleven surface collection units, designated A through K. The units were distributed fairly evenly over the site and their total area equaled nearly 7200 m^2 or approximately one-sixth of the potential site area as defined in the project proposal.

The clearing of the eleven units preparatory to conducting the controlled surface collection was constrained by the fact that the East Aberdeen site had a documented history of occupation starting around 1830 and continuing through late 1977. Special care needed to be taken not to destroy or obliterate shallow historic materials and/or features which might have been present. In response to this problem it was decided to use and compare two methods of surface preparation: box-scraping alone versus box-scraping followed by shallow disking. The rationale for box-scraping alone was that it would remove the cover vegetation but do little damage in terms of disturbing the historic deposits and their stratigraphy. On the other hand, the rationale for light disking was that it would not result in appreciable or detrimental disturbance but that by turning the soil over slightly it would provide a larger and more representative sample of the materials which were present.

After the eleven units were selected, a small tractor dragging a metal box-scraper cleared the vegetation from the surfaces of all but one of them. Four units (A, E, F, and H) were left as they were at that point. Three units (D, I, and K) were then shallowly disked to a depth of 3 to 8 cm. A section of Unit B was left box-scraped only and another section of the unit was lightly disked. In Units G and J a side-by-side approach was used in which alternate rows, measuring roughly 2 m in width, were treated by the two methods of surface preparation. All of Unit C and marginal sections of several of the other units were treated by other methods of surface preparation such as hand-clearing, front-end loader clearing, etc.; these methods were used because vegetation and dampness prevented the use of the tractor in these sections. The eleven units, their total areas, and a summary of their surface treatments are presented in Table 1.

After the units' surfaces had been prepared, a series of north-south and east-west transects were shot in each unit and then tapes were used to triangulate a 4 x 4 m grid over each unit. Wooden stakes were used to mark the grid. Finally, each 4 x 4 m square was sub-divided into 2 x 2 m squares and hand-collected. Materials collected within each 2 x 2 m square were bagged and recorded together.

Informal evaluation of the relative effectiveness of the two methods, based on observations as the units were being collected, was in favor of the shallow disking. The disked squares appeared to be easier to collect and to yield greater numbers of all types of materials. Also, the depth of disking proved to be very con-

Table 1. Surface collection units and methods of surface preparation.

Unit	Box-Scraped m^2	Box-Scraped %	Disked m^2	Disked %	Other m^2	Other %	Total m^2
A	176	100					176
B	772	22	1752	51	948	27	3472
C					204	100	204
D			124	100			124
E	120	100					120
F	120	100					120
G	232	41	116	20	224	39	572
H	676	97			28	3	704
I			268	37	448	63	716
J	188	30	316	50	132	20	636
K			328	100			328
Totals	2284	32	2904	40	1984	28	7172

trollable and consistent and disturbance appeared to be inconsequential. However, as the controlled surface collection was conducted care was taken to keep records which would enable a more formal comparison and evaluation of the two methods. These data have been organized and analyzed with the assistance of the Thomas E. Tramel Computing Center at Mississippi State University and the results of the analyses are shown in Tables 2 through 6. It should be noted that the following analyses are limited to only the types and numbers of artifacts collected from the surface. Also, no features were discerned in any of the units during the controlled surface collection so it is not possible to evaluate the effectiveness of the surface preparation methods in regard to this type of data.

The first step in comparing the methods was to consider the internal variation within all of the 2 x 2 m squares treated in the same manner. This was done using a one-way analysis of variance treating the type of surface preparation as the independent variable and the numbers of the various types of materials collected as the dependent variables. Table 2 shows the results of this analysis in terms of a .05 alpha or level of significance. Differences within the squares treated in the same manner are few for the variables considered. The highest amount of variation, significant differences for five of the seventeen variables, exists in the residual "Other" surface treatment category. Based on the small amounts of variation evident within the box-scraped and the disked squares, i.e. in each case significant differences exist for only two of the seventeen variables, it is fair to conclude that the populations sampled by all of the squares treated in the same manner were the same.

The next step in evaluating the results was to ex-

Table 2. One-way analysis of variance within methods.

Types of Materials	Box-Scraped	Disked Significant at .05 Alpha	Other
Ground Lithic Tools	No	Yes	Yes
Flaked Lithic Tools	Yes	No	Yes
Other Lithics	No	No	No
Prehistoric Sherds	No	No	No
Bone	No	No	Yes
Shell	No	No	Yes
Coal	No	No	No
Charcoal	No	Yes	Yes
Sandstone	Yes	No	No
Historic Sherds	No	No	No
Bottle Glass	No	No	No
Window Glass	No	No	No
Nails	No	No	No
Other Metal Objects	No	No	No
Brick	No	No	No
Other Objects	No	No	No
Total Objects	No	No	No

Table 3. T-test within units and overall.

Types of Materials	Unit B (2 Sections)	Unit G (Rows) Significant at .05 Alpha	Unit J (Rows)	All Box-Scraped vs All Disked
Ground Lithic Tools	Yes (2)	Yes (2)	Yes (2)	Yes (2)
Flaked Lithic Tools	No	No	Yes (2)	No
Other Lithics	No	Yes (2)	Yes (1)	No
Prehistoric Sherds	No	No	Yes (1)	No
Bone	No	Yes (1)	Yes (2)	No
Shell	No	No	Yes (1)	No
Coal	No	No	No	No
Charcoal	No	No	No	No
Sandstone	Yes (2)	Yes (1)	Yes (2)	No
Historic Sherds	No	Yes (2)	Yes (2)	No
Bottle Glass	No	Yes (2)	No	No
Window Glass	No	No	No	No
Nails	No	No	No	No
Other Metal Objects	No	No	No	No
Brick	No	No	No	No
Other Objects	No	No	No	No
Total Objects	No	Yes (2)	No	No

NOTE: The numbers in parentheses after notations of significance denote which method yielded the greater numbers of objects in that type category. 1 = Box-Scraped and 2 = Disked.

Table 4. Means and standard deviations of total artifacts within units.

Units	Box-Scraped Mean	Box-Scraped Standard Deviation	Disked Mean	Disked Standard Deviation
Unit B (2 Sections)	7.2	8.4	28.4	25.8
Unit G (Rows)	30.0	21.2	51.3	25.9
Unit J (Rows)	15.7	8.9	17.7	12.8
All Box-Scraped versus All Disked	11.6	13.7	24.8	24.4

Table 5. One-way analysis of variance among methods.

Types of Materials	Three Methods Significant at .05 Alpha
Ground Lithic Tools	Yes
Flaked Lithic Tools	No
Other Lithics	No
Prehistoric Sherds	No
Bone	Yes
Shell	No
Coal	No
Charcoal	Yes
Sandstone	Yes
Historic Sherds	No
Bottle Glass	No
Window Glass	No
Nails	No
Other Metal Objects	No
Brick	No
Other Objects	No
Total Objects	No

amine those units in which both methods were used. Table 3 summarizes the results of the Student's t-Test within such units and between all squares at the site which were treated by the two methods. The least amount of significant differences is exhibited in Unit B where the two methods were used in two separate sections. Greater variation is exhibited in Units G and J where the two methods were used in alternating rows. In all of the units, when there is a significant difference between the two methods at a .05 alpha, it was usually disking which produced the larger number of items. When the overall differences between all box-scraped squares and all disked squares are compared, the unit-specific differences virtually disappear. In order to further explore the differences between the two methods, the means and standard deviations of the units in one materials category, total objects collected per square, are presented in Table 4. This table illustrates a phenomenon common to most of the other materials categories, i.e. that the mean number of items is consistently higher in the disked squares and units but so is the amount of variation as evidenced by the standard deviation. At present no explanation for this pattern has been recognized.

Finally, Table 5 shows the results of comparing variation among the three groups of all squares subjected to the same surface preparation treatment. This was also done by using a one-way analysis of variance treating the type of surface preparation as the independent variable and the numbers of the various types of materials as the dependent variables. As the table shows, four or less than one-fourth of the materials categories exhibit significant differences.

It is notable which of the materials categories show the highest occurrence of significant differences in all of the analyses. Table 6 shows the numbers of times that each category showed a significant difference out of the eight times it was used as a dependent variable. Ground lithic tools, pieces of sandstone, and bone each showed up in fifty percent or more of the possible occurrences. This may reflect actual differences in the effectiveness of the surface treatments in facilitating the recovery of these types of materials. On the other hand, it may indicate that these types of materials exhibited a highly concentrated areal range of deposition within the site while the other types of materials were more evenly distributed over the site.

Table 6. Total instances of significant differences for types of materials.

Types of Materials	Number of Significant Differences
Ground Lithic Tools	7
Flaked Lithic Tools	3
Other Lithics	2
Prehistoric Sherds	1
Bone	4
Shell	2
Coal	0
Charcoal	3
Sandstone	5
Historic Sherds	2
Bottle Glass	1
Window Glass	0
Nails	0
Other Metal Objects	0
Brick	0
Other Objects	0
Total Objects	1

The analyses of the data from the East Aberdeen site do not show a clear advantage for the effectiveness of either box-scraping alone or shallow disking. A slight advantage for disking is in evidence. However, the data do not show a decided disadvantage for either method. Based on the analyses conducted, several differing conclusions are possible: that there were no real differences between the two methods in terms of the types of artifact samples they produced; that disking may have produced a better sample; or that the data from the East Aberdeen site were insufficient to make any definite statements as to the relative effectiveness of the two methods. Perhaps the last conclusion is the best for the time being. It is here recommended that the two methods of surface preparation be tested in a similar manner at other sites which have both prehistoric and historic components and that as further tests are conducted the data collected be compared with those from the East Aberdeen site in an effort to develop more conclusive evaluations of these methods, and possibly others, in terms of effective surface data recovery.

Augering as a Method of Evaluating Sub-surface Stratigraphy

The primary purpose of the augering program conducted at the East Aberdeen site was to establish a rapid but fairly accurate picture of the natural and cultural stratigraphy of the site prior to any excavation efforts. This was necessary for several reasons. First, pre-project survey and testing had not only been concentrated within a very small portion of the site but had failed to produce an acceptable estimate of depth of the dark brown cultural material bearing deposit even in that portion. Second, there was uncertainty as to what types of soils lay beneath the dark brown deposit. Third, knowledge of the sub-surface stratigraphy was needed to facilitate estimates of the depths necessary for excavation units to reach sterile soil and, subsequently, the requisite resources which would be needed for these efforts.

The augering program consisted of excavating several different types of auger holes in the five units in which the controlled surface collection yielded the most materials. A hydraulic augering truck dug holes roughly 20 cm in diameter at 4 m intervals along an east-west and a north-south transect in two of the surface collection units. After the truck equipment malfunctioned, a combination of a mechanized hand-auger and a manual auger were used to continue augering in the remaining three units. These auger holes were also excavated at 4 m intervals along north-south and east-west transects but were smaller, approximately 10 cm in diameter. The approach with all augering methods was to dig down until either yellow sand or yellow clay underlying the dark brown deposit was reached and record the depths of the bottom of the dark brown soil. The soil excavated from all of the auger holes was manually examined for artifactual materials and that from the truck-dug holes was waterscreened through 6.4 mm mesh and further searched for artifacts.

In terms of producing the needed data in an efficient manner, augering proved to be very effective. As the augering was done along central intersecting axes over the units, it was possible to extrapolate fairly accurate estimates of the depth of the dark brown soil throughout the units and to use this information in estimating the requirements of the various excavative efforts which were later undertaken. Compared to the utility of the data their cost was low; the major costs involved the rental of the augering truck and its operator and approximately 30 crew person-hours.

Based on the results from the East Aberdeen site the use of augering as a part of site testing and even site survey is recommended. Even though they yielded few artifacts at this site, the truck-dug 20 cm auger holes not only have the potential of providing a useful indication of the sub-surface stratigraphy but also excavate a volume of soil which can potentially provide a useful estimate of the artifactual content of a site. Use of manually-dug auger holes along central axes of a site during survey could provide data which might not only be helpful in evaluating site significance but also in estimating the overall extent of investigations needed if the site is selected for mitigation efforts.

Metal Detector Survey as a Method of Locating Historic Features

The metal detector survey at the East Aberdeen site was undertaken to search for concentrations of metallic materials and, in particular, to locate a documented blacksmith's shop which had operated there during the late nineteenth-early twentieth centuries. The survey employed a U. S. Army metal detector and consisted of taking readings at 4 m intervals midway between the gridded 4 m apart north-south and east-west transects covering three of the surface collection units. Unfortunately, the survey did not prove to be successful; rather than locating distinct highs and lows, a fairly consistent pattern of medium to medium-high readings was recorded over all of the units.

Two types of factors should be considered in evaluating the effectiveness of this method: the particular history of the site and the type of equipment used. Had the site experienced a short period of historic occupation and/or had the blacksmith's shop been the only metal-intensive activity center at the site, it is likely that the survey would have been more productive. However, the East Aberdeen site was continuously occupied for nearly 150 years during historic times and there were several other metal-intensive activity centers present, including two gasoline-pumping facilities and a cotton gin. These activities apparently resulted in the presence of a fairly heavy and uniform distribution of metal objects over the site. Additionally, the survey was limited by the type of metal detection equipment available. The Army surplus metal detector which was used had no controls for either the types of metal which registered or the depths of the deposits. Both of these capabilities would have been helpful in better defining the nature of the metallic deposits present at the site. Therefore, while the metal detector survey did not prove to be useful at the East Aberdeen site, the approach may be effective at other archaeological sites having historic components, particularly if more sensitive equipment is used.

Slope-cuts Versus Deep Test Units for Obtaining Data on Stratigraphy

One of the primary goals of testing activities at the East Aberdeen site was to assess the deep natural and cultural stratigraphy of the site. The traditional approach to this problem would consist of a test unit excavated from the surface downward. However, for sites with deep cultural deposits, such as the East Aberdeen site, this approach can result in problems and substantial expense in terms of complying with required safety regulations. While test units were used at the East Aberdeen site another approach, the excavation of slope-cuts, was tested as an alternate method of obtaining data on deep stratigraphy while avoiding many of the safety hazards and limitations of traditional test units. Of concern here is a comparison of the slope-cuts with the test unit which was located closest to them.

The test unit was 4 x 4 m at the surface. At a depth of 1 m a central 2 x 2 m square was excavated to a depth of 2 m and then a central 1 x 1 m square was taken down to sterile soil at 3 m in total unit depth. The unit was excavated in arbitrary 10 cm levels as no natural and/or cultural stratigraphy was recognized. The only exception to this occurred when features were encountered; they were excavated as complete sub-units. All soil excavated was waterscreened through roughly 6.4 mm mesh and the artifacts collected were bagged and recorded by level. Level plans and wall profiles were recorded.

The slope- cuts were initially dug by a front-end loader which pushed soil off the side of a bluff on the western portion of the site until the exposed surface was consistently below the original ground surface of the bluff. Three slope-cuts were dug in this manner but before hand-excavation began one of them became so badly gullied by erosion that investigation of it was abandoned. Before hand-excavation of the remaining two slope-cuts began they were hand-shoveled to smooth their surfaces and to remove debris that rain had washed down them after they had been mechanically dug. Then 1 m wide strips were laid out down the side of the bluff and hand-excavation began. The approach taken with the excavation of the slope-cuts was essentially the opposite of that taken with the test unit; their excavation began at the bottoms of the slopes and progressed upward. The method of excavating the two slope-cuts differed slightly due to differences in the angles of their slopes. As illustrated in Figure 1, Slope-Cut 1 had a much smaller angle of incline than did Slope-Cut 2. The excavation approach on Slope-Cut 1 consisted of excavating 1 m squares but the unit was not stepped until the risor reached a height of approximately 50 cm. One m squares were also excavated in Slope-Cut 2 but the unit was stepped at the conclusion of the excavation of each square; this resulted in risors of between 50 cm and 1 m in height. Because it was longer Slope-Cut 1 required the excavation of 19 1 m squares to reach the top of the bluff while Slope-Cut 2 reached the top with the excavation of 14 1 m squares. All soil excavated was waterscreened through roughly 6.4 mm mesh and the artifacts collected were bagged and recorded by squares. Floor plans of the squares and the profile of the north wall of the unit were recorded.

In evaluating the effectiveness of the slope-cuts versus the test unit, it should be noted that neither approach produced levels of equal volume throughout the units. In the test unit this was due to the necessity of the ever-decreasing horizontal unit size as depth increased. In the slope-cuts it was due to the angular nature of the units' surfaces. Therefore, neither

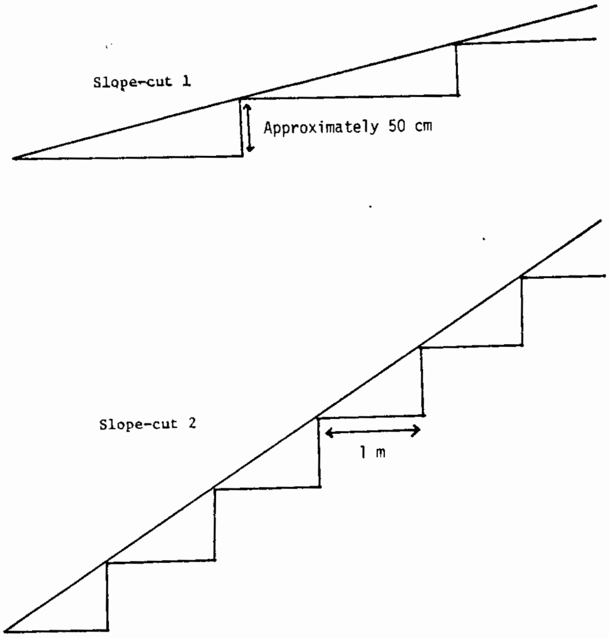

Figure 1. Approaches to slope cut excavation.

method resulted in comparability of the densities of cultural materials among levels. The slope-cuts were easier and faster to excavate than the test unit was. Slope-Cut 1 took a total of 136 person-hours to excavate and Slope-Cut 2 took 212 person-hours; even though Slope-Cut 2 was shorter, the extra soil removed due to its sharper angle of incline and the greater compactness of the soil in the unit necessitated an appreciably greater labor expenditure. The test unit required nearly 800 person-hours for its excavation. However, and most importantly, the slope-cuts did not accomplish the goal of providing data on the deep stratigraphy of the site. Over the many years of occupation at the East Aberdeen site so much erosion had occurred down the side of the bluff that the profiles and cultural stratigraphy of the slope-cuts were nearly meaningless. The recovery of a Middle Archaic projectile point and a plastic hair curler within 5 cm of each other illustrates this problem. The wall profiles and the artifactual data from the test unit were much more useful in assessing the site's stratigraphy.

While the slope-cuts did not produce the desired data at the East Aberdeen site they might be more effective at other sites. The most important factor to be considered appears to be the amount of erosion which has occurred. The data from the East Aberdeen site indicate that if a site has been subject to extensive erosion, a slope-cut may not be an appropriate method of data recovery. Although it was not undertaken at this site, it may be possible to solve this problem by extending the original mechanical cut deeper in order to reach below the area where movement and mixing of cultural materials has occurred. If little erosion has occurred or if a deeper cut can be made, then the lower manpower requirements and fewer safety regulation problems may favor further testing of slope-cuts as methods of assessing the deep natural and cultural stratigraphy of archaeological sites.

Box-scraping to Find Historic Features

Both the controlled surface collection and the seven excavated test units at the East Aberdeen site confirmed the presence of historic nineteenth and twentieth century occupations of the site; however, very few historic features were found and it was decided to undertake further investigative activities to locate and study historic features. One approach to accomplishing this goal would have been to hand-excavate large units in areas of the site where the controlled surface collection and/or test units had indicated concentrations of historic materials. However, temporal and monetary constraints as well as the highly compacted nature of the soil in a great portion of the site precluded using a program of hand-excavation. Progressive box-scraping was used as an alternate approach for several reasons. First, it was believed to be faster and more efficient than large-scale hand-excavation would have been. Second, the light weight of the box-scraping equipment was believed to have the potential of resulting in less disturbance than would have been the case with other types of mechanical equipment. Finally, it was believed that box-scraping would enable good vertical control in removing shallow layers of soil within the historic components.

Two large units, each measuring well in excess of 100 m², were selected for this investigative approach because of their high yield of nineteenth century materials during the testing activities. In both units a small tractor dragging a metal box-scraper proceeded to scrape away shallow layers of soil, ranging from .5 to 1 cm. As the layers were scraped away, crew members followed behind the tractor looking for exposed features. When each approximately 5 cm of soil had ben scraped away in this manner, crew members regridded the units into 4 x 4 m squares, collected the surface within the squares, and bagged and recorded the materials accordingly. This procedure was continued to a total depth of roughly 30 to 35 cm in both units as this was the maximum depth of the historic deposits at the site as indicated by the previously excavated test units.

The results of box-scraping were disappointing. Three small features, later excavated and found to be circular concentrations of clay, were found in one unit and no features were found in the other unit. However, this is consistent with the fact that relatively few historic features were found in any of the excavated units or during later heavy equipment stripping activities. Apparently the historic occupants of the East Aberdeen site either left few features behind or the environmental and later cultural factors acting on the site deterred the preservation of the features which had been there. On the other hand, the surface collections made during the box-scraping did appreciably increase the total artifact sample and, particularly, the sample of historic materials obtained from the site. On the minus side, these additional materials were costly in terms of the time and effort expended to recover them. The highly compacted nature of the soil in one of the units greatly slowed the box-scraping process and a total of 22.5 hrs of mechanical equipment time was required to take both units to a depth of 30 to 35 cm. Additionally, roughly 143 person-hours were spent in supervising, observing, gridding, collecting, and recording. Also, even though particular care was taken to record the proveniences of the artifacts which were exposed after every roughly 5 cm of box-scraping, the method of exposing them negated these efforts to a great extent. Observers watched cultural materials being moved from one end of the units to the other and in one instance two freshly broken fragments of the same ceramic vessel were collected approximately 12 m apart.

Overall, box-scraping for historic features was not effective at the East Aberdeen site. It did not expose features and the additional artifact sample obtained could have been secured with equal or less effort and cost and with much better horizontal and vertical control through the hand-excavation of several small units placed within the areas of the site where the box-scraping took place. This is not to say that this approach could not be effectively utilized at other sites. However, it would be preferable if solid evidence of the presence of historic features existed prior to box-scraping. If little or no evidence of shallow, sub-surface historic features has been found, it may be more expedient and economical to use faster types of mechanical equipment, such as a roadgrader or small bulldozer, for this type of investigation. Another factor to be considered in a decision to use the approach is soil compactness and texture. The high compactness of the soil in one of the units at the East Aberdeen site resulted in less movement of artifacts but necessitated many hours of mechanical work. It also required extensive use of the removable teeth on the box-scraper which resulted in greater disturbance of the soil and its contents. In the other unit, where the soil was very sandy, the mechanical work progressed much more rapidly but so did the movement and mixing of cultural materials.

Conclusions

The East Aberdeen project not only provided an opportunity for increasing knowledge of the prehistoric and historic occupations along the Tennessee-Tombigbee Waterway but it also provided an opportunity to examine the effectiveness of various methods of data recovery. While the data from one site are insufficient for drawing definitive conclusions, these data have enabled the development of some tentative evaluations. As further sites are investigated and additional methodological tests are conducted it should be possible to develop some useful guidelines for selecting methods of data recovery which are optimal in terms of particular site characteristics and research goals.

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THE DEPOSITIONAL IMPLICATIONS OF ARCHAIC STRUCTURES AT THE BRINKLEY MIDDEN, TISHOMINGO COUNTY, MISSISSIPPI

Archaeological excavations at the Brinkley Midden were conducted between December, 1977 and July, 1978 under contract sponsored by the Nashville District of the Corps of Engineers and the Heritage Conservation and Recreation Service—Atlanta (Contract; CX 5880-B-0031), and were conducted by the Office of Archaeological Research at the University of Alabama. The midden is located in the center of the wide flood plain at the former confluence of Yellow Creek and Little Yellow Creek. The site is situated near the center line of the "divide cut", which will totally destroy the site. Before the construction of Pickwick Reservoir, which has raised the watertable in the bottoms, the bottom land was rather wet; particularly in the winter and spring floods when the midden is the only above water feature in the bottoms. The elevation of the midden (440′ AMSL) is only 22′ above the high pool level of Pickwick Lake (418′ AMSL). This reservoir has raised the level of the Tennessee River between 80-113 feet (TVA 1936; Webb and DeJarnette 1942:2). This has raised the water table in northeastern Tishomingo County which probably intensified the flooding and alluviation. Alluviation has been intensified by European agriculture in these loosely consolidated Cretaceous formations (Hubbert 1978). The prehistoric landscape must have been somewhat different.

Seasonal variation in rainfall suggests that in winter and spring the bottomlands around the Brinkley Midden would have been quite wet. In the summer and fall the area is much dryer (as much as one-fifth of the yearly rainfall, 113.3 cm, occurs in March and April). Given the greater stability of the watershed in prehistoric times, late summer through early winter would have been the dryest time of the year and, presumably, the optimal time for occupation.

The Brinkley Midden consists of a 1.5 m rise above the present flood plain. The cultural bearing matrix is between 40-80 cm in thickness with features intruding into geologically deposited sand to a depth of 2.0 m. Underlying the midden is a layer of white sand which is a meter thick. This is alluvially deposited, culturally sterile sand (Wilson 1978) and overlies a tan sand. The presence of these smaller particles in the upper level of the midden suggests a less rapid deposition during the prehistoric period of human occupation.

The time span of the occupation on the site, based on stylistic analysis of the projectile points, ranges from Transitional Paleo-Archaic, through the Archaic, to Woodland occupations in the upper levels. These latter deposits were largely disturbed in the plow-zone. The different cultural periods represented in the midden are visually stratified with the darker soils generally toward the top.

Eleven semi-subterranean structures were defined. Five were extensively tested. All structures were apparent on the stripped surface by the presence of a concentration of yellow sand (Zone 1), circumscribed by a dark brown structure floor midden (Zone 2), which was darker in color and texturally less compacted than the surrounding ledge and site matrix. The diameter of these structures varied considerably from a maximum of 4.1 m to a minimum of 1.75 m, with a mean diameter of 2.49 m. These structures were basin shaped with gently sloping side walls, and slightly rounded bottoms. The maximum and minimum depths of the structures were 0.85 m and 0.22 m, respectively, with a mean depth of 0.46 m.

These structures were circumscribed by a ledge, which was indicated by the dark circular stain lighter than Zone 2. The ledge fill was a compacted, dark brown, sandy clay. Fire cracked sandstone, charcoal, and lithic debris were abundant in the ledge fill. The ledge dimensions varied considerably (max-min. depth: 0.2-0.12 m, max-min. width: 0.25-0.08 m) within and between structures. This variation in ledge size appears to relate directly to the scarcity of postmolds found intruding into the ledge. Two postmolds were found intruding into the ledge at angles of 42.25°-43.25° inward (off vertical), but no continuous arrangement of posts was found. This suggests that the deposition of the ledge was directly related to the sequential events: construction, occupation, and collapse of the structures. Most postmolds were probably destroyed when the structures collapsed.

Figure 1 shows the sequential events: construction, occupation, and collapse, and the implied effects of deposition. Posts were positioned on the ledge at an angle equal to the supposed angle of each opposing post. The dirt removed during construction of the ledge was probably compacted around the post for support. The high density of sandstone found in ledge fill, as compared to surrounding matrix, indicates that additional sandstone was added to dirt around posts. This arrangement of posts on the ledge would result in a conical superstructure. This conically shaped superstructure would have been designed to be sound enough to support a heavy dirt load of insulation and provide external drainage away from the structures. Collapse of the structure would cause a displacement of post and ledge fill. The resulting deposition was indicated by the absence of posts intruding into the ledge, suggesting that some posts burned, decomposed in place, or were removed before collapse. Most of the upper levels of Zone 2 appear to have been deposited simultaneously with the ledge fill.

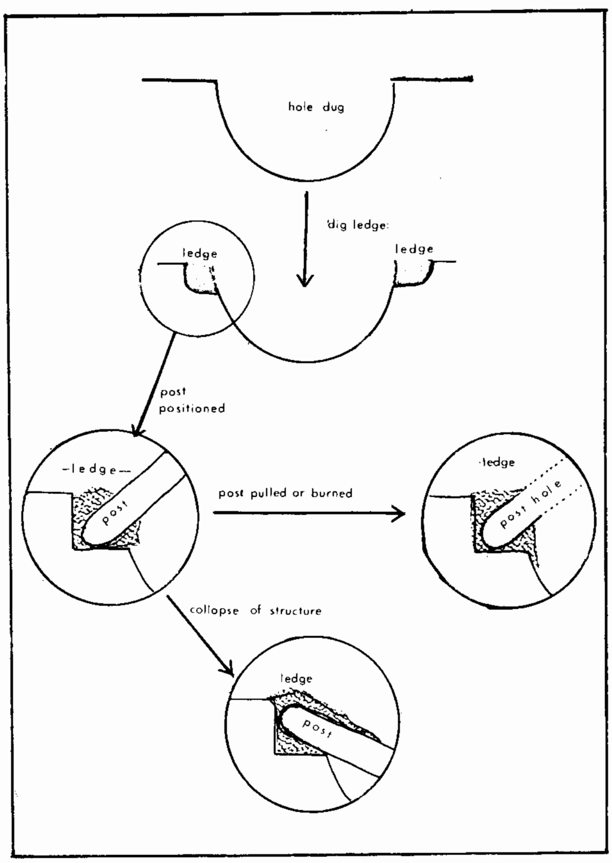

Figure 1.

Internal Stratigraphy

In all structures the internal stratigraphy consisted of a yellow sandy zone overlaying a dark brown, sandy loam, Zones 1 and 2 respectively. Zone 1 was yellow sand, virtually devoid of cultural material. This zone was deposited in 8 of the 11 defined structures. No siltation bands were found within Zone 1, which indicates that alluvial processes were not involved in the deposition of Zone 1 (see Fig. 2). The quantity of cultural material recovered from Zone 2 was considerably greater than Zone 1 and the surrounding midden (Table 1). Burned nut shells, fire cracked sandstone, and lithic debris were abundant within this zone. Several Archaic projectile points (Benton types) were recovered from this zone. The depositional characteristics of Zones 1 and 2 suggest that Zone 2 (dark zone) was deposited from the occupation of the structures and the overlaying Zone 1 was deposited upon collapse of the structures' roofs. No ceramics or post-Archaic materials were recovered from any excavations of the structures.

Table 1 shows the densities of selected materials per volume of dirt and is standardized to show relative densities. A density score of +1.0 indicates that all of the material of that category occurred within that limit. The midden level in Structure 1 (Zone 2) has densities of sandstone 7 times the density of the most dense midden deposit, which was the upper level of the midden located 3 meters from Structure 1. In the preliminary analysis this square appears to be typical of the densities over the rest of the dense midden. The lower 5 levels of the midden square are approaching the sterile levels, which emphasizes the relative sterility of Zone 1. The density of materials in Structure 4 (which was determined to be a tree tip-up) indicates that the density was half as high as densities in the general midden. This was expected because of the mottled zone encountered in this feature. In summary, the distribution of fire cracked sandstone indicates that the midden level in the structure (Zone 2) had the most dense deposit of fire cracked rock on the site. Impressionistic data suggest that this was also true for nut shells, though this portion of the analysis is not complete. The relative lack of sandstone in Zone 1 is consistent with the interpretation of this zone as a collapsed superstructure.

Behavioral Models

The nature of the midden (in situ geologic stratigraphy) and natural conditions (i.e., gravitational pull) limit certain kinds of deposits from the archaeological record, imply that certain things have happened, and preclude the possibility that other events caused the observed deposition in the structures. In all of the structures there was a dark zone on the bottom of the deposit which was overlain by relatively homogeneous sand. This sand occurred stratigraphically above the levels at which it had been geologically deposited outside the structures. This means that the sand must have been deposited from above as one unit (siltation bands were observed in only one case). A tree

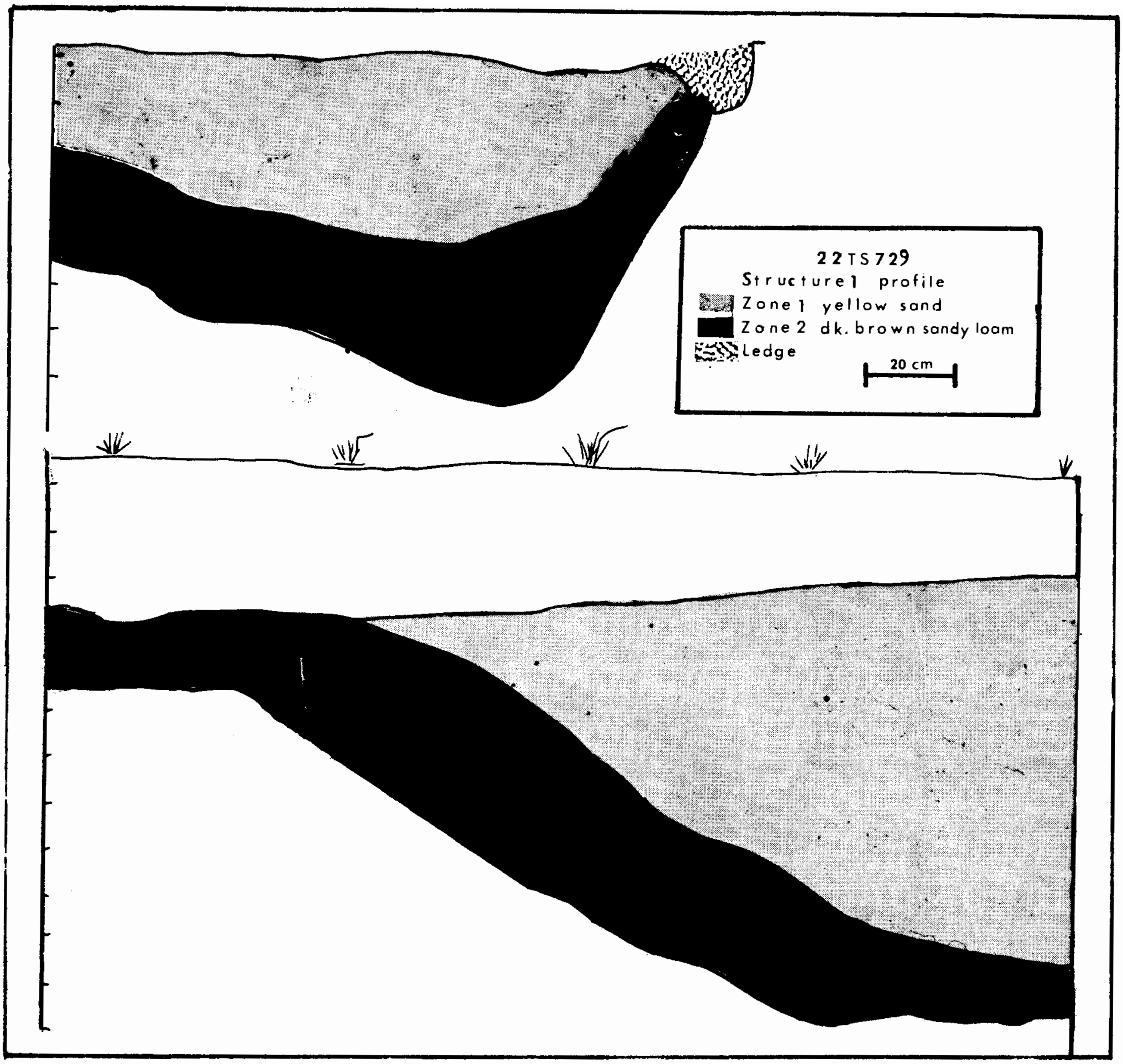

Figure 2.

tip in such soil profiles produces a highly mottled zone at the center of the tip. A darker zone was produced across only half of the tree scar, where the less consolidated midden was deposited when the roots were ripped up (Figure 3). Large root disturbances do not have the midden band across the bottom. The only interpretation consistent with the structure of the deposit is that the sand was on a superstructure which collapsed, depositing the sand roof insulation onto the top of the midden, which was deposited on the floor of the structure.

Figure 4 shows a critical path analysis of the necessary precedent order of construction and depositional destruction. First it is necessary to dig a hole. This can take place in several possible natural contexts: regular ground, a tree tip or float hole, or a decayed tree root hole. The latter contexts would have been much easier, especially considering the poorly developed digging technology present at these times.

Next the ledge and/or postholes for the emplacement of the superstructure were dug. Previously sized beams were then placed at an angle of 42° off vertical, as indicated by the angle of the few postmolds found intruding below the ledge. The dirt from the hole was then set on the roof as protective insulation, which must have been stabilized in some manner. The large dark stain in the center of several of the larger structures suggests the possibility of central support posts and possibly a platform on the interior. The slanted walls would make more sense if this were the case and the lower portions could have been used for storage, cold trapping, and the accumulating level of midden. If these structures were occupied in the fall and early winter (as the large quantity of nutshells suggests), then heat could have been a problem. There is no evidence for internal fires. Large quantities of fire cracked rocks suggest the possibility that these were used to provide heat. This would be structurally consistent with and possibly ancestral to the ethnohistorically known hot houses. According to this behavioral

Table 1. Densities of burned sandstone in structures compared to the adjacent midden, Brinkley Midden (22Ts729). For derivation of these statistics see Lafferty (1977:appendix IV).

Unite	Level	Cubic Meters A	% Vol. Expected Frequencies B	Sandstone grams C	Sandstone % D	Deviation "D - B E	Maxmax scores Volumetric Relative Density F
78N/48.3W	1-5	0.133	6.29	4818.6	10.84	4.55	.0484
	6-10	0.315	14.89	1589.7	3.58	-11.31	-.7642
Structure 1							
	Zone 1	0.137	6.48	1140.0	2.56	-3.91	-.6034
	Zone 2	1.191	56.31	31569.2	71.02	14.71	.3367
	Ledge	0.316	14.94	3659.3	8.23	-6.71	-.4491
Structure 4		0.023	1.09	1677.6	3.77	2.68	.0271
Total		2.115	100.00	44454.4	100.00	0.0	N/A

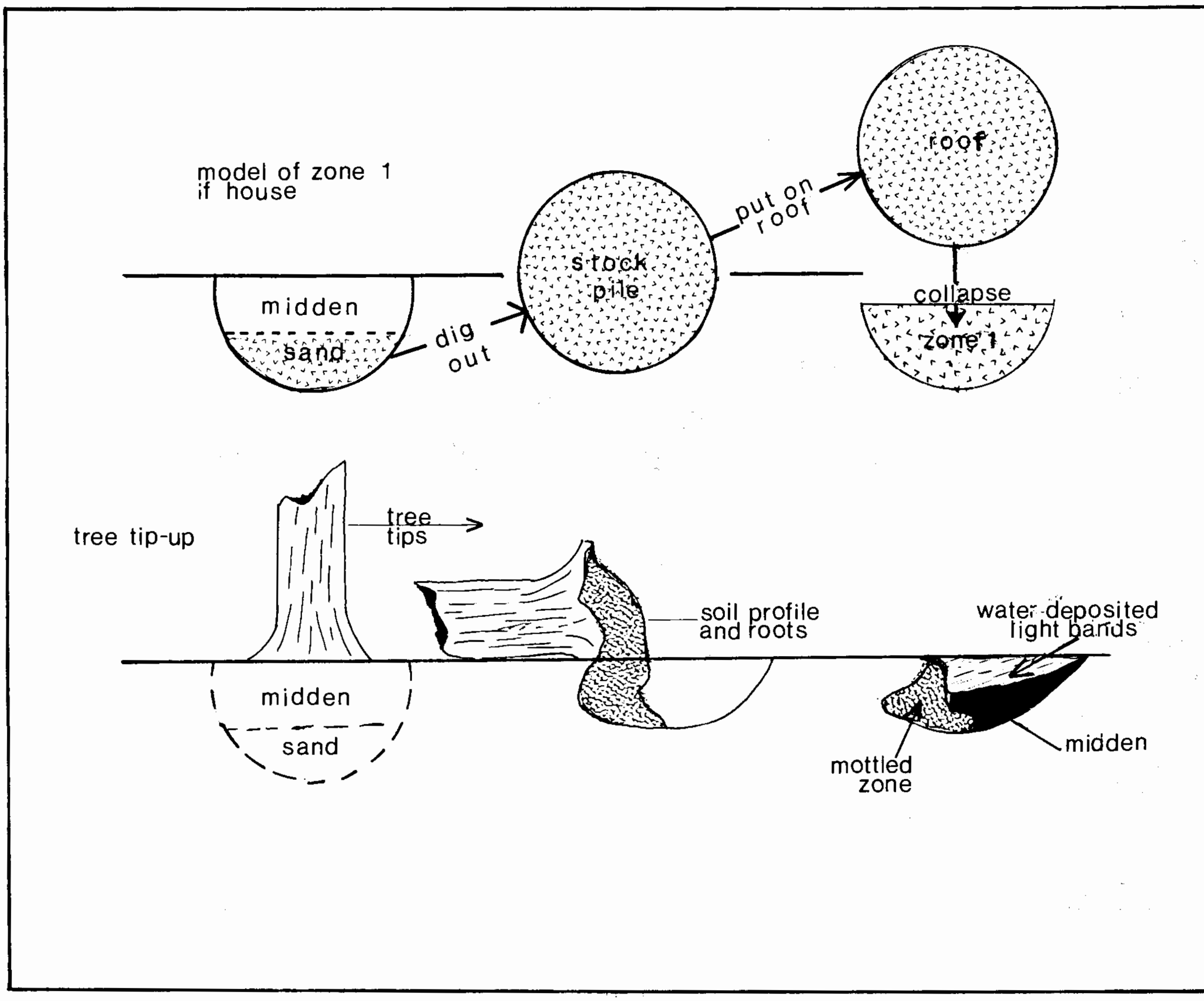

Figure 3.

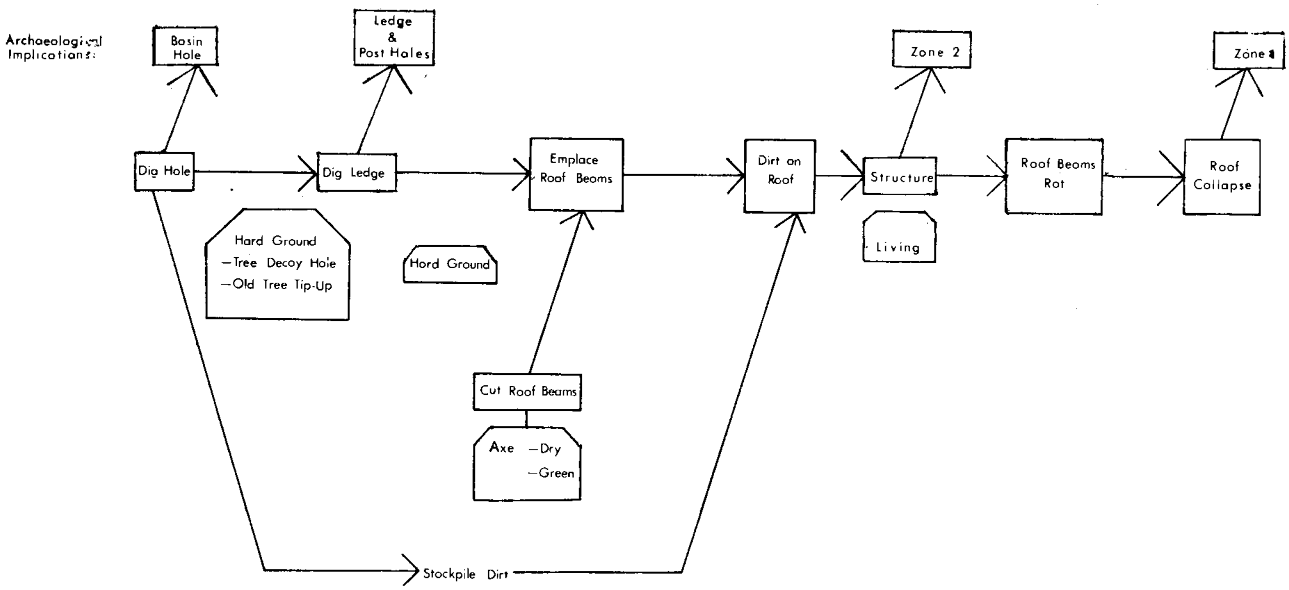

Figure 4.

model, the midden zone would have been laid down when the structure was occupied. The upper sand zone (Zone 1) should have been deposited when the roof rotted and collapsed. It is possible that, properly constructed, such a structure could have lasted a long time.

Similar structure types are found elsewhere in the archaeological record. At Chilca, Peru (Donnan 1964: 137-144), a similar structure was dated to 5370 ± 120 B.P. (UCLA-664). This structure was semisubterranean, about 2.5 m in diameter with posts set around the periphery. The frame, which was preserved, was erected of cane and covered with grasses. Neither fire hearth nor ashes were encountered. Donnan (1964: 141) points out that "the house apparently served only to provide shelter from the cold and a place to sleep. Although quite small, it could have served this purpose well." In the excavation of Structure 2 at the F. L. Brinkley Midden a large piece of a cane wall was found (measuring 2.2 cm in width, 6.3 cm in length), which could have been used in the construction of these structures. The fragment of cane is the largest that the authors of this paper have seen in these latitudes. Another similarity between these and the Brinkley structures is the absence of internal fire hearths.

The University of Georgia excavations in the Wallace Reservoir have unearthed a series of similar structures in the uplands but also at a much later time period (A.D. 1600: Mark Williams, personal communication). These structures were depositionally identical to the Brinkley structures in that there was a dense midden deposit across the bottom which was covered with a relatively sterile level of red clay (into which these structures had been excavated). Two differences noted were the presence of a central hearth and a burned smoke hole in the center of what has been described as Zone 1. Thus, in terms of size and other characteristics, these structures were virtually identical to the Brinkley structures. Other Archaic structures are known from the Koster site (Jaehnig 1974). The thick deposit of midden across the floors of the Brinkley structures is similar to other known earthen-floored structures in the Tombigbee Basin (Jenkins and Ensor, this symposium).

In conclusion, the large basin shaped excavations found in an Archaic context at the Brinkley Midden in northeastern Mississippi appear to have been aboriginal structures. These structures are much too large to have been storage pits and larger than most other known Archaic features. The midden in the floors of the structures has denser material than other deposits on the site. This indicates an intense utilization, such as might occur in a late fall camp when the weather is becoming cold. The presence of large quantities of charred nuts supports the hypothesis of late fall and early winter occupation, and is consistent with the dry weather characteristic of these times of the year. These structures are depositionally distinct from tree tips though these might have been used as house preforms. The large non-alluvial Zone 1 present in most of the structures implies a placement directly above the whole pit which could not have happened by any natural means know to the authors of this paper.

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Stephen Williams

ARMOREL: A VERY LATE PHASE IN THE LOWER MISSISSIPPI VALLEY[1]

Some thirty years ago (1948) James B. Griffin completed a manuscript on "Prehistoric Cultures of the Central Mississippi Valley" for the Cole volume in which he discussed late Mississippian foci and said that "In the lower St. Francis area such sites as the Rose Mound exhibit a mixture of the St. Francis and Walls complexes. At such sites I believe the Walls Complex to last longer and come up into the early historic period" (Griffin 1952a:232).

At a later date, but published earlier, Griffin (1951: 157, 165, 173) again discussed the situation in which sites on the Mississippi and the St. Francis differed in some ways but shared other traits such as head vessels; some of these traits such as teapots were considered very late indeed (ca. A.D. 1700).

Still later at a Southeastern Conference meeting at Moundville (1954) I gave a paper on the "Moundville Horizon in Northeast Arkansas" based on recent work that I had carried out in that region. I published a portion of that paper (Williams 1956) referring to certain "Engraved Shell Buttons"[2] which seemed to be good candidates for marking a late historic horizon in the Lower Valley and elsewhere.

At this time I was quite familiar with the Cairo Lowlands region in Southeast Missouri. However, while I was researching the collections at Nodena Plantation, northeast Arkansas, in the fall of 1953, I had been struck that some of the sites around there had quantities of snubnosed scrapers as did a few of the late sites in *southern* Missouri (Williams 1954:190-194) in contradistinction to Crosno and other such classic Mississippian sites as Matthews, Lilbourn, and Beckwith's Fort. I even did a few rough distribution charts of a series of traits with help from some of the local collectors such as Kenneth Beaudoin which seemed to link such disparate sites as Parkin, Rose, Big Eddy and Middle (not Upper) Nodena, not to mention Menard and Oliver nearby, and the Murphy site at the mouth of the Wabash. I became convinced that there was a late phase in the area which "washed over" the differences that were evident earlier in separating the regionally distinct Parkin (Griffin 1952a: 231-233; Phillips 1970:930-933), Nodena (Phillips 1970: 933-936; Morse 1973) and Walls phases (Griffin 1952a:233-236; Phillips 1970:936-938). Phillips (1970: 929) listened to this notion and incorporated some of this thinking in his 1970 review of Lower Valley phases.

Returning recently to the scenes of my earlier peregrinations in Northeast Arkansas and Southeast Missouri, I was again struck by the reoccurring data which seemed to urge a revision of these late complexes. That summer (1978) while visiting Dan Morse's laboratory in Jonesville, Arkansas, and while discussing Parkin and Nodena relationships with Dan and Phyllis, I was shown collections from the Armorel site (9-Q-3) east of Blytheville (Morse *et al.* 1974) and decided to try to use that material as the linchpin of a construct to describe this rather oft-discussed entity.

As fate would have it, just at this moment of decision, I saw, at Jim Price's Naylor lab, a copy of the *Arkansas Archaeological Survey Bulletin* (Vols. 16-18, 1977) in which new data further established for me the validity of the complex which I intend to call the "Armorel phase." Mike Hoffman (1977) published on the Kinkead-Mainard site near Little Rock with a fine Parkin Punctuated vessel of Armorel phase affiliation in association with late (Quapaw) Lower Arkansas River materials (Hoffman 1977: Fig. 6:45c), and Timothy Klinger published a find of some of *my* "Shell Buttons" from the Campbell site (Klinger 1977b), further strengthening, as if it was needed, that site's temporal ties with Middle Nodena and the Oliver site. A visit to Leo Anderson's museum in Van Buren, Missouri, and yet another look at his superb collection from the Campbell site convinced me that the Armorel phase definition was a concept whose time had come. It represents a separate formalization of what has been called late Nodena and late Walls phase into a new complex.

The Armorel phase: A definition

This phase represents the latest aboriginal culture unit in the region just prior to significant decimation and dispersal by strong European contact. It is the terminal Mississippian phase with some significant cross-ties to the north into Oneota, and to the south toward the Natchez. Eastern links are with the mouth of the Wabash locality and even with eastern Tennessee. Certain specific artifacts of short-time duration serve to fix these connections in very strong fashion.

Distribution: Southern Southeast Missouri along the Mississippi, south of New Madrid, and in Northeast Arkansas both along the Mississippi and on the St. Francis as well as far south as just below Memphis (see Fig. 1). Some exist as single components, but also as late components on sites with considerable time depth such as Rose. See Phillips (1970:929, 933) for brief discussion of some of them.

Previous Terminology: Late Nodena phase and late Walls phase (by all previous writers).

Type Site: Armorel (9-Q-3)* chosen for its central location in known distribution (Morse *et al.* 1974); best published single component is Campbell (Chapman and Anderson 1955).* LMS site no.; Armorel is 3Ms23 in the Arkansas State Survey.

Other Sites: Campbell [Cooter] (8-Q-7), Holland (8-Q-5), McCoy [Chute] (8-R-3), Walnut (9-P-2), Scott (9-P-5), Chickawawba (9-Q-2), Hales Point (9-R-1), Middle Nodena (10-Q-4), Richardson Landing (10-Q-10), Bishop (10-R-1), Shelby (10-P-12), Parkin (11-N-1), Bradley (11-P-2), Pecan Point (11-P-6), Banks (11-P-8), Friends (11-P-11), Rose (12-N-3), Big Eddy (12-N-4), Rhodes (12-O-6). (See Phillips 1970:Fig. 3, for locations).

Characteristic Artifacts: (See Fig. 2)
Ceramics. Late Mississippian types and modes: Well executed Bell Plain, late Parkin Punctate, Campbell Appliqué, Fortune Noded; arcaded handles, "jar-necked" bottles and other composites (see Chapman

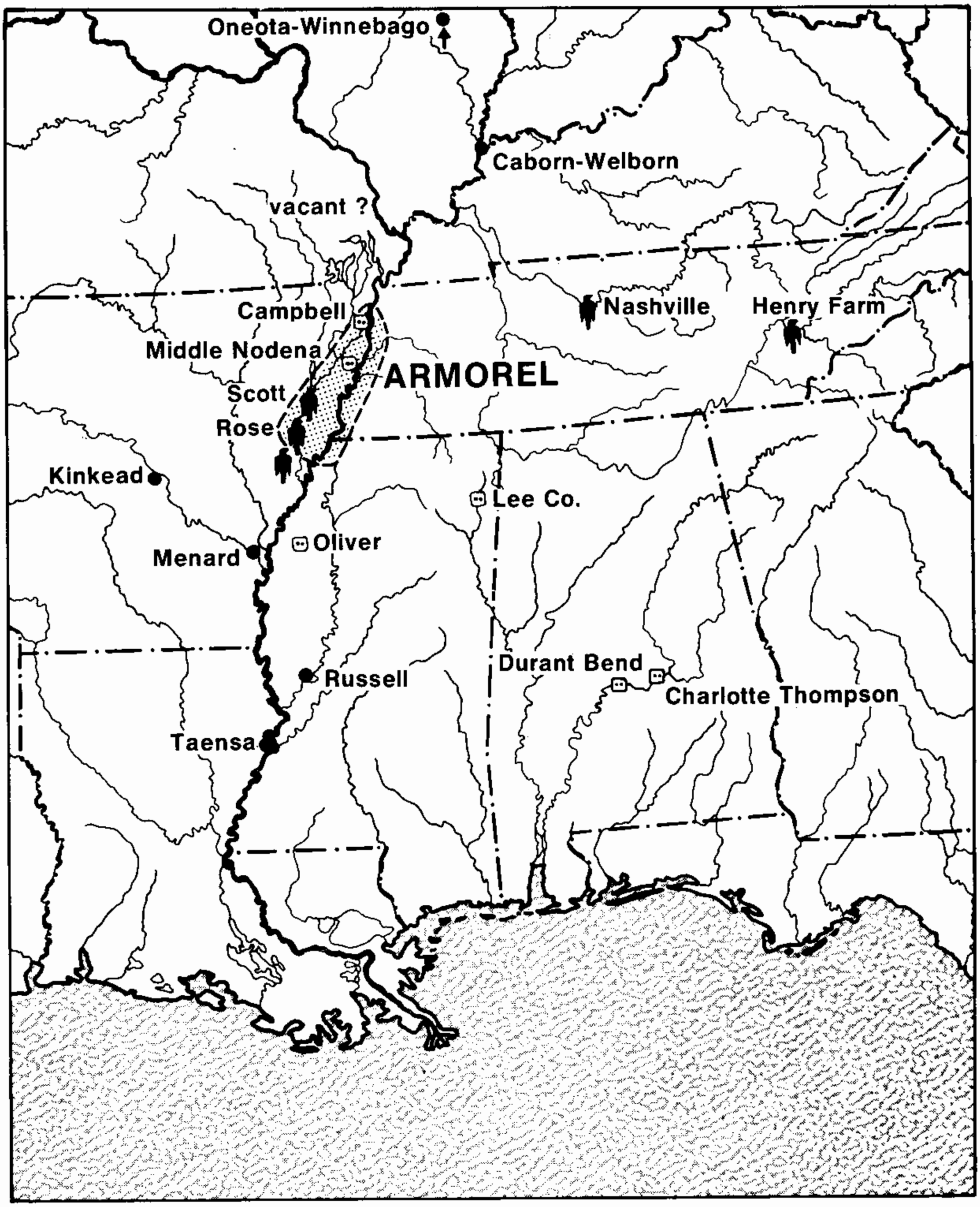

Figure 1. Distribution of the Armorel phase and Markala horizon, A.D. 1500-1700.

and Anderson 1955; Moore 1910, 1911; also Hathcock 1976; White 1976 for Field Museum collection).

Lithics. Snub-nosed scrapers—large and small (thumb nail); Nodena (willow leaf) projectile points; "pipe" drills; basalt groundstone adzes; catlinite, especially Siouan disk pipes.

Special Horizon Traits: Square engraved shell buttons (Williams 1956) and non-repoussé copper eagles (Moore 1911:Plate 10; Hamilton *et al.* 1974:165-168).

Historic Trade Goods: Some of Spanish origin: Parkin (Klinger 1977a); others at Campbell (Anderson collection); Rhodes and Bradley (Moore 1911); Clay Hill—a Clarksdale bell (personal communication, John House).

Dating: A.D. 1500-1700

Other Contemporary Phases: Late Walls (Phillips 1970:936-938) and Kent (Phillips 1970:938-939); Oliver (Phillips 1970:941-942); Menard/Quapaw (Phillips 1970:943-944); Russell (Phillips 1970:568; Brain 1975); Taensa (Williams 1967; Phillips 1970:445); Arkansas

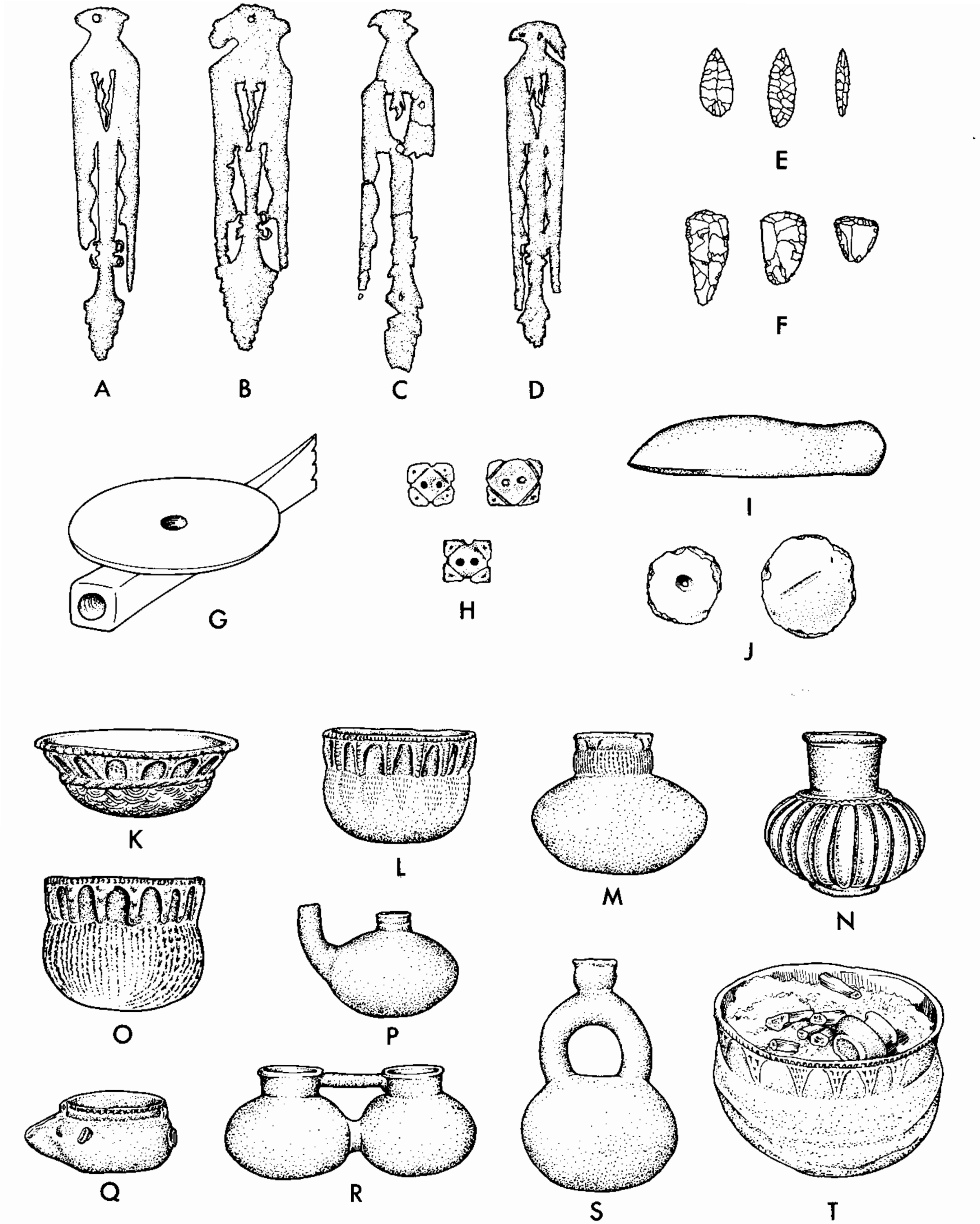

Figure 2. Some characteristic artifacts of the Armorel phase and the Markala horizon. *A-D,* plain copper eagles (*A,* Rose Mound; *B,* Scott; *C,* Clay Hill; *D,* Henry Farm); *E,* Nodena points and "pipe" drill (Parkin); *F,* snub-nosed scrapers (Parkin); G, "Siouan disk pipe-catlinite (generalized); *H,* engraved shell buttons (LeFlore, Parkin, Durant Bend); *I,* ground stone adze-basalt (Cambell); *J,* sherd disks (Rose); *K,* bowl with arcaded handles (Richardson's Landing); *L,* Parkin Punctate jar with applique strips on handles (Bishop); *M,* "jar-necked" water bottle (Richardson's Landing); *N,* gadrooned water bottle (Campbell); *O,* Castile Linear Punctate jar (Bishop); *P,* teapot (Richardson's Landing); *Q,* "possum" jar (Richardson's Landing); *R,* conjoined vessels (Campbell); *S,* stirrup necked bottle (Richardson's Landing); *T,* urn burial (Richardson's Landing).

River Quapaw (Dickinson and Dellinger 1963; Hoffman 1977); Caborn-Welborn (Green and Munson 1978); Oneota/Winnebago (Hall 1962).

Some post-Knoxville research in the LMS files at Peabody did reveal very interesting additional data—especially from the Hampson Collection photos. Four additional sites were added to the phase list: Richardson Landing (10-Q-10), Bishop Place (10-R-1), Shelby Place (10-P-12) and Friend's Mound (11-P-11). Unusual low *bowls* (Fig. 2, K) with arcaded handles, out-flaring rims and curvilinear incising (Rhodes-like, one in "Ranch" design) on the body link all four sites very closely. Another very unusual trait, one which I seem to have subconsciously rejected over the years since I first encountered the data at The Nodena Museum, and thus had forgotten because of its very non-Mississippi Valley character, is urn burial which was discovered by Dr. Hampson at both Richardson Landing (Fig. 2, T) and Bishop.

Is it coincidental that the Bishop site is east of the Valley proper in west Tennessee on the Hatchie River on a route leading toward the Alabama River where this late trait is most common and associated with some vessels not unlike Armorel phase ceramics (Holmes 1886:396, Fig. 399, 400; Nance 1976:129, Fig. 24)? The extraordinary Hale's Point, Tennessee, pottery casket (Holmes 1886:381-382, Fig. 372; Thruston 1897:29-30, Fig. 1) discovered by Capt. W. P. Hall, not far to the north, may well be from an Armorel phase component as other vessels (Holmes 1886: Fig. 404; Thruston 1897: 161, Fig. 64) from the site (9-R-1) seem to be of this phase affiliation. Much more can be learned from further work on museum collections which are very strong in Armorel phase data.

Two interpretations seem to follow quite logically from these Armorel data; one is historical, the other functional:

1) There seems to be a fairly high correlation of this complex and some of its more widespread traits with Siouan-speakers; for example Winnebago (but see Mason 1976) and Quapaw. Also to the west, Kansa and Osage also can be linked, although I'll admit it is some time since I reviewed those data. Late movements of Siouans may be indicated by some of this artifactual information (Griffin 1952b:364). Turning from an historical interpertation to a functional one,
2) What about those snub-nosed scrapers? Here they are in quantity for the first time in 9,000 years (since Dalton times). In the Plains there is a correlation with hide-dressing and buffaloes. In the Lower Valley—it's a question, but where are the bison?

Another problem: how much should one add to the complex? It will require a lot of straightforward comparative study that I haven't done yet. But there are some suggestive occurrences of traits that do seem to fit in time and space with the Armorel phase, including shell mask gorgets, narrow copper head bands, perhaps spatulate celts—often pierced, (Holland, Kinkead, Moore's sites in Alabama), Pecan Point head vessels, maybe even sherd disks (Fig. 2, J). I had the same problem with Long Nosed God complex nearly 20 years ago; where to stop.

Indeed, the question is really one of categories: complexes, phases, traditions, and horizons. The difficulty may well be with the use of the term "complex." After outlining the specific distribution of the Long Nosed God masks, I felt it worthwhile to add to it with a complex of other traits (Williams and Goggin 1956:51), which has not proven too useful. I must confess Phil Phillips tried to dissuade me from building up such a complex, but I was not amenable to his suggestion then. Does one never learn?

In the earlier version of this paper I merely defined the Armorel phase and discussed the distribution of certain widespread traits: engraved shell buttons and plain copper eagles. I did not use the term "horizon" at all. That omission was a mistake which I hasten to correct now, although the new terminology may not win too many adherents. This horizon is currently marked by the two traits: shell buttons and copper plates and may be termed "Markala."[3] It dates within the historic period, probably A.D. 1540-1650, although finer correlations may be achieved later. Thus the Armorel phase of Missouri and Arkansas is tied very precisely into the late chronologies of Mississippi and Alabama by the distribution of Markala horizon markers (Fig. 1).

Distribution of Special Traits of the Markala Horizon (Fig. 2, A-D, H)

Engraved Shell Buttons:

1) Campbell (Klinger 1977b)
2) Middle Nodena (Hampson collection, Wilson, Ark; Finger 1973)
3) Parkin (Stanley Mound,[4] Arkansas; Put nam 1882:84-85)
4) MLe 18, near Tupelo, Miss. (Jennings 1941:172; 1952:Fig.144J)
5) LeFlore, (18-P-3) Grenada Co., Mississippi (Cottonlandia Museum Collection, Sam Brookes photo)
6) Oliver, Mississippi (Peabody 1904:47-50)
7) Durant Bend,[5] Alabama (Moore 1899:311, Fig. 23)
8) Charlotte Thompson, Alabama (Moore 1899:320-321, Fig. 36)
9) Frenche's Island, on Tennessee River (MacCurdy 1917:83, Fig. 16)
10) ? Citico, Tennessee (Meyers 1964:Fig. 2). Shape is right but only a single perforation in center and no incising visible.

Plain Copper Eagles:

1) Rose Mound, Arkansas (Moore 1911: Plate 10)
2) Scott site, Arkansas (Adams 1972; Hamilton *et al.* 1974:165-168)
3) Clay Hill, (13-N-7), Arkansas (John House, personal communication)
4) Henry Farm, Tennessee (Quimby 1975)
5) Nashville, Tennessee (Brooks 1945)
6) Oneota, Wisconsin (Hall 1962:Plate 79) at least two specimens

Some may say that the context of the Armorel phase is lacking in definitiveness; in some cases there are surely earlier components on the site. Parkin and Rose are good examples; however, other sites, such as Campbell, the most completely documented of the phase and its type site, do seem to have a relatively pure complex, not muddied by other materials. Griffin (personal communication) has given his support to such a construct. Also there seems to me to be enough regularity of occurrence to date much of the phase quite well and to note the results of the widespread trade networks (shell buttons and copper eagles: horizon markers) that were still in existence even at this late time level as the European horde arrived (Griffin 1952b:364).

That some time is encompassed by this construct is perhaps best seen by changes within certain artifact categories: for example the cluster of shell buttons in the Valley and the near Southeast contrast with changes in form of somewhat similar buttons showing up to the north in Fort Ancient sites like Fox Farm. Similarly, four of the copper eagles (Rose, Scott, Clay Hill and Henry) retain high formal similarity (Fig. 2, A-D) until one gets north to the Winnebago occurrences (but what about the Nashville find—it's not like Henry, unfortunately). Of course, our chronologies are not sufficient to assure us of temporal priorities in either case, although the Rose Mound eagle and its mates "look" earlier than the Winnebago ones, as do the more elaborate engraved shell buttons.

Other traits found in the Armorel phase heartland, but not yet installed as horizon markers, have a very wide distribution too, from the Red River in Oklahoma where a red-filmed teapot (Quapaw type?) is known from the Kaufman site (Perino, personal communication) to east Tennessee and a Siouan disk pipe (Rice 1974). There is also a north/south axis from Wisconsin to Louisiana. What seems to have been a long established east-west connection from Oklahoma via Alabama to Florida may begin with the Long Nosed God horizon (Williams and Goggin 1956:60-61); it is also evident later (in my chronological view) when some of the embossed copper plates show much the same "path" (Phillips and Brown 1978:206-208, Fig. 270, 271).

Another widespread late trait is that of catlinite, especially the so-called "Siouan disk pipe (Fig. 2, G)." There seems to be little doubt that the distribution of this distinctive artifact (Jolly 1973; Rich and Jolly 1973; Rice 1974) has some close parallels with both the Armorel phase (McCoy site, etc. Jolly 1973:9, Fig. 4) and the Markala horizon. The occurrence of catlinite pipes at Upper Nodena seems a bit early in contrast to an absence at Middle Nodena where an Armorel phase component is attested; at Moundville there are some rather late ceramics (Jolly 1973:6, to the contrary) with similarities to the Alabama River phase (V. Steponaitis, personal communication) which *might* be late enough for an association with the two catlinite pipes known from the site. However, the whole question of unraveling the late period in the entire Southeast can be drawn into the discussion of these catlinite pipes as Jolly (1973:5-10) has done; time is not now available for such an extended and up-dated comparative study, which would be a worthwhile endeavor, no doubt.

Two things seem to me important that grow out of this slight exercise in phase definition: first, the lack of Armorel or related phases or even any shared traits in the Cairo Lowlands-Kincaid-Lower Tennessee River regions seems to strengthen my "Vacant Quarter" hypothesis for late Mississippian times in that geographic segment, probably including areas as far north as Cahokia (Williams n.d.). I recognize some circularity in the reasoning since its absence led me to question the nature of late phases in that area, but I submit that now that Armorel has been set out, the blank space looks even blanker. Second, with the exception of James B. Griffin and a few others, the distribution of specific formal traits (Griffin 1951: Section IV and many other instances) and their chronological significance have not been a favored research technique, even in pre-New Archaeology times. Its value as a distinct aid to sharpen chronological perspectives is commonplace in other parts of this country such as the Southwest and in the Old World as well. That such distributional studies could provide understandings that go beyond general statements about distribution systems and the interaction spheres, two valued and often-praised processual findings is clear, at least to me. For example, what would closely controlled and fine-grained analytical studies of Angel and Nashville Negative Painted distributions tell us about the events, centers of cultural developments, and directions of flow in the Pan-Southern tradition between A.D. 1200 and 1450? Much I am sure.

Footnotes:

[1]This paper is a slightly revised and expanded version of that given at the SEAC meeting in Knoxville in November, 1978. The name "Armorel" derives from a site in Mississippi County, Arkansas. It was only after it had been selected and used in this paper that I learned of its true origin. Dan Morse (personal communication) informs me that it is a "made-up" name for the plantation owned by R. E. L. Wilson: AR = Arkansas, MO = Missouri, REL = Robert E. Lee. How appropriate in terms of its distribution!

I wish to acknowledge the aid and counsel of a number of friends and colleagues in the preparation of this paper including James B. Griffin, Philip Phillips, Jeffrey P. Brain, Dan F. Morse, Phyllis Morse, James E. Price, Sam O. Brookes, John House, Michael Hoffman, Gregory Perino, Leo O. Anderson, Roger Nance, and Fletcher Jolly. Their information has been most gratefully received. The interpretations are my own.

[2]The term "button" is not used here to denote implied function, but to set these button-like pierced and engraved shell artifacts apart from other beads, etc., (Williams 1956:31).

[3]Originating terminology is not easy—I tried several site and geographic terms for the horizon, but none were very satisfactory. "Copena" has been called inelegant, so what of "Shel-cop?" I have settled uneasily on "Markala": *M* for Mississippi, *ark* for Arkansas, and *ala* for Alabama, the three principal states of its current known distribution; it does have, at least to me, a vaguely Muskogean sound. It also has the possibility of additions; should one wish to extend it to Florida and Georgia: "-flaga," but please don't! Someday "Markala" may have the same ring to the ear as Chavin or Olmec horizon, but somehow I doubt it.

[4]I am indebted to Phyllis Morse for the archival research that enabled her to discover that the Peabody Museum's excavated site, Stanley Mound of the 1880's was in fact the well-known Parkin site.

[5]I am indebted to Roger Nance for the correction of the spelling of C. B. Moore's site. Moore spelled it Durand's, as have many archaeologists following his orthography—the proper way is *Durant Bend*.

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Ian W. Brown

ARCHAEOLOGICAL INVESTIGATIONS ON AVERY ISLAND, LOUISIANA, 1977-78

Avery Island is one of a series of five salt domes located along the coast of southwest Louisiana (Fig. 1). The Lower Mississippi Survey of Peabody Museum, Harvard University, conducted archaeological investigations on this salt dome in 1977 and 1978 (Petite Anse Project). The abundant material and subsistence resources on Avery Island should have been an attraction to man throughout prehistory, yet previous archaeological work has revealed considerable temporal gaps in the island's occupation. Sherwood Gagliano (1967, 1970) recorded strong Meso-Indian components scattered over the salt dome, with equally strong Paleo-Indian and late prehistoric Plaquemine culture occupations at Salt Mine Valley (33-I-5) (Fig. 2). The absence of Plaquemine material on the rest of the island and in the surrounding marshes suggested to Gagliano that late prehistoric peoples of the Medora phase migrated from the Lower Mississippi Valley for the sole purpose of producing salt at Avery Island (1967:92).

In the original proposal for our research (Brown 1977), we argued that any interpretation of the role of Avery Island in Southeastern prehistory was tenuous without the support of extensive archaeological survey and excavation. It did indeed seem curious that early and middle Neo-Indian cultures like Tchefuncte, Marksville, Troyville, and Coles Creek were absent at such an attractive ecological location as Avery Island. Our immediate goal was to determine whether or not the absence of these cultures was a product of limited

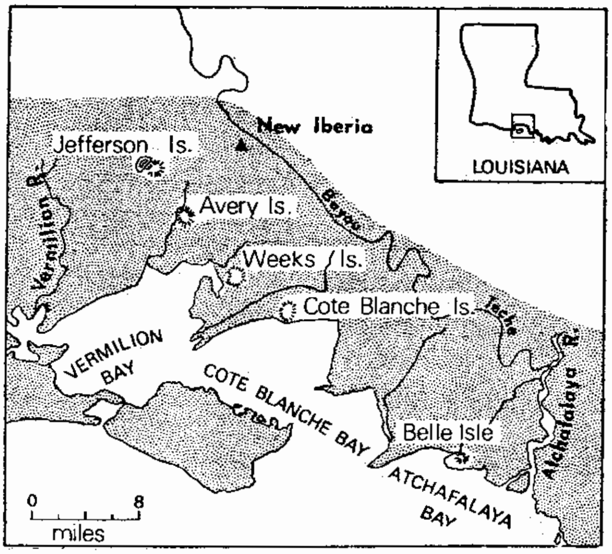

Figure 1. Location of Avery Island on the coast of Louisiana.

archaeological investigations. A secondary goal of the project concerned the late prehistoric Plaquemine component. We first had to determine if materials of this culture were actually just confined to Salt Mine Valley (33-I-5). If the remainder of the island and the surrounding marshes were devoid of such materials, a good case could indeed be made for an actual movement of Plaquemine peoples from the east for the sole purpose of producing salt.

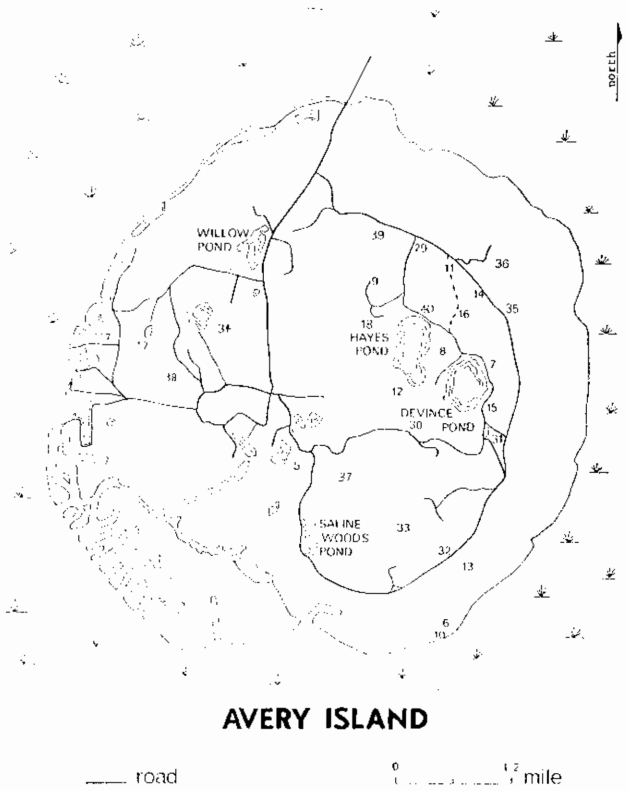

Figure 2. Archaeological sites on Avery Island. *5,* Salt Mine Valley; *6,* Banana Bayou mound; *7,* De Vince Pond; *8,* Hayes Pond Ridge; *9,* Prospect Hill; *10,* Banana Bayou midden; *11,* Deer Run; *12,* Vaughn's Clearing; *13,* Palmetto Branch; *14,* Shortrack; *15,* Morningside; *16,* Fisher; *17,* Residence Hill; *29,* Slim Picking; *30,* Triple Ridge; *31,* Sugar House; *32,* Cherry Hill Bottom; *33,* Middle Gate Bottom; *34,* Tung Oil; *35,* Magnolia Bridge; *36,* Stumpy Bayou; *37,* Black's Bottom Hill; *38,* Bradford; *39,* Bamboo Spring; *40,* Ringle.

Archaeological fieldwork

Salt Mine Valley (33-I-5) The immense quantities of pottery lying on the surface of Salt Mine Valley were well known long before Gagliano did his fieldwork on Avery Island (Fontaine 1884:67; Harris and Veatch 1899:252-253; Hilgard 1872:14-15; Joor 1895: 394-395; Leidy 1889:33; Owen 1863:250-252). We decided upon a strategy of making extensive surface collections at this site prior to performing any excavations. It was hoped that such a survey would enable us to work up a local ceramic classification and to select areas on the site which would supply the necessary vertical stratigraphy. Finding undisturbed locations in Salt Mine Valley was a sizeable task, however, as strip mining in the last century severely altered the original surface expression (Hotaling 1863; Kneedler 1896:30-33; Owen 1863:250-252).

A recent disturbance was the construction of a brine pit by the International Salt Company (Fig. 3). Gagliano surface collected this embankment in 1960 and 1961 (1967:Fig. 8). He divided the area into two analysis units. The western part of the embankment's southern leg was designated Unit 1 and it yielded primarily lithics. The remaining portions of the embankment, labeled Analysis Unit 2, produced mostly pottery. Gagliano felt that the dredge uncovered horizontal stratigraphy in the valley when making the spoil bank, his interpretation being that Unit 1 predated Unit 2. To test his interpretation of horizontal stratigraphy, and to obtain a sizeable controlled sample of artifacts, we divided the southern and eastern legs of the embankment into 29-4 m units. Ten minutes of collecting time were spent in each unit. Several thousand potsherds were gathered and, to our surprise, approximately three-quarters of the sample were shell-tempered (Brown and Lambert-Brown 1978a). Such material, evidence of Mississippian culture, was totally unexpected. We confirmed the occurrence of horizontal stratification, but our results differed somewhat from those of Gagliano's. The western end of the southern leg was indeed primarily lithic, but all but a few specimens were pebbles or rocks cracked by natural agencies. The eastern end of the southern embankment and the entire eastern leg produced great quantities of pottery. The Mississippian material was almost en-

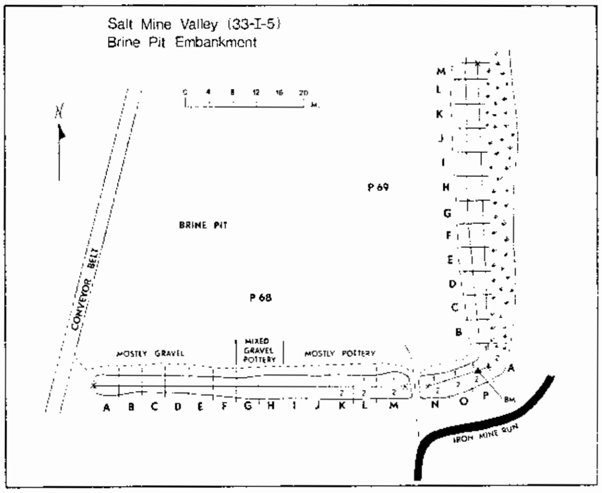

Figure 3. Salt Mine Valley (33-I-5); survey of the brine pit embankment.

tirely confined to the juncture of the two legs, whereas Plaquemine material was recovered along the northern end of the eastern embankment.

As expected, the survey of Salt Mine Valley yielded useful information on the cultural history of this site, and also helped in the selection of areas for excavation. Three trenches and twelve 2 m squares were excavated in 5 different areas of Salt Mine Valley. One trench was placed on the ridge south of the recent valley deposits. This ridge had earlier been shovel-tested, as the area is presently under a thick forest cover. A total of 96 shovel tests were excavated at 6 m intervals over the ridges, covering a maximum north-south distance of 168 meters and an east-west distance of 102 m. All tests were excavated to subsoil, the contents were sifted through ½ inch mesh screen, and the hole profiles were then drawn. Only one area, located near a seepage spring, appeared to be culturally significant. A 1 m wide trench was laid out north-south in this area for a distance of 18 m. Every other 2 m section of the trench was excavated, the result being a heavy concentration of Plaquemine culture pottery.

Another trench was laid out on the southern ridge immediately adjacent to the recent valley deposits. Five 1 x 2 m sections were excavated in two hillocks. One of these tumuli turned out to be brick and charcoal rubble from nineteenth century mining activity, while the other was aboriginal in nature. Over 1.5 m of material remains occurred in the latter area and vertical stratigraphy was clearly apparent. As excavations continued in this area, however, we soon learned the soil was heavily disturbed. A large amount of Plaquemine culture pottery was found overlying Mississippian material. As Mississippian culture found elsewhere in the Lower Valley was younger than Plaquemine, there was naturally the suggestion of disturbance. The discovery of early nineteenth century creamware at the base of the excavations supported the interpretation of reversed stratigraphy. This soil had apparently been thrown on to the valley edge when nineteenth century salt miners were trying to get down to the rock salt. These excavations were not a total loss, however, as we did accumulate a sizeable collection of Plaquemine culture pottery. Except for the thin veneer of Mississippian material lying against the subsoil, the deposits appear to have resulted from a single component.

Finding an area where ground surface is undisturbed is a considerable task in Salt Mine Valley. As stated above, we did find an intact component of the Plaquemine culture on the ridge somewhat removed from the southern rim of the valley, but we still needed to find shell-tempered Mississippian material in an undisturbed context. As the surface survey had revealed heavy concentrations of such pottery in the valley itself, our next move was into the recent deposits. We knew of the problems of water seepage when excavating within the valley (Gagliano 1967: 24-25), so we hoped to alleviate this problem by investigating a relatively high location adjacent to the northern edge of the recent deposits. A 1 m wide trench, 12 m long, was staked out in an east-west direction. Water seeped into the trench at less than 50 cm below ground surface. In order to get down to the pottery-bearing level reported by Gagliano (1967:Fig. 12), which we thought was no more than 2 m below ground surface, we erected a plywood cofferdam in one of the trench sections. Although we were able to excavate considerably deeper, nothing of cultural relevance was uncovered.

A series of four 2 m squares were then opened immediately north of Gagliano's pit V (1964:Fig. 8), as we felt the probability of penetrating the recorded pottery level was much greater in this area. Thin layers of sterile multi-colored sand were encountered in the first 50 cm, and then we hit water. A cofferdam was erected to get us down to the desired depth, but with disappointing results. Even an auger test, excavated to a depth of over 3.5 m in the cofferdam itself, failed to produce midden material. The negative results from this excavation, along with our knowledge from auger hole tests elsewhere in the recent valley deposits, revealed that Salt Mine Valley does not have a single blanket of midden at a specific level. Rather, it possesses a series of meandering terraces which supported aboriginal occupation (Roger Saucier, personal communication). The Indians, when producing salt, naturally chose slightly higher ground in the valley to keep their feet dry. It was our task to find one of these terraces in an undisturbed context.

With the fortunate coincidence of a rainy day and a visit to the site by Sherwood Gagliano, we found just such a location at the end of the summer field season. Along the southern leg of the brine pit embankment between Analysis Units M and N (Fig. 3), a thick layer of pottery-bearing midden was observed in a drainage ditch which was cut to drain the reservoir. Several hours of sunshine normally totally obscures this midden, but Gagliano fortunately remembered having seen it in an earlier visit to the site. We excavated eight 2 m squares in this area and the quantity of material recovered was phenomenal. Over 20-10 pound bags of pottery were removed from each square, even though the midden layer was only about 10 cm thick. It was, however, rather dense and extensive. More than 40,000 artifacts were recovered in less than two weeks of excavation, and all but a handful of the ceramics were shell-tempered. Included were large quantities of Cracker Road Incised, *var. Unspecified* (Brown 1977), Leland Incised, *var. Williams* (Williams and Brain n.d.), Barton Incised, *var. Unspecified,* Old Town Red, *var. Unspecified,* Owens Punctated, *vars. Owens* and *Menard,* Pouncey Ridge Pinched, *var. Unspecified,* and Winterville Incised, *var. Winterville* (Phillips 1970). Although only miniature vessels were found intact, many of the larger vessels can be reconstructed. Jars were represented in the ceramic assemblage, but almost all of the vessels were large shallow bowls. The Indians obviously evaporated salt in these containers and then merely left the vessels behind when their function was performed. The materials were indicative of a single very late prehistoric component dating somewhere in the sixteenth or seventeenth centuries A.D.

In all, the investigation of Salt Mine Valley turned out to be quite exciting. Although we did not find good vertical stratigraphy, there were indications that further excavation would recover it. Perhaps of more importance, we did discover strong unmixed Plaquemine and Mississippian components in horizontal stratification. The Meso-Indian and early Neo-Indian Eras were not represented in Salt Mine Valley, however, so in order to fill out the picture of Avery Island's culture history, we had to look elsewhere for these components.

Pepper Fields The pepper fields along the eastern periphery of the island were surveyed in the winter and spring of 1978 (Fig. 4) (Brown and Lambert-Brown 1978c). This area was believed to have been

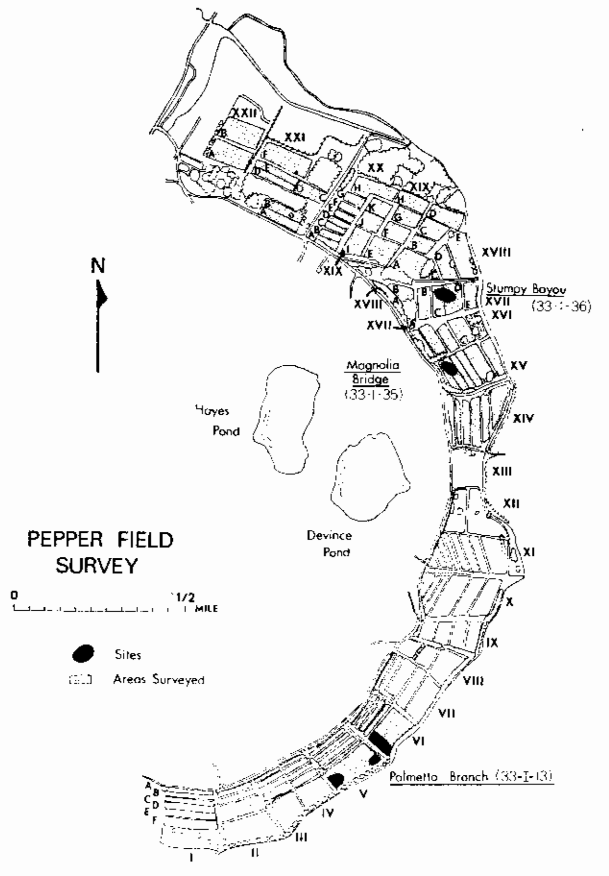

Figure 4. Pepper Field survey.

ecologically attractive, because an ancient bayou once ran in the marsh adjacent to the island. The fields are close to the marsh, but of course slightly above it, presumably an attraction for habitation. Approximately two-thirds of the fields were surveyed, the remaining portion either being in grass or being planted at the time of our survey. We believe, however, that the area sampled was large enough to give us a reasonable approximation of the human use of the island's

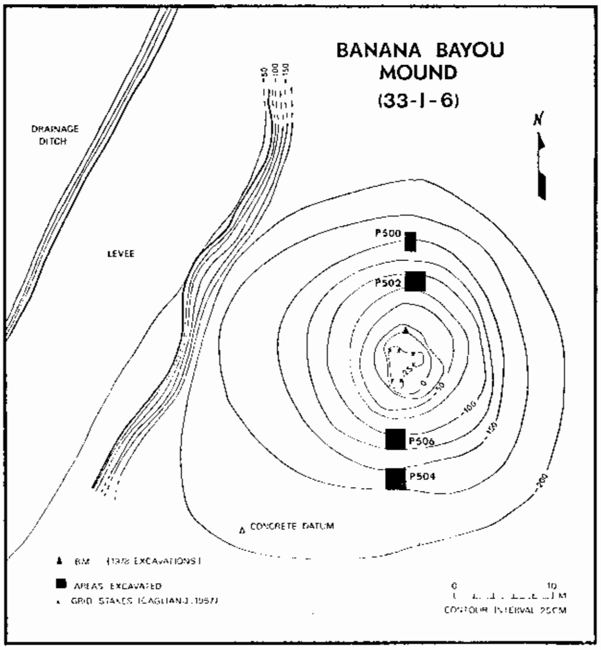

Figure 5. Banana Bayou Mound (33-I-6); contour map and excavations.

eastern periphery. The pepper fields were divided into 22 sections. The terraces of each section were given a letter designation, with the innermost terrace being labeled A, the next one out B, and so on. Each terrace was also given a distinct collection number and every third row was examined for cultural remains. These fields had been intensively plowed for many years, and a significant amount of land-leveling had occurred in the last three decades, so we did not have much confidence in correlating present artifact distribution with original deposition. We did, however, feel that if considerable human activity occurred in a given place, it was probable that such activity would still be apparent by surface scatter in the same general locale. We found the artifact scatter over the pepper fields to be quite thin, however. Only in three locations were concentrations great enough to be designated sites. Two of these sites had undiagnostic ceramic remains, while the third, Palmetto Branch (33-I-13), produced a fairly large lithic assemblage.

Banana Bayou Mound (33-I-6) Palmetto Branch is located fairly close to the Banana Bayou Mound (Fig. 5). They are each located along the ancient course of Saline Bayou (also called Banana Bayou), and they both share a considerable quantity of lithic remains. Banana Bayou Mound is approximately 2 m high and 30 m in diameter. It was originally excavated by Gagliano in 1962, the despression resulting from his T-shaped pit being clearly apparent in the center of the mound (Gagliano 1967:16-19). Gagliano observed two construction mantles, the primary mantle having been composed of a dark gray to black clay, derived from a nearby buried midden. The upper mantle was light brown in color and composed of silty clays. The only artifacts recovered in the primary mound were a few fired clay objects of amorphic shape. A radiocarbon date of 2,490±260 B.C. was obtained for the secondary mantle which, if true, would have made Banana Bayou one of the earliest known mound constructions in the Southeast.

We opened up three 2 m squares and one 1 x 2 m excavation unit in order to reexamine the constructional history of the mound, and to determine when and why it was built (Brown and Lambert-Brown 1978d). We confirmed Gagliano's interpretation of two principal stages of mound construction (Fig. 6). The mantles were quite symmetrical, the second stage being somewhat thicker than the primary deposition. A subphase of construction was also observed in the form of a 20 cm high platform at the central base of the primary mound (stage 1a). Some activity occurred on top of this platform, as a lens of charcoal extended over a large portion of the mound base. Above this platform was deposited a thick layer of the same sort of highly organic midden. Gagliano observed a number of charcoal lenses within the primary mound, but we only detected one other lens at the very top of stage 1b. Some activity occurred on top of the primary mound, as indicated by the appearance of several postholes and a fire pit. These features were filled with soil from the upper mantle, which suggests they were related to the second stage of mound construction.

Cultural remains at Banana Bayou Mound were few, but fortunately some diagnostic artifacts were recovered. Included were two Williams points, an Ellis point, and a Ponchartrain point. The Ponchartrain specimen was the only point found well within the primary mound, the others having been recovered near the interface between the two mantles. There was

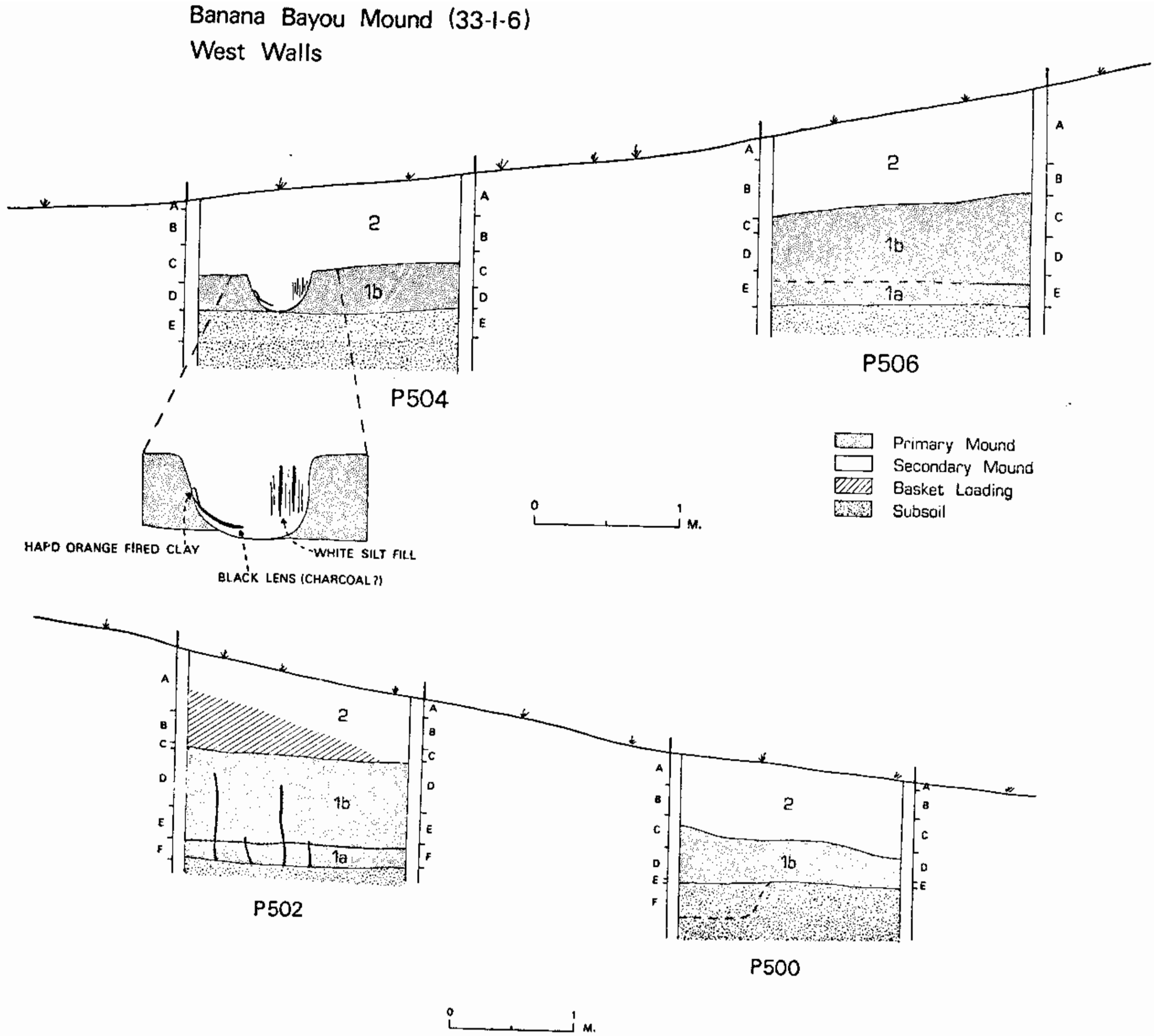

Figure 6. Banana Bayou Mound (33-I-6); section drawings.

abundant evidence, however, to suggest that all of the points were related to the first construction stage. These artifacts, along with the large quantity of amorphic-shaped fired clay objects and numerous lithic tools found within the primary mantle, argue for a late Meso-Indian occupation dating perhaps between 2000 B.C. and 1500 B.C. Seven radiocarbon samples have been secured from various parts of the mound, but they have not yet been dated. A small amount of organic material, including deer, fish, turtle, shells, and nuts, was also retrieved from the primary mound. Flotation samples were taken, but have not as yet been processed. The secondary mantle was largely devoid of artifacts. There were a number of undiagnostic ceramics scattered throughout the latter, however, indicating that this cap was deposited in the Neo-Indian Era.

Although we now have considerably added to our knowledge as to how and when the Banana Bayou Mound was constructed, we still do not know why it was built. Burials were not found in either our's or Gagliano's investigations. There is some evidence of structures having been erected at the base and on top of the primary mound, but the mantles were obviously not platforms designed to support substantial structures. An explanation as to why the mound was constructed must await further investigations.

Upland Area Thus far we have discussed two of the three micro-environmental zones on Avery Island. The Banana Bayou Mound (33-I-6) and the pepper fields are located on the island periphery adjacent to the marsh. Salt Mine Valley (33-I-5) is located in a low area considerably removed from the marsh. In order to complete the picture of the prehistoric use of Avery Island, we needed to examine the upland area for sites. Almost all of the upland area was used for sugar cane production in the last century, but the land is presently in pasture. In order to locate areas of intensive occupation, to determine site size, and to plan our strategy for sites to be excavated in later stages of the project, we decided to employ a plow strip survey (Brown and Lambert-Brown 1978b). Over 50 plow strips were excavated in various parts of the island. Areas selected for plowing were based on proximity to water and degree of land slope. Everything over a 10% grade was immediately rejected. We no doubt missed a number of sites as a result of this sampling procedure, but we believe many more sites were found than would have resulted from a strategy based upon pure random sampling.

A sketch map was made of each plow strip and photographs were taken from both ends. We performed these operations even when sites were not found, and therefore have a permanent record not only of where sites are located, but also where they are absent. If concentrations of materials were found, wooden stakes were placed at the ends of each strip. The beginning and termination points of each artifact cluster were then measured from the stakes. By this method, conducted over a number of parallel plow strips, we were able to reconstruct the size and shape of most of the sites. In most cases artifact clustering neatly followed the contour of old ponds and marshy areas, as in the sketch map of Vaughn's Clearing (33-I-12) (Fig. 7). In other situations, however, the plow strip survey was able to rule out large tracts of land which otherwise appeared to be equally as attractive as the location actually selected for habitation (Fig. 8).

The upland sites on Avery Island were, for the most part, small hunting camps. A few semi-sedentary sites with considerable amounts of ceramics were found, however, three of which were partially excavated in the summer field season. As illustrated in the Hayes Pond Ridge (33-I-8) site plans (Figs. 8-9), the plow strip survey was instrumental in designing our excavation strategy (Brown and Lambert-Brown 1978e). A 40 x 1 m trench was laid out at both Hayes Pond Ridge and Middle Gate Bottom (33-I-33), and ten 2 x 1 m sections were excavated in each trench. At Vaughn's Clearing (33-I-12), four 2 x 1 m trench sections were excavated. The objectives of these investigations were to increase the material sample, to discover any vertical or horizontal stratigraphy which

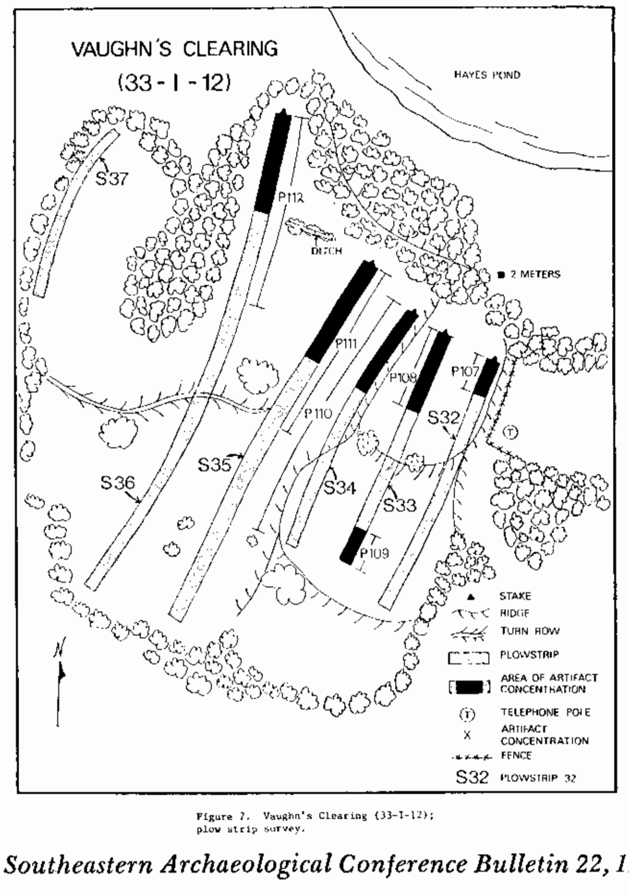

Figure 7. Vaughn's Clearing (33-I-12): plow strip survey.

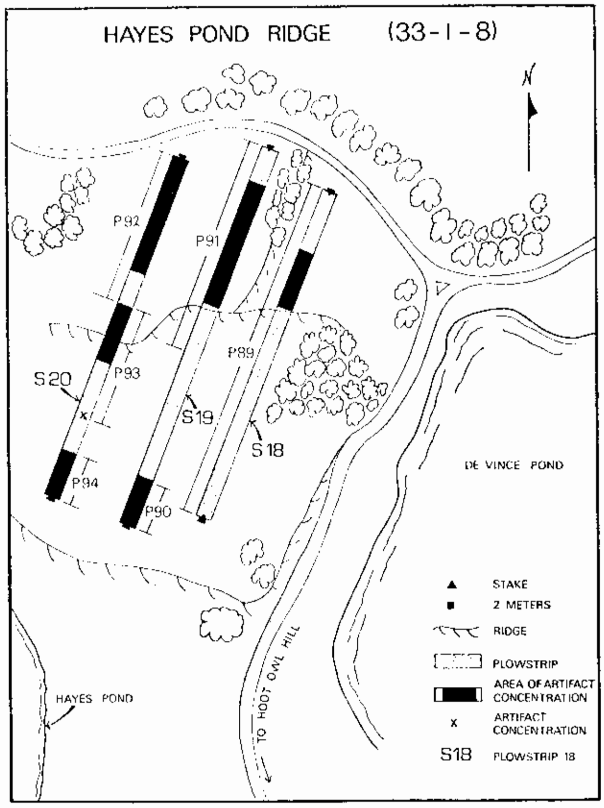

Figure 8. Hayes Pond Ridge (33-I-8): plow strip survey.

might exist, and, most importantly, to uncover features relating to aboriginal settlement and subsistence patterns. The only objective met at all three sites was the first one. All sites revealed strong Coles Creek-Plaquemine culture components. Hayes Pond Ridge seems to have been more heavily utilized by Plaquemine peoples, whereas Middle Gate Bottom was more popular in the Coles Creek period. Vaughn's Clearing produced meager results in terms of ceramics, but a significant quantity of lithics was collected. A Marksville component was observed at Vaughn's Clearing and evidence of Tchefuncte and Mississippian occupations was recovered at Middle Gate Bottom, but these components were quite minor in comparison with the Coles Creek-Plaquemine occupations. Evidence of structural remains or other features did not occur at any of these sites. A hundred years of sugar cane cultivation has apparently destroyed all but the material evidence of Avery Island's early upland occupants.

Preliminary interpretations of the role of Avery Island in southeastern prehistory

With a good deal of survey and excavation now behind us, including both current and past work, the role of Avery Island in Southeastern prehistory is becoming clearer. We are now in a position to answer some of the questions posed at the beginning of our research. As Gagliano concluded, there are indeed major temporal gaps in the cultural history of Avery Island. Gagliano's research demonstrated the presence and importance of Paleo and Meso-Indian peoples (1967, 1970), but little evidence of their activity can presently be detected on the uplands and periphery of the salt dome. Our survey and excavations also failed to produce evidence of significant Poverty Point, Tchefuncte, or Marksville occupations, although, as

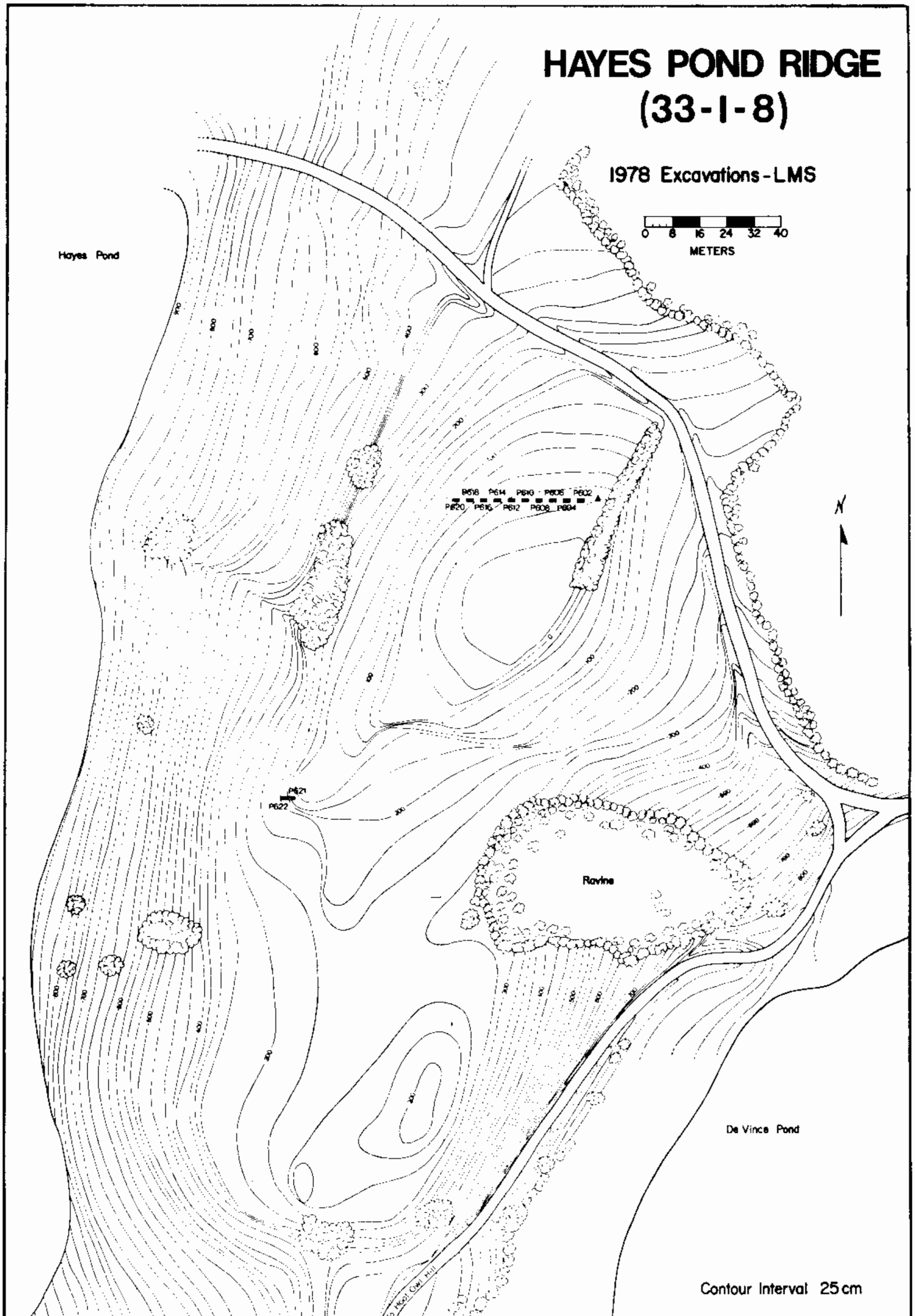

Figure 9. Hayes Pond Ridge (33-I-8); contour map and excavations.

depicted in Fig. 10, a few artifacts of such cultures do occur. The early and middle periods of the Neo-Indian Era are essentially absent at Avery Island. The late Neo-Indian Era, however, is well represented. A number of Coles Creek and Plaquemine components are scattered over the uplands at such sites as Hayes Pond Ridge (33-I-8), Middle Gate Bottom (33-I-33), Vaughn's Clearing (33-I-12), and Deer Run (33-I-11), as well as at a number of smaller sites. These people generally seem to have settled around depressions in

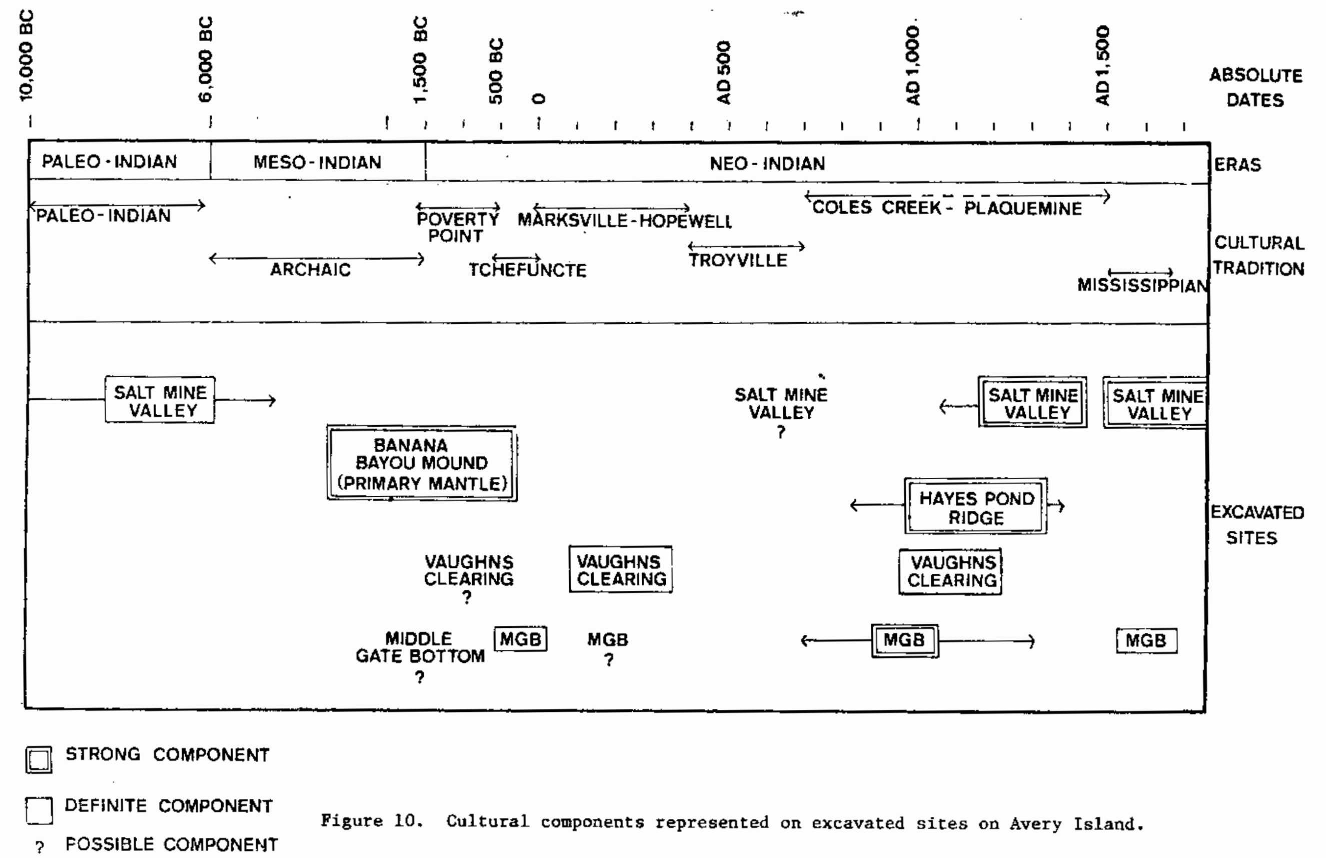

Figure 10. Cultural components represented on excavated sites on Avery Island.

the salt dome which were, in prehistoric times, either small ponds or marshy areas. There is no evidence of major village occupation, the Coles Creek-Plaquemine occupations having been primarily hunting camps.

An important discovery was that the Plaquemine culture was not just confined to Salt Mine Valley (33-I-5). The Plaquemine use of Avery Island was therefore not solely oriented to a single resource. The examination of archaeological collections from other sites in the Vermilion Bay region has also revealed that peoples of the Plaquemine culture were quite active in the coastal marshes. We thus can no longer argue for a westward migration of these people to Avery Island for salt production.

Survey and excavation at Salt Mine Valley (33-I-5) has, however, revealed a totally unexpected component, evidence for a movement of peoples on a much larger scale than conceived of previously for this area. Shell-tempered pottery, characteristic of Mississippian culture, is quite rare in the western portion of coastal Louisiana. Such materials are not only evident at Salt Mine Valley, but they constitute a principal component. After having examined collections at the Peabody Museum of Harvard University, we are reasonably convinced that the closest cultural parallels with the Mississippian component at Salt Mine Valley occur in the southernmost portion of the Yazoo Basin of the Lower Mississippi Valley. The linear distance between the latter area and Avery Island is 185 miles, and at least double this distance by water travel.

The discovery of Mississippian peoples at Avery Island significantly contributes to our understanding of aboriginal trade networks and sociopolitical organization. Why these people should have traveled so far for salt when other salines were considerably closer is a problem which needs resolving. It could be that other licks, such as those in northern Louisiana, Arkansas, Illinois, and Missouri (see Beck 1823:154; Breckenridge 1814:66; Bushnell 1907, 1908, n.d.; Harris and Veatch 1899; Keslin 1964; Lang 1957; Peithmann 1953; Schoolcraft 1819:54, 207; Veatch 1902) were already controlled by powerful aboriginal groups. The Avery Island saline, in the middle of more dispersed and less politically complex coastal populations (Gibson 1976: 12-19; Swanton 1911:337-364), may have been the only available salt source for these Mississippian peoples. Another possibility is that these Indians may have discovered rock salt at Avery Island. Such a find would certainly have made the long trip well worth the effort, as salt production by the evaporation method is a long and tedious process (Beckenridge 1814:66; Foreman 1936:134; Keslin 1964:14-23; Lewis 1907:217-218; Williams 1930:122, 437-438).

Archaeological research, however, argues against the aboriginal discovery of rock salt. The high incidence of large shallow shell-tempered bowls supports the interpretation that the salt was produced by evaporating saline water. These bowls were made of local clays. The high incidence of sand in the pottery paste, so common on Avery Island, is rare in the pottery of the southern Yazoo Basin. A curious phenomenon is the thinness of the pottery. With few exceptions (Bushnell 1907; Keslin 1964; Morse and Morse 1977; Williams 1954:209-211), most salt springs frequented by Mississippian populations bear evidence of thick heavy fabric-impressed pottery, a type absent at Salt Mine Valley (33-I-5). There is thus the suggestion of a variation in the production of salt in the area.

Another change, which reflects upon the socioeconomic organization of late prehistoric Mississippian peoples, concerns the time involved in the production of salt at Avery Island. We know that historic Indians of the Lower Mississippi Valley procured salt on a seasonal basis, whole families generally leaving for salt licks in the winter months and returning in the spring (Le Page du Pratz 1774:153; Swanton 1911:78, 307). Considering both the time involved in producing salt and the distance traveled (over 700 miles), it does not seem possible that the entire process could be completed in a single season. There is thus the suggestion that specialization occurred, with a small group of salt producers being stationed at Avery Island for a relatively long period of time.

Conclusion

In order to understand more fully the role which Avery Island played in the salt trade of the Lower Mississippi Valley and in regional prehistory, further work is required on the four other salt domes and in the surrounding marshes (Fig. 1). An examination of collections from Avery Island, Jefferson Island, and Weeks Island has revealed quite different cultural histories. The Tchefuncte culture is common at Weeks, but rare at Avery and Jefferson Islands. The Marksville culture is particularly common at both Weeks and Jefferson, but rare at Avery Island. Plaquemine culture is common at both Jefferson and Avery Island, but almost nonexistent at Weeks. Mississippian culture is represented only on Avery Island, whereas Coles Creek culture is common on all three islands. These three salt domes are all located within the space of but 14 miles. Why they should have had such different cultural histories is a problem which requires serious attention. Similarly, we must know what occurred prehistorically in the surrounding marshes in order to place Avery Island in an understandable cultural perspective. A solid understanding of the cultural history of the region is necessary to demonstrate the truly unique position Avery Island occupied in Southeastern prehistory.

Acknowledgements

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Timothy K. Perttula

CADDOAN PREHISTORY: SOME RELATIONSHIPS TO LOWER MISSISSIPPI VALLEY PREHISTORY

Coles Creek ceramics, primarily varieties of Coles Creek Incised, have a wide distribution outside of the Lower Mississippi Valley. In the Caddoan area of the Trans-Mississippi South (Schambach 1971) Coles Creek ceramics occur in abundance along the middle Red River (Fig. 1), the Arkansas River Valley, the middle and lower Sabine (Jensen 1968; Jones 1957; Webb and others 1969), and as far west as the upper Sulphur and Cypress Creek Valleys of East Texas (Doehner and Larson 1978; Stearns n.d.; Dee Ann Story, personal communication).

Stratigraphic context, burial association, and radiocarbon dating suggest that the Coles Creek ceramics occur prior to diagnostic Caddoan wares in the Red River section of the Caddoan area. This fact, allied with the presence of cultural features such as flat-topped mounds that later become prominent in Caddoan prehistory, has suggested to some regional archaeologists (Hoffman 1970; Wyckoff 1970) and to Eastern Woodland archaeologists in general (Stoltman 1978: 723), that the ultimate derivation of the Caddoan tradition lies within Coles Creek developments.

The nature of the relationship of Caddoan prehistory with that of the Lower Mississippi Valley forms the subject of this paper. In particular I wish to discuss the presence of Coles Creek components in the middle Red River Valley and consider what this represents in terms of developmental trends in the area as well as in stylistic interaction and cultural contact between Caddoan and Lower Mississippi Valley cultural systems.

Ford to Krieger

In 1936 James A. Ford established a number of Lower Mississippi Valley ceramic complexes or horizons based upon far-ranging surface collections (Ford 1936). One of the complexes, a Caddoan ceramic complex, was placed on the same temporal level as the Tunica and Natchez complexes; i.e. Horizon III or historic.

Ceramic material began to be identified in the Caddoan region that was related to recognized Lower Mississippi Valley horizons. Dickinson and Lemley's work at Crenshaw and Kirkham (Fig. 1) suggested the presence there of Coles Creek and/or Marksville related components stratigraphically below Caddoan components in burial and midden contexts (Dickinson 1936; Dickinson and Lemley 1939; Lemley 1936).

When Alex D. Krieger came in the late 1930's to the W.P.A. lab in Austin, Texas the temporal and spatial relationships between Caddoan and Lower Mississippi Valley cultural systems began to be clarified (Story 1978:59). Krieger's "Culture Complexes and Chronology in Northern Texas" (1946) and "The George C. Davis Site" report (Newell and Krieger 1949), and Ford's "Measurement of Prehistoric Design Developments in the Southeastern States" (1952) and the Greenhouse site report (Ford 1951) provided the basic definition and chronological placement of Caddoan and Lower Mississippi Valley ceramic complexes.

From their different perspectives each attributed the Coles Creek components occurring in the middle Red River Valley to different processes (see Davis 1961). Ford argued that these components were representative of a late Coles Creek migration up the Red River Valley. He interpreted the Caddoan sequence as late for two reasons: a) Caddoan area ceramic traits, particularly engraving, do not appear in the Lower Mississippi Valley until the Plaquemine period; and b) ceramic influences seem to be moving from east to west. Certain decorative motifs, such as meander and repetition of curvilinear incision, zoned punctation, and horizontal incision were thought by Ford to have originated in the Florida Gulf Coast in Weeden Island times (Willey 1949), spread to the Lower Valley throughout the Coles Creek period, then on to the Caddoan area (Ford 1952). Caddoan developments, therefore, were diffusions out of the Coles Creek period in the Lower Valley. Krieger, however, had aligned Early Caddoan (Alto focus) ceramic complexes coeval with Troyville-Coles Creek (Krieger 1946). Bolstered by the ceramic classifications of Clarence Webb in this area (Webb 1961) and a radiocarbon date of A.D. 398±175 from Mound A at George C. Davis (Krieger 1951), Krieger did not buy Ford's conclusions, and, in fact, suggested that flat-topped mounds and maize at Davis represented one of the earliest known "Mississippian" sites in the east, certainly earlier than Coles Creek. Marksville components were present (Fulton and Webb 1953) but Coles Creek components did not exist "at all in Texas, Oklahoma, or Arkansas; within the Caddoan area they are found only in the Shreveport area" (Krieger in Davis 1961:111).

The primary burden of the arguments presented above, once the radiocarbon date from Davis was summarily rejected (Griffin and Yarnell 1963), was ceramic only and here Ford and Krieger would not budge.

Western Coles Creek

It was not until the 1960's and 1970's that some additional work was carried out at the above-mentioned sites and in the area in general. Sites were examined in detail, chronologies established, and the site structure worked out, etc., making it possible to further explore this question and attempt to resolve it.

Work at major prehistoric centers in the Caddoan area, such as Crenshaw, Bowman, Graves Chapel, and Mineral Springs in Arkansas (Bohannon 1973; Durham and Davis 1975; Durham and Kizzia 1964; Hoffman 1971; Wood n.d.), Mounds Plantation, Louisiana (Webb and McKinney 1975), George C. Davis and Sam Kaufman in Texas (Skinner and others 1969; Story 1972, Story and Valastro 1977), and Spiro and Harlan in Oklahoma (Bell 1972; Brown 1971, 1976; Brown *et al.* 1978) provide the majority of information with which to talk about Coles Creek-Caddoan relationships.

Western Coles Creek: The Concept

All of the sites mentioned above have some evidence of a Coles Creek ceramic complex. In addition,

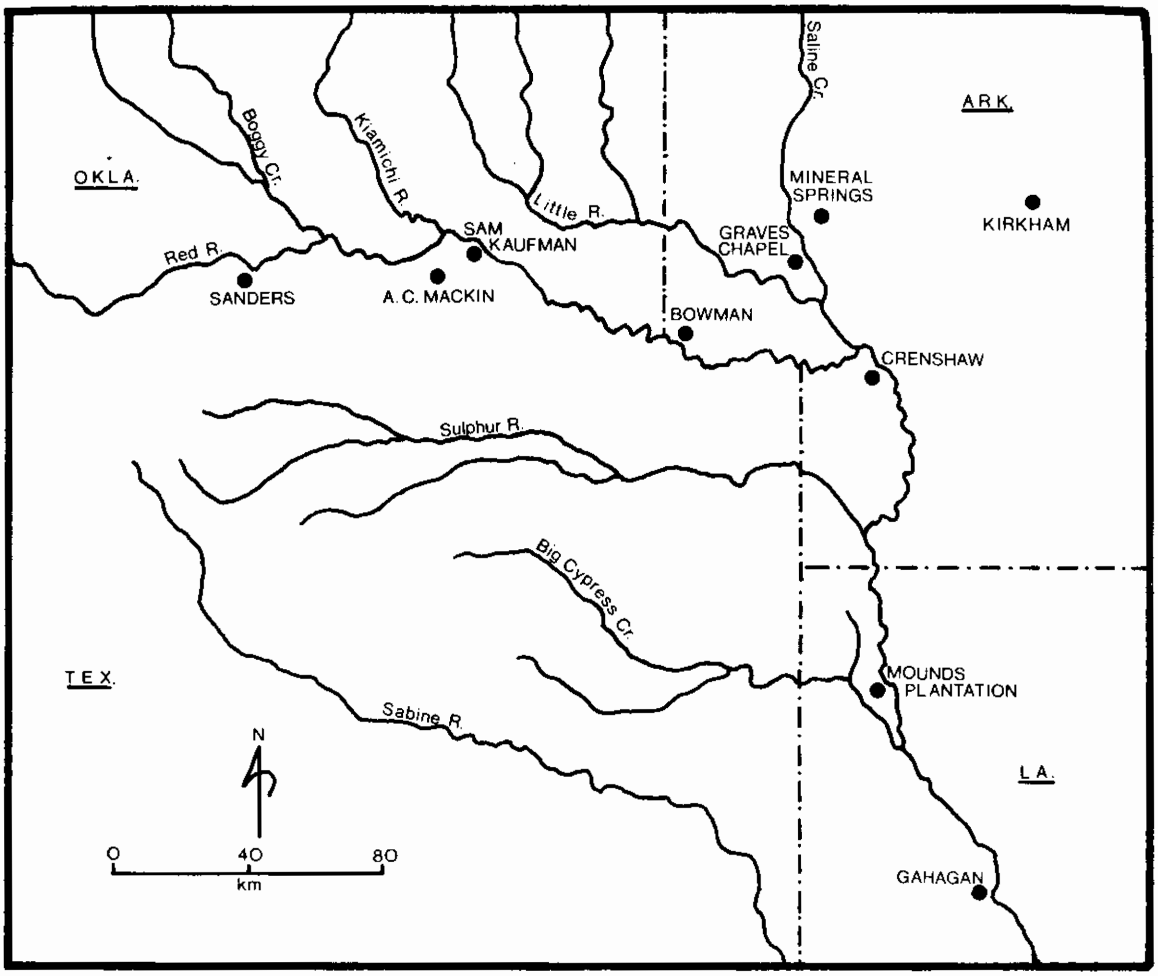

Figure 1. Sites mentioned in text from the Middle Red River Valley.

minor centers with burial mounds and smaller villages predominantly located along the Red River in Louisiana also have Coles Creek ceramics (Webb and McKinney 1975:123).

According to Webb and McKinney (1975:85-6)

> The Coles Creek ceramic complex, along the western margins of its distribution and before as well as during the Coles Creek-Alto transition, shows paste, color, and vessel form (carinated bowl, recurved and flaring rims, pear-shaped bottles without spouts) attributes that, heretofore, have been attributed to Caddoan ceramics . . . late Coles Creek and Alto ceramics, therefore, have a number of types in common and are more closely related than most students of the area have been willing to acknowledge.

This complex, in addition, differs from that defined from the Lower Valley in that wide lips and lip grooves are generally lacking in Coles Creek varieties here, with pigment present in the decoration lines (Webb 1961: 19), while the paste and temper (high percentages of bone tempering) characteristics are local not Lower Mississippi Valley (Hoffman 1971; Webb and McKinney 1975). The ceramics thus have a Caddoan flavor, but lack the engraving technique and have a Coles Creek flavor but are divergent primarily in vessel form. Interestingly, the view expressed by Webb above is a product of new study (compare with Webb 1961). Where once Webb would have been inclined to classify horizontal incised sherds as Davis Incised, a Caddoan type (Suhm and Jelks 1962), he is now apt to classify them as Coles Creek Incised (*var. Davis*).

While the terminological and classificatory problems loom large, the attributes presented by Webb indicate a distinct ceramic complex in the middle Red River from surrounding Lower Valley, Arkansas Valley and east Texas areas. This complex is dubbed herein *Western Coles Creek.* Parallel horizontal incised lines on ceramic vessels comprise the primary decorative modes in both Lower Valley Coles Creek and Alto focus utilitarian wares. At the far western margins of the Caddoan area in the oak-hickory savanna of Texas and Oklahoma, cross-hatched and diagonal incised lines are dominant in an early Caddoan context and parallel horizontal incised lines are mostly lacking (Mallouf 1976; Rohrbaugh 1973).

The Western Coles Creek complex occurs in primary context prior to diagnostic (engraved) Caddoan ceramic wares in the middle Red River. Where information is best, namely at Crenshaw, Mounds Plantation, and Spiro, this Coles Creek ceramic complex is predominant prior to A.D. 1000. Early Caddoan components at Crenshaw and Mounds Plantation, radiocarbon dated A.D. 1000-1050 (Valastro *et al.* 1975; Webb and McKinney 1975), overlie this material, while its occurrence during the Evans phase at Spiro and Harlan suggest an A.D. 700-1000 occupation

(Brown 1967). No radiocarbon dates, except at Crenshaw, have been obtained from these middle Red River Coles Creek components so it is not feasible to set a firm lower temporal limit for them. It is usually assumed, though, that this material is late Coles Creek, primarily because of the occurrence of Coles Creek Incised *var. Hardy* and *Blakely* (Phillips 1970). Since Coles Creek is considered to date between A.D. 800-1200, at least in the Yazoo Basin (Brain 1971), it would be inadvisable to assign a late Coles Creek date to this material, particularly since the few C14 dates on Lower Valley Coles Creek all fall in the A.D. 800-1000 interval (Phillips 1970; Valastro *et al.* 1975) irrespective of early and late Coles Creek ceramic designations. A reasonable guess of A.D. 800-1000 for the Western Coles Creek occupations is suggested.

Significantly, early Caddoan components in the mixed pine/hardwood and oak-hickory savanna areas along smaller river valleys such as the Kiamichi, Neches, and Big Pine Creek have also been dated prior to A.D. 1000 (Mallouf 1976; Rohrbaugh 1973; Story and Valastro 1977). Based on extensive radiocarbon dating at the George C. Davis site, a baseline date of A.D. 750-800 for initial Caddoan occupation is supported (Story and Valastro 1977:67), perhaps across the entire western fringes of the Caddoan area.

It is clear, therefore, that along the middle Red River (Fig. 1) Western Coles Creek components are contemporaneous with early Caddoan components in the hilly and smaller river valleys of east Texas (Early Village at George C. Davis) and eastern Oklahoma, and with Coles Creek components in the Lower Mississippi Valley. Early Caddoan components in the middle Red River follow the Western Coles Creek components and date after A.D. 1000.

The settlement pattern, as poor as it is presently known, is similar in structure between both Western Coles Creek and the later early Caddoan components within this section of the Red River. Ceremonial centers with large earth-moving projects characterize both components. The pattern is dispersed, with the three major ceremonial centers—Crenshaw, Mounds Plantation, and Gahagan—approximately equidistant from one another in the Red River floodplain and separated by a series of secondary or minor centers (those with one or two small mounds) and village sites in the floodplains and Tertiary uplands.

The ceremonial and mortuary customs, however, in Western Coles Creek occupations differ from Lower Valley Coles Creek as well as early Caddoan (pre A.D. 1000) mortuary behavior, as exemplified by Mound C at George C. Davis, and from the later Caddoan components in this section of Red River.

As Brain describes, burial interment was not elaborate, nor a special affair during Coles Creek times in the Lower Mississippi Valley. "Even at the larger mound sites, burials of all ages and sexes were equally consigned to the earth with a minimum of differential treatment (Brain 1978:343-4)". The burials were usually mass burials that had little or nothing in the way of burial grave goods. Their inclusion in mounds is considered to be almost incidental and not reflective of the mound's primary function (Brain 1971:69).

Early Caddoan mortuary customs established separate functioning burial areas, conical burial mounds, with ceremonial burials of individuals with presumably high status or rank, retainer sacrifice, and abundant grave goods in elaborately prepared and deeply excavated burial pits.

Along the middle sections of the Red River, the mortuary behavior in the Western Coles Creek components, as with the ceramics, have significant differences from either surrounding area. Specialized burial areas, in pyramidal, flat-topped mounds, were established at both Mounds Plantation (Mound 5) and Crenshaw (Mounds B and C). Large burial groups, with multiple burials associated with a paramount individual (Burial 6, Mound 5, Mounds Plantation) and retainer sacrifices, in prepared rectangular burial pits, are also known. Burial goods, however, are generally lacking in these specialized burials. Mass burials up to 18 individuals, extended and lined up in a large rectangular pit, are known from the Western Coles Creek component at Crenshaw (Durham and Davis 1975). These also have few burial goods.

Summary

The differences and similarities in ceramic wares, mortuary behavior, functional differences in mound usage, and settlement distributions between Coles Creek of the Lower Valley, early Caddo (pre A.D. 1000), and the Western Coles Creek components discussed here from the middle Red River suggest that its development is sufficiently divergent from the other areas to make typological pigeon-holing an unwarranted masking of the archaeological record. This development, while resembling adjacent cultural systems in terms of stylistic parameters, is considered herein an independent and contemporaneous cultural adaptation within a specific region or habitat of the Red River floodplain. It is separated from early Caddo and Lower Valley Coles Creek primarily in stylistic terms, mortuary behavior, and functional differences in mound construction and use.

The stylistic differences along the floodplain zone of the Red River appear to represent linear trends in stylistic innovation and change within a relatively homogenous ceramic complex. Within a broad style zone (*e.g.* Binford 1965) of horizontal incised ceramics continuous contact with spatial proximity influence the form of the ceramic tradition, such that distinctive stylistic parameters become apparent. The Western Coles Creek complex, obviously similar to Lower Valley ceramics, are sufficiently different to preclude incorporation into Lower Valley classifications directly. The same may be said for its relationship to contemporaneous Caddoan wares.

It is not clear what determines interaction between adjacent cultural groups, but proximity may not be the sole limiting factor. Nevertheless, if interaction between cultural groups is relatively constant, then it is to be expected that the amount of interaction would be inversely proportional to the distances between them (Plog 1976). In the Red River Valley, the alluvial floodplain of the lower Red and Mississippi River is the heartland of Coles Creek (Brain 1978). The Western Coles Creek complex is distributed from the area around Gahagan, near where the Red River enters the alluvial floodplain of the Mississippi, to the Fulton Bend, while early Caddoan ceramic complexes (pre-A.D. 1000) range from the Fulton Bend to the Sanders site area (Fig. 1). These "style" zones generally do not overlap and are relatively discrete. In a stylistic sense, the Western Coles Creek complex does exhibit intermediate stylistic attributes characteristic of adjacent areas which is reflective of its middle position along the Red River floodplain.

Montuary behavior, and related mound construction and utilization, suggest that it is worthwhile to discuss this Western Coles Creek area as a separate, but eventually Caddoan, entity within the Trans-Mississippi South. Caddoan occupations on major streams such as the Ouachita and Little Rivers (the Texarkana, McCurtain, Mid-Ouachita, Belcher, and Haley foci or phases), as well as post A.D. 1000 Caddoan occupations in the middle Red River are characterized by one or more major nucleated center, usually containing a number of platform and conical burial mounds, with a network of minor ceremonial centers and smaller dispersed hamlets (Wyckoff 1974). This is the general pattern for Caddoan occupations on major streams up to A.D. 1700. The continuation of elaborate ceremonial behavior and attendent mound construction in the middle Red River would suggest that the developmental trends in this area are part of a broad based interaction along the major rivers of the Caddoan area with weakening developmental relationships with the Plaquemine cultures. This interaction is further suggested to have increased over time as the Caddoan cultural systems stabilized. Why platform and burial mounds were no longer constructed in certain regions of the Caddoan area such as Northeast Texas and major portions of Eastern Oklahoma appears to be related to a deemphasis of social and ceremonial activities (e.g. Brain 1976), possibly the result of new increases in the productivity of the maize varieties adapted to the area.

The vast majority of exchangeable items in prehistoric Southeastern cultural groups ended up in ceremonial contexts, and are the primary basis for judging inferences about cultural contact. Correlating developments in subsistence strategies and elaborations in social and ceremonial activities might be utilized to suggest that discontinous patterns of exchange evidenced in Caddoan and Lower Mississippi Valley prehistory would be reflective of climax situations (Brain 1976) where exchange was a highly patterned and predictable activity, pursued by adjacent (though not always) cultural groups with similar adaptive strategies.

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Jack D. Nance

LOWER CUMBERLAND ARCHAEOLOGICAL PROJECT 1978

Introduction

Considering the amount of archaeological investigation in Kentucky over the last 50-60 years, one might expect most or all portions of the state to be fairly well-known by now. This is certainly not the case and one of the least known areas of Kentucky is the extreme western part, the region of the lower Tennessee, Cumberland and Ohio Rivers. There are historical reasons which perhaps account for the fact that this portion of Kentucky has been almost ignored by prehistorians (Nance 1976a).

The region is somewhat unique in that several of the continent's major waterways meet here. Given the importance of waterways as aboriginal communication channels, it appears likely that the archaeological potential of western Kentucky has been underrated to a very great extent. The presence of many important sites here (Funkhouser and Webb 1932) attests to the fact that the potential of this area to yield important information about prehistoric southeastern cultures has been vastly underestimated. This is especially true for later cultures and no doubt holds for earlier manifestations as well. The Lower Cumberland Archaeological Project (LCAP) in one important respect is an attempt to begin to tap the considerable archaeological potential of extreme western Kentucky.

No definite results are reported here because our analyses have just begun. However, it is my firm conviction that on-going research needs to be reported as quickly as possible. Thus, this report should be considered "preliminary".

The Lower Tennessee-Cumberland Area

The area of extreme western Kentucky may be divided into three major units (Fig. 1). Jackson's Purchase represents the northermost extension of the Gulf Coastal Plain (Mississippi Embayment). The area lying between the Tennessee and Cumberland Rivers is known as "Land Between the Lakes (Rivers)". This zone marks the transition from the Embayment to the west of the Tennessee River and the Mississippian Plateau to the east of the Cumberland. Although several significant natural zones may be defined within

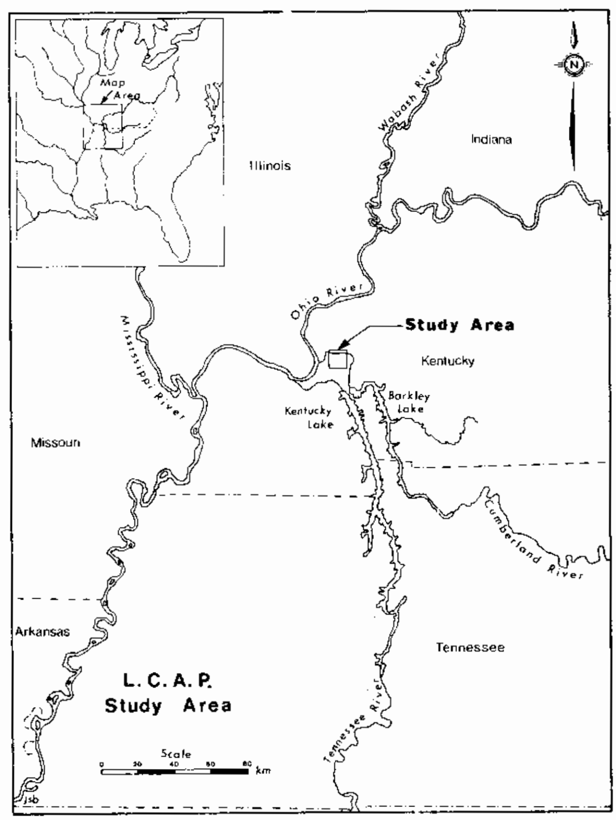

Figure 1. Location of 1978 LCAP study area.

this region (McFarlan 1943), here I shall confine my attention to three which are of direct relevance to 1978 LCAP field work.

For present purposes the lower Cumberland region (Fig. 2) may be defined as an irregularly shaped drainage area lying astride the Cumberland River from Barkley Dam to the Ohio River (approx. 45 km channel distance). The western boundary is the Tennessee Valley Divide. The eastern/northern boundary is the limit of drainage into the Cumberland, of streams flowing over the surface of the plateau to the east and north of the river.

Owing to the fact that it has downcut into the limestone bedrock underlying the area, the Cumberland is contained within a narrow floodplain reaching a maximum width of 1.5-2 km. This width is attained only in limited areas, however. The eastern floodplain boundary is marked by limestone bluffs, in some locations up to 90 m in height.

Along streams which have dissected the surficial deposits to the west and south of the Cumberland lie fingers of relatively level land blanketed with Quaternary alluvium. These gently sloping surfaces extend as much as 6-8 km into the upland and are oriented roughly perpendicular to the flow of the river. Surrounding these upland alluvial areas are hills and knolls at elevations greater than about 115 m above sea level and rising to a maximum slightly in excess of 150 m.

Earlier investigations upstream, beyond Barkley and Kentucky dams, have shown that the river floodplain and the elevated alluvial areas are frequently the locus of Archaic (and other) sites. No Archaic sites are recorded for the Plateau in this immediate vicinity and until 1978 no attempt had been made to ascertain the density of prehistoric remains in the hills and knolls.

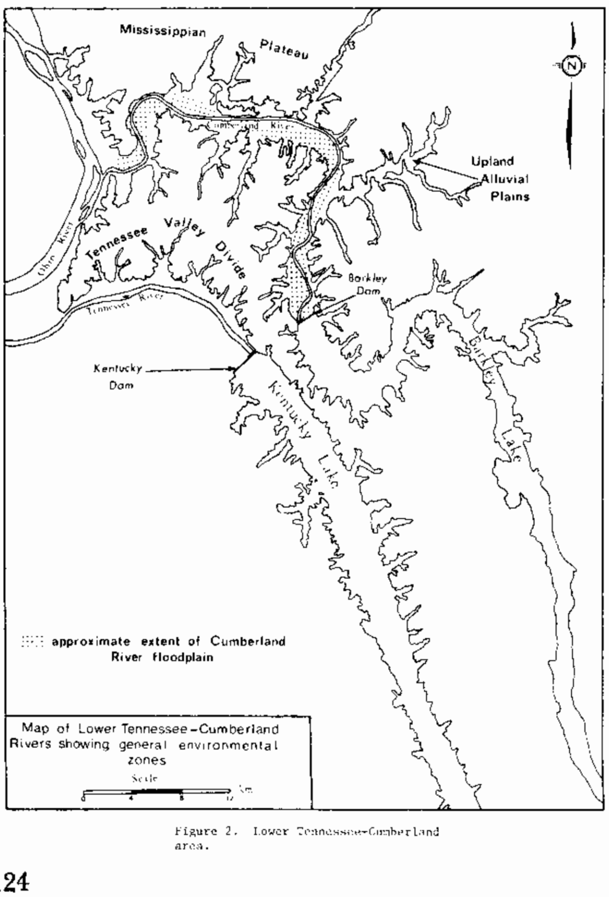

Figure 2. Lower Tennessee-Cumberland area.

Past Archaeological Research

The earliest references to archaeological remains in west Kentucky may be found in the writings of Rafinesque (1824), Moore (1915), Collins (1874), Marshall (1824), Loughridge (1888), Young (1910) and Thomas (1894). Nance (1976a) has summarized past archaeological research in this area. It is worth noting here that modern investigations have been restricted to areas upstream from the study area of LCAP. This work has mainly been salvage, associated with hydroelectric and flood control projects in the late 1930s and early 1940s (Webb 1952) and late 1950s and early 1960s (Schwartz, Sloan, Griffin 1958; Coe and Fischer 1959; Clay and Schwartz 1963; Schwartz and Sloan 1959) and highway construction from the late '60's to the present (Hoffman 1969; Allen 1973, 1977; Mocas 1977; Schock *et al.* 1977; Schock and Wyss 1970). Early on Webb and Funkhouser undertook investigations in the area (Webb 1929, 1952; Webb and Funkhouser 1929, 1931, 1933; Funkhouser and Webb 1931, 1932).

Although many prehistoric sites have been discovered, interest has centered mainly on ceramic bearing components and investigations have been for the most part oriented toward "floodplain archaeology" (Nance 1977). Nance (1972, 1975, 1975a, 1976b, 1979) carried out brief research investigating small, mainly Archaic, sites in an upland zone west of the Cumberland in Land Between the Lakes. Portions of that work may be seen as the stimulus for LCAP.

Lower Cumberland Project: Background and Objectives

The lower Cumberland project was conceived in 1976 as a means of extensively investigating the numerous, small, limited-activity sites associated with the later Archaic occupation of west Kentucky. Such sites have been all but ignored in eastern prehistory. Major syntheses of Archaic in this part of the continent have little more than hinted at their existence (e.g., Lewis and Kneberg 1959; Dragoo 1975; Caldwell 1958; among others). The project reported here is generally founded upon the idea that these small, unspectacular loci may contribute substantially to our knowledge if they are approached collectively and studied in an appropriate manner.

Small sites appear to have a distinct research potential since they represent accumulations over short periods of time usually, and for the most part represent but a small portion of the annual cycle of the group using the site (see also Talmage and Chesler 1977; Moseley and Mackey 1972). By and large, therefore, they promise to be relatively "pure". That is, individual sites may be little affected by factors such as shifts in adaptation or extensive superposition of activity areas which may be associated with the temporal variable.

Specifically, I have proposed (Nance 1977) that study of distributions of individual artifact types and joint type occurrences among the members of systems of such sites may well contribute to an understanding of "cultural formation processes" (Schiffer 1972, 1976). One major objective of LCAP is to foster development of methods of "small sites archaeology" in an attempt to advance understanding of cultural formation processes, knowledge of which is a prerequisite to interpretation of artifact assemblages occurring in "small sites".

General Objectives of LCAP

In the broadest terms our objectives for 1978 field work were to establish a baseline from which progress toward the goals of small sites archaeology could be made. The overall objectives of LCAP are to:

1. Establish a reliable cultural chronology, especially as relates to Archaic materials;
2. Ascertain through regional sampling methods estimates of the relative density of prehistoric usage of different environmental zones in the study area and identify major biases inherent in sampling in an area characterized by variable conditions of surface visibility and intense, long-standing modern cultural activity;
3. Initiate systematic investigation of Archaic sites in the region in an effort to relate west Kentucky Archaic to "classic" Archaic elsewhere in the mid-south;
4. Begin lithic resource studies including geologic studies to identify potential availability of lithic sources, and technical and nontechnical examination of various chert resources aimed at characterization of aboriginal quarry sites;
5. Instigate paleonenvironmental studies by exploring for potential pollen-bearing sediments and other means;
6. Develop "small sites" archaeological methods which will aid the investigation of cultural formation processes.

Below I shall briefly comment on some general considerations of the areal prehistory, Archaic chronology and extra-areal relationships, and present a description of the methods which were employed during our 1978 field work and some preliminary results which were obtained.

Chronology

There are complications when chronological control is sought among small, limited-occupation sites. Materials datable by radiocarbon are often absent and although many larger sites in the region yield diagnostic artifact forms (mainly projectile points) which are useful in relative dating, such items are often missing in small, limited occupation/activity sites. We are therefore seeking time-sensitive variation in "nondiagnostic" materials which occur universally. Temporally varying use of different chert sources may be one fruitful avenue of exploration. In 1978 we collected considerable quantities of lithic debris and are currently engaged in examining this material for fossil content and other characteristics (see Chert Resource Survey).

Remains that might be assigned to early Archaic or transitional Palaeoindian/Archaic phases are known from the area. For example, Rolingson and Schwartz (1966) have reported Dalton, Cumberland and Quad points along with unifacial scrapers, "knives" and gravers from two sites in Lyon and Trigg counties.

However archaeological syntheses of the area (Clay and Schwartz 1963; Allen 1973) suggest that most Archaic remains in the area represent later Archaic components (e.g., Ralls and Wallace sites [Coe and Fischer 1959]). Similarly, several components on the Plateau east of the Cumberland have revealed later Archaic materials (Schock and Wyss 1970; Schock *et al.* 1977). These sites have yielded mainly a variety of straight- and contracting-stemmed projectile forms and have been identified with late Archaic phase (Ledbetter and Big Sandy) remains to the south in Tennessee (Clay and Schwartz 1963; Coe and Fischer 1959; Allen 1973).

However the absence of mid-Archaic components is probably more apparent than real, and a result of a lack of systematic research. Mocas (1977), for example, has reported on a component (Lawrence site: TR-33) yielding abundant Kirk materials with associated radiocarbon dates clustering around 5,000-5,400 B.C. On our final day in the field, we visited a large site, with deep deposits and massive firehearths eroding from floodplain deposits of the Tennessee River. Local collectors have gathered copious amounts of Kirk material from this site. Similarly, our limited excavations at LCAP site 52 revealed a component yielding predominantly Big Sandy (side-notched) projectiles, incorporated 40-50 cm into Sandy terrace deposits along the Cumberland. Finally during our 1978 field work we viewed numerous collections originating from various parts of Jackson's Purchase. Several of these contained Kirk, Big Sandy and, occasionally, Eva II points. Many others contained a wide variety of straight- and contracting-stemmed forms, known to be late Archaic in this area. It thus appears that the complete range of Archaic materials is represented in west Kentucky.

Relations With "Classic" Archaic

Successfully relating west Kentucky Archaic to Archaic manifestations in surrounding areas is a task which may take several years. Based on present impressions, however, some speculation is possible. There are various factors (such as the possible presence of components buried in floodplain deposits) which must be taken into account when Archaic in west Kentucky is considered. These kinds of considerations relate primarily to earlier materials, however (Nance 1977). Later Archaic materials, visible on the surface, abound in this region.

The limited data available permit the suggestion that later Archaic manifestations in this region (Schwartz, Sloan, Griffin 1958; Coe and Fischer 1959; Nance 1972, 1975, 1976a, 1979; Schock and Wyss 1970; Schock *et al.* 1977) differ remarkably from contemporaneous components nearby in Tennessee (Lewis and Kneberg 1947, 1959; Lewis and Lewis 1961) and farther east in Kentucky (Webb 1950a, 1950b, 1951).

Late Archaic "shellmound" and other protracted-habitation sites appear to be absent. The later Archaic occupations appear to be represented by abundant, but briefly-occupied sites, associated with numerous small, temporary limited-activity camps. None of these exhibit the variety of remains common to larger, more intensely and longer-occupied sites occurring in surrounding areas.

In general, the picture presented is one lacking any marked degree of sedentism. "No evidence of structures has been discovered. Burials have not been reported. Items of personal adornment and ritual items are nearly absent. Interestingly, even the legendary " 'bannerstone' . . . is infrequent so far. In short, small, highly mobile groups with a transitory settlement pattern are indicated; all artifactual remains reported to date are portable and/or expendible" (Nance 1977:8).

These observations, based on limited evidence, suggest that the sites are the result of, at most, seasonal occupation.

Further speculations about these matters are probably best reserved until more extensive investigations have taken place. It is of interest to ask, nonetheless, why shellmounds are absent, given their frequent occurrence in relatively nearby areas. Such sites are usually visible enough for me to suppose that if Archaic shell middens were present in the area, at least one or two would have been found by now.

Explanations involving buried late Archaic materials appear generally untenable. Late Archaic remains visible on the surface abound in the region. To argue that late Archaic shell mounds are buried under floodplain deposits would be to argue for selective burial. Similarly, it appears unsafe to argue that the shell mounds have been removed through erosive river action because, again, one would have to argue for selective erosion.

My present explanation for the absence of late Archaic shell middens is contingent upon the apparent fact that most species of shellfish exploited by Archaic groups (in west Kentucky at least) were shallow-water species (Marquardt and Watson 1976; Patch 1976). Although the rivers have probably changed substantially over the last few thousand years, especially during the last few decades (Walker 1957; Gallaher 1964), presently the lower reaches of the Tennessee, Cumberland and Ohio do not appear to provide extensive habitats favorable for shallow-water shellfish because of deeper water and substantial sedimentation. Thus, given Archaic technology, it may be that conditions in the lower parts of the river valleys simply made exploitation of shellfish resources impossible or impractical. On the other hand, it could be the case that if later Archaic utilization of this area was seasonal and transitory, the inhabitants may have been there at the wrong season (i.e., during winter and spring high water periods) for access to shellfish. Such a possibility suggests that the true "home" (i.e., longer-occupation sites) of these groups may have been in other areas. Such a possibility may also be suggested by the character of known late Archaic artifact assemblages referred to above.

Supporting an "inaccessibility hypothesis" in this regard may be difficult in view of the fact that impromptu observations at several Mississippian sites in the area have shown that later groups did exploit shellfish resources. However, to my present knowledge, no analyses of the species of shellfish utilized by later inhabitants have been accomplished. Until such analyses have been performed, revealing the possible methods of exploitation employed, these observations have little meaning. It is interesting in this regard, however, to note that the Mississippian sites give the impression of having been "permanent" habitation sites, that is, these groups would presumably have been present in the area during low-water periods when shallow-water species were accessible. Such questions may be realistically approached through studies of shell from the sites (Ham and Irvine 1975). I am presently seeking funds to commence studies of shell remains in these later sites.

Regional Sampling

To contemplate extensive study of systems of sites is to presuppose information about the distribution of cultural remains over different environmental zones in a region and an understanding of the environmental factors which may act to bias attempts at archaeological sampling. These kinds of data are best sought from a regional sampling perspective. Thus the sampling procedure which we employed was a variant of regional sampling.

Selection of the Sampling Area

To initiate regional sampling the area along a small spring-fed tributary of the lower Cumberland was selected as a case study (Fig. 3). Selection of this area was based on several considerations arising largely from the P.I.'s experience in the area: (1) the stream (Hickory Creek) is spring-fed, providing a permanent water source; (2) a large proportion of the area is under cultivation, thus facilitating search procedures; (3) all parts of the area are easily accessible and in proximity to field headquarters; (4) a preliminary visit in December 1977 had shown most landowners/tenants to be kindly disposed toward our work.

The boundary of the sampling area was taken as the approximate limit of drainage into Hickory Creek. In the river floodplain zone, however, the east and west boundaries were arbitrarily defined by projecting the east and west boundaries of the total sample area to the river.

Sampling Design

The area identified above was stratified into three zones, each regarded as an independent sampling domain. Stratum boundaries were determined by the generalized distribution of Quaternary alluvium as delineated on U.S.G.S. 7.5 minute topographic sheets and Geologic Quadrangles (G.Q.'s). Stratum 1 repre-

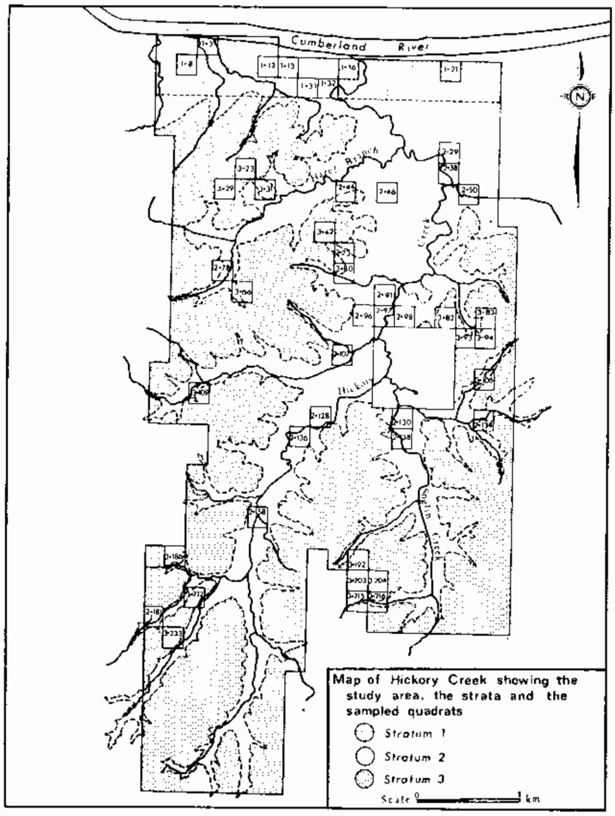

Figure 3. LCAP 1978 sampling area, sampling strata and quadrants examined.

sents essentially the Cumberland River floodplain. Stratum 2 represents the approximate limit of the Quaternary alluvium along streams at elevations above the river floodplain and stratum 3 is the for-the-most-part forested upland.

A 200 m grid was superimposed over this area and sample quadrats were selected within each stratum by means of a random number generator (Hewlett-Packard 1975). Table 1 presents data on population sizes, sample sizes and first-stage sampling fractions for each stratum.

In all random sampling designs certain practical considerations interfere with selection of a truly random sample. Our procedure was no exception. For example, when a quadrat was selected where we had been denied entry it was necessary to (randomly) select another unit. In some cases where it was known in advance that an owner was unalterably opposed to our entry, that property was excluded from the sample area before sample quadrats were selected. For these kinds of reasons our sample must be regarded as only "approximately random".

Quadrat Size

Perhaps one of the more unique aspects of the LCAP sampling design is the use of what might be considered unconventionally small sampling units. There are several practical reasons for the use of a 200 m grid rather than the more conventional 400 or 500 m units employed in archaeological sampling exercises reported elsewhere (e.g., Dye 1977; Thomas 1969; Judge, Ebert, Hitchcock 1975; Matson and Lipe 1975). Some of these reasons are outlined below:

1) The sampling area has small dimensions. Small quadrats conform better to stratum boundaries under these circumstances;
2) Smaller units have a beneficial psychological effect on field-crew members—they appear more manageable than large units, especially in those cases (as frequently happened in strata 2 and 3) where vegetation cover is heavy;
3) Given our objective of obtaining detailed information on the conditions under which sampling was undertaken, small units seemed appropriate, that is, they are convenient to map;
4) Landowners appeared generally more receptive when they learned that our activities were to be restricted to a very small area on their property;
5) Since the sampling area was small and access to all areas was easy, travel time between units was negligible.

Table 1. Population and sample sizes and first stage sampling fractions for the Hickory Creek sample.

Stratum	Pop. Size	Units Examined	First Stage f
Floodplain	40	8	.20
Elevated Alluvium	194	20	.10
Uplands	271	19	.07

Search Strategy

Quadrat corners were located on the ground by taking distances and bearings from landmarks (buildings, etc.) on U.S.G.S. topo maps and employing compasses and 100 m tapes to establish datum points in the field. Each quadrat was divided into three sections (Fig. 4): 1) the east half of each unit (100 x 200 m) was surveyed in the conventional manner of searching the surface for cultural materials, looking for exposures, etc.; 2) the southwest quarter (100 x 100 m) was subsampled by a "random walk" procedure. Sixteen randomly placed 1 x 1 m units were excavated to an approximate 10 cm depth and the proceeds of these units were passed through a 6.4 mm screen; 3) the northwest quarter of each quadrat was treated in the same manner except that the 16 test pits were systematically located. Prehistoric cultural items recovered from test units were bagged and labelled with stratum, quadrat, search strategy (random or systematic), subunit number and a "site" number reflecting the sequence of discovery. Cultural material discovered in the conventional survey section of each quadrat was mapped into place and labelled with similar information.

The procedure for locating the 16 randomly placed units was not a true random walk procedure. The units were initially located on paper by random selection of x and y coordinates within the southwest quadrant of the primary sampling units. From these coordinates distances and bearings were computed which permitted location of the corner of the quadrat; the corner of the second-to-be-excavated unit was located from the first-excavated unit and so on. Hence the units were not examined in the order in which they were selected. The above procedure obviated the construction of a grid-work on the ground and permitted relatively rapid and efficient subsampling. Two

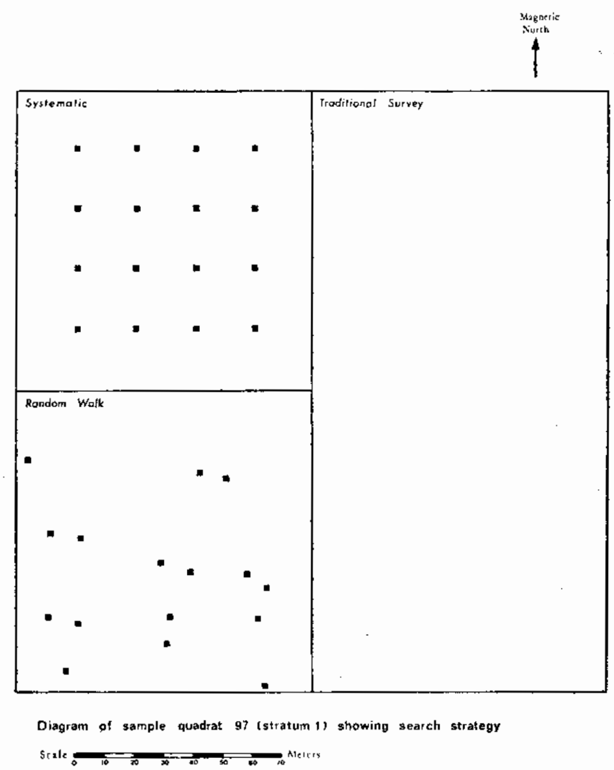

Figure 4. Search strategy employed in regional sampling.

days practice before "real" work began was sufficient to familiarize the field crew with these field procedures.

Finally, as each quadrat was subsampled and surveyed, it was mapped to obtain information on site locations, general topography, modern cultural features (i.e., presence and location of structures, roads, cultivation), kind and extent of ground cover, location of streams, etc. This information, which was rapidly obtained, is permitting us to conduct detailed examination of factors which might introduce bias into our sampling efforts and is permitting a number of different kinds of sampling simulations which promise to yield useful information. For example, given the objective of acquiring knowledge about the region (and not just about archaeological sites), we may now perform random point sampling of the quadrat maps and obtain truly quantitative comparisons over a broad range of conditions existing within and among the sampling strata. As another example, consider that in cultivated areas it was of course not necessary to excavate test units to discover cultural material. But since the location of cultural materials was plotted on the quadrat maps, we may superimpose random or systematic test pit locations upon the quadrat maps and obtain good estimates of the number of such units which would have intersected the locus of cultural items. Hence we are able to continue field work on paper, in essence.

Preliminary Evaluation of the Sampling Design

An extensive evaluation of our regional sampling design and field tactics cannot be undertaken here because our analyses are incomplete at this point. However some general observations are in order.

Generalizing Relationships Among Strata

As noted above we will ultimately conduct truly quantitative analyses of the sample units examined in 1978. Presently, however, only an examination based on qualitative information is available.

The three strata of the sample area grade one into the other. Therefore the sample quadrats may be perceived most accurately as having been drawn from a continuum of variation. This being the case, it is desirable to examine the data by a procedure which permits a description preserving this inherent characteristic.

For each sample unit we have observations relating to discovery of prehistoric cultural materials, topography, modern cultural factors, ground cover, proximity to water sources, geologic zone, etc. These variables, with the sole exception of geologic zone, were defined independently of those utilized to delineate stratum boundaries. Observations on the presence or absence of each of these attributes were utilized to obtain a measure of similarity (Simple Matching Coefficient [Sneath and Sokal 1973:132-133]) between all pairs of quadrats over all strata. The resulting similarity matrix was subjected to a principal coordinates analysis (Gower 1966) using the "GOWER" and "FACTOR" programs included in the NT-SYS package from SUNY, Stony Brook (Rohlf, Kishpaugh, Kirk 1974). The results of this procedure are portrayed graphically in the ordination diagram in Fig. 5 which shows similarity relationships among the 47 sample quadrats along the two major dimensions of variation in the similarity matrix.

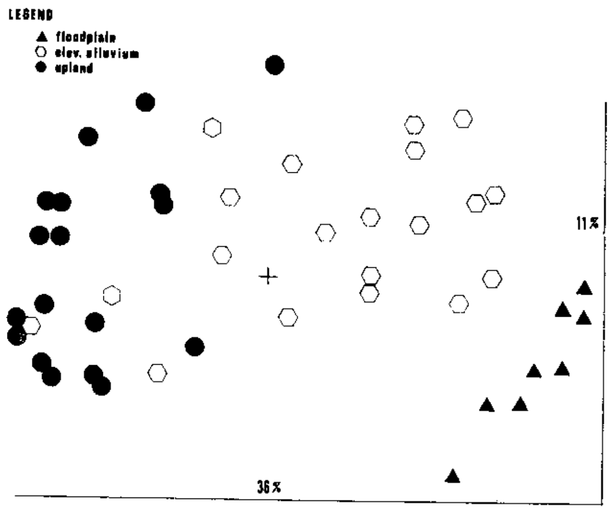

Figure 5. Two dimensional ordination diagram of principal coordinates analysis of Simple Matching Cooefficients among 47 sample quadrats examined in the Hickory Creek area.

From this diagram it is clear that units within strata are similar. It appears, therefore, that our stratification criteria were reasonably effective in delineating independent sampling domains which are internally homogeneous. Not unexpectedly strata 1 and 3 reveal the least inhomogeneity while stratum 2 units cluster less-markedly, no doubt a result of greater variability in conditions in this zone. A tendency for some intermixing of units from strata 2 and 3 apparently reflects gradation of conditions between these two zones. The transition from stratum 1 to the higher-elevation strata is of a more abrupt nature.

The horizontal axis of Fig. 5 accounts for about 36% of the variation in the original similarity matrix. Units clustering toward the right (positive) side of the diagram may be generally described as units from strata 1 and 2 on level alluvial surfaces in proximity to a permanent water source and under cultivation. Both large and small sites were discovered ("large" sites were observed only in stratum 1). Prehistoric material was frequently found using conventional survey methods. Quadrats on the negative end of the scale represent units from stratum 3 mainly, but also from 2. These are forested, elevated alluvium and hill units with intermittent streams. Discovery of cultural items was infrequent.

The second (vertical) dimension of the scattergram accounts for about 11% of the similarity matrix variation. Units on the positive end of this dimension include quadrats from strata 2 and 3 which were drawn from areas that tend to be unforested but in pastureland. These are units away from the River or a permanent water source, often encompassing alluvial surfaces. Conditions were such that discovery of small sites was possible. Large sites do not occur. Culture items were discovered by conventional survey and test pits.

In contrast, units on the negative end of this dimension represent a variety of characteristics. They are predominantly forested (except for stratum 1) with intermittent streams. Occurrence of cultural materials is not frequent (except in stratum 1 units). Elevated alluvial areas are represented as are river floodplain locations. Stratum 2 and 3 units are for the most part forested and hilly and removed from permanent water sources and probably represent areas generally unfavorable for site locations.

A third unillustrated axis accounts for about 10%

of variation in similarity. Quads which are positive are mainly from stratum 2. These represent flat to undulating alluvial surfaces along intermittent streams. They are largely under cultivation (about 60%) and generally failed to yield evidence of prehistoric activity. Many of the stratum 2 and 3 units with positive scores on this dimension are probably the unforested counterparts of units with negative placement on the second dimension above. Negatively placed quads are primarily from strata 1 and 3 and represent units mainly in forest and pasture where prehistoric material was found more frequently than above. Surfaces are flat (stratum 1 units) to undulating and include hills.
In summary:

1. Large sites occur on flat Quaternary alluvial surfaces immediately adjacent to the river (floodplain). (These sites are located atop linear ridges oriented parallel to the river channel.) This area was predominantly under cultivation.
2. Regardless of the search procedure employed, prehistoric cultural material was most frequently found in flat areas under cultivation within units containing a permanently-flowing stream or where the quadrat was in proximity to some permanent water source.
3. Undulating to hilly upland areas, presently forested or in pasture, with intermittent streams most often failed to yield evidence of prehistoric activity.
4. Small campsites and thin scatters of culture items occur on alluvial surfaces along Hickory Creek at elevations higher than large sites (floodplain). Large sites do not occur in this zone which is largely unforested and cultivated. Modern cultural features tend to occur in this zone.
5. Elevated alluvial areas around intermittent streams yield prehistoric materials only infrequently.

None of these findings are remarkable or even surprising. What may be surprising, however, is that 88% of the units in stratum 1 yielded prehistoric remains; 70% of stratum 2 units yielded such remains. In stratum 3, 35% of our sample units yielded prehistoric remains. It is obvious that the hill and knoll zone contains numerous potentially exploitable resources which were no doubt utilized prehistorically. Our data seem to support this assertion.

Statistical Comparisons

The sampling and search designs employed permit analyses of sample results utilizing several different approaches. Each of these approaches yields a different kind of information. For example, from one perspective each sample unit may be viewed as having been subjected to two different search procedures. The west half was examined by test pits, the east by conventional means. Use of a "paired-comparisons" statistical model will permit an assessment of the effectiveness of the two practices in locating cultural materials.

On the other hand the 16 (or 32) test pits dug in the two quarters of the quadrats may be considered a series of cluster samples drawn from each stratum. Hence by counting the number of units yielding cultural items in each cluster sample and manipulating these observations with the proper cluster sampling formulae (Cochran 1963:64-70; Kish 1967:148-173) estimates of the density of cultural materials over various strata may be obtained. Table 2 presents data on the proportion of test units in cluster samples of 16 (random quarter) units yielding cultural items for each stratum.

Non-site Sampling

In areas of limited surface visibility, or where conditions of surface visibility vary markedly, these kinds of density estimates are more appropriate than are estimates involving site frequencies because frequency estimates assume a complete search of every sample unit. Where this is not a realistic expectation, estimates will be imprecise and inaccurate. Subsampling with small subunits (here 1 x 1 m) is biased toward location of sites with large surface areas (Nance n.d.), and therefore introduces bias into site frequency estimates. Expressing density in terms of the proportion of test units intersecting the locus of cultural materials avoids this source of bias.

It must be explicitly understood that the subsampling plan described here is an example of "nonsite" sampling (Thomas 1975). The purpose of this type of sampling is to provide information on the region in terms of the density of cultural materials over various sampling zones and not about archaeological sites, *per se*.

Our regional sample plus informal survey did, however, result in the location of numerous clusters of cultural remains and/or midden deposits which are definable as archaeological sites. For those sites occurring outside our formal sampling area limited surface collections were obtained by selective collection techniques. Processing of these materials has not progressed sufficiently to permit description of the sites. Archaic, Woodland and Mississippian components are included among a total of more than 50 sites. These data will constitute the substance of a separate survey report.

PR and Random Quadrat sampling

In this part of North America little land is publicly owned and many formerly large tracts of land, owned by a single individual, have been subdivided among members of various generations. Often small parcels are sold off when owners cease to till the land. Small family farms have always been the rule in west Kentucky. This means that one must deal with a large number of landowners in this area.

To compound this problem even further, in recent years "agribusiness" has arrived on the scene so that not only must one approach owners for permission to enter land, but also land lessors who own the crops being grown on the subject acreage. Frequently during our 1978 field work at least two generations of owners in addition to a lessor had to be tracked down and

Table 2. Proportion of test units yielding prehistoric cultural items over three strata, Hickory Creek sample.

Stratum	Proportion of Subunits Yielding Cultural Remains
Floodplain	.32
Elevated Alluvium	.07
Uplands	.01

approached. The director of the project spent a major portion of the field season in this pursuit, learning a great deal in the process.

Thus, an indispensible element of LCAP '78 was the U.S. Department of Agriculture A.S.C.S. office. A.S.C.S. offices maintain files of small scale aerial photos upon which landowner boundaries are superimposed. Each farm has a number and that number is cross-referenced to the farm owner's name. Hence learning landowners' names and locating property boundaries in a given area was a reasonably simple procedure. Landowner boundaries from A.S.C.S. photos were redrawn onto 7.5 minute topographic maps and this served admirably to let us know upon whose property a randomly selected quadrat was located.

An initial attempt to contact all landowners in the sampling area showed this approach to be excessively time-consuming. Because of our sampling design, however, we only needed to contact those owners on whose property selected sample units were located. This results in a substantial time saving.

There is considerable interest in prehistory in western Kentucky and Livingston County. At the same time, there exists some suspicion among many residents (especially older landowners) that archaeologists may be after more than artifacts and soil samples. Specifically, there has been some mining (for fluorspar; Hook and Clark 1962) in the region. On occasion our purposes could have been, or rather were, misunderstood. In several instances it was necessary to dispell the idea that we were surveying for oil, fluorspar, gold or other minerals.

Procedure was, therefore, to explain in some detail exactly what our procedures were. In several cases where permission to enter land was denied upon initial contact, the decision was reversed after explanation employing diagrams, etc., of our purposes and procedures. As indicated above, landowner attitude seemed to be better when it was discovered that we were actually interested in small patches of land rather than proposing to range aimlessly over a farm. We had a reasonably complex procedure worked out for locating sampling units and examining them. In general, landowners seemed to have been favorably impressed with our specificity of purpose and research design; we obviously knew what we were after and how to go about going after it. In only one instance was permission to excavate our test units denied. Thus, there appear to be practical, "non-archaeological" benefits to working with an explicit set of procedures which can be communicated to landowners in straightforward terms.

Surface Collection

Although the relationship between total site content and surface materials is not clear-cut and various difficult-to-assess factors may affect the composition of the assemblage occurring on the surface of a site, surface collection does provide useful, albeit limited, kinds of information about the sites in a given region. As such, this procedure is an integral part of site survey and regional sampling methodologies. We therefore made a concerted effort to obtain extensive surface collections from sites located during our regional sampling exercise.

Originally our intent was to surface collect every site discovered completely and intensively and surface sample those with vegetation cover by test pitting. However it quickly became obvious, given the number of sites located, variability in surface conditions, time and number of people available, that such objectives were overly ambitious. We therefore adopted a more practical policy which should benefit our future work.

Where sites were located in cultivated areas surface collections were amassed by systematic search for materials. The procedure was to search site surfaces with 4-8 people walking at one meter intervals flagging individual items with survey pins. Once this task was completed an estimate of the area of item scatter could be made. Subsequently all flagged materials were collected, bagged and labelled. This procedure permitted adequate, rapid coverage of sites of small to moderate size with low to moderate densities of materials, at the expense of maintaining control over extact intra-site provenience.

For larger sites, on the river floodplain, site boundaries were defined by flagging surface materials in the above-described manner. The surfaces were then sampled with systematically or randomly selected 2 m sampling units. Subsequent to sampling in this manner, the sites were systematically surveyed in conventional archaeological fashion and all recognizable artifacts collected.

When it became obvious that complete, intensive surface collection would be a monumental task, the decision was taken to collect a limited number of sites in a manner which would permit us to use the data to conduct sampling experiments directed at determining possibly optimal methods of sampling site surfaces where complete surface collection proved impractical. To that end several (5) sites were completely and intensively collected by flagging all surface material, establishing a datum (or more than one) and obtaining the exact point provenience for each object (distance and bearing from datum) through use of transit and 100 m tapes. Artifacts were then collected and placed in individual plastic bags along with a card bearing site and artifact number and distance and bearing from datum. The material from one site has been processed and Ball (1978) is engaged in producing computer-generated data point and proximal maps using a data-conversion program and SYMAP (Dougenik and Shehan 1976).

The analyses of these surface collections are only beginning, therefore conclusions are unjustified presently. However, it is clear from the preliminary results that the spatial distributions of artifacts and other materials exhibit very definite clustering (Ball 1978), in spite of the fact that the sites have been under cultivation for some time. Ball, in collaboration with T. Peucker of the SFU Geography Department, has also developed a program which will permit us to superimpose a grid of variable size over site surfaces and study the behavior of various statistical quantities when site surfaces are sampled using collection units of different dimensions. Our ultimate purpose is to define a variance function describing the relationship between size of unit and magnitude of error estimate (Cochran 1963:244-245). We will also compare observed spatial distributions with several hypothetically derived statistical distributions. Examination of departures from the hypothetical distributions should permit us to assess the effects of cultivation on surface distributions and develop a general model which can be used to characterize surface distributions on small sites.

Chert Resource Survey

A second important aspect of LCAP '78 was initiation of a systematic study of chert resources with a long-range view toward eventual identification of sources used for fabrication of prehistoric artifacts. Our long range objectives include:

1) identification and location of chert-bearing formations and outcrops in the region;
2) location of aboriginal quarries;
3) macro-micro/thin-section examination of samples from various outcrops and quarries;
4) neutron-activation characterization of at least major aboriginally-utilized sources.

While all of these objectives require several years of research, I shall summarize our finds to date.

An initial survey of chert exploitation potential over the area was undertaken by Tom Gatus (Gatus 1978) of the Kentucky Heritage Commission. This survey may be seen as part of a larger-scale, state-wide project (Gatus and Maynard 1978). We feel that the cooperative effort will benefit both LCAP and archaeology in Kentucky and the mid-south generally.

Prior to coming to the field Gatus performed a preliminary study of G.Q.'s to identify potential areas of outcrop. During the first week of August these areas were visited and bedrock or residual samples collected. In addition, periodically over the field season various personnel made spot checks for outcrops, chased down leads from local residents, performed informal survey for quarry sites and checked stream beds. One member of the sampling crew was always vigilant for potential chert sources during sampling operations. Two trips were also made to Dover, Tennessee to extensively sample that well-known aboriginal quarry. Samples collected through these activities provide a reasonably extensive reference collection to aid in tentative visual identification and other analytic procedures.

Gatus' findings are provided elsewhere (Gatus 1978). Here I shall only summarize those data and indicate some immediately apparent characteristics of chert distribution over the area surveyed so far.

In all, 24 G.Q.'s were surveyed (Fig. 6). Outcrops of 18 chert-bearing formations were located. Although 18 formations outcrop only about eight of these appear to provide potentially useful materials. Potential is judged upon criteria of fractural quality, size of nodules or chunks occurring, presence of extensive weathering/fracture planes and extensive inclusions, etc.

A limited examination of the data suggests considerable spatial patterning in potential availability of cherts. Examination of associations among variables (outcrops describing G.Q.'s; Table 3) indicates that the quadrangles in the northern portion of the study area may be characterized as exhibiting substantial diversity and variability in potential. That is, quadrangles to the south show a consistent (almost invariant) association between some young chert-bearing units (Cretaceous and Tertiary deposits) and older Mississippian cherts, while lacking outcrops of younger Mississippian rocks. In contrast, the northernmost quadrangles exhibit a diverse and variable array of outcrops of different ages. This situation is no doubt a result of faulting which occurs from Eddyville northward toward the Ohio.

The significance of this variability to the study of aboriginal utilization of chert is not immediately clear. However, the overall diversity of potential chert availability seems to parallel an impression of similar diversity among lithic materials observed in artifact assemblages from the area. Generally the ubiquity of some cherts would seem to complicate attempts to pinpoint aboriginally-used sources. On the other hand the availability of some cherts is spatially limited (younger Mississippian rocks in the northern G.Q.'s). Unfortunately, with one exception (St. Genevieve/Fredonia), all of these cherts are among those judged as having low potential for artifact manufacture. An aboriginal quarry where St. Genevieve/Fredonia chert was mined was, in fact, located in this area. Analysis of material from this quarry has not yet begun.

Between the systematic survey and our informal

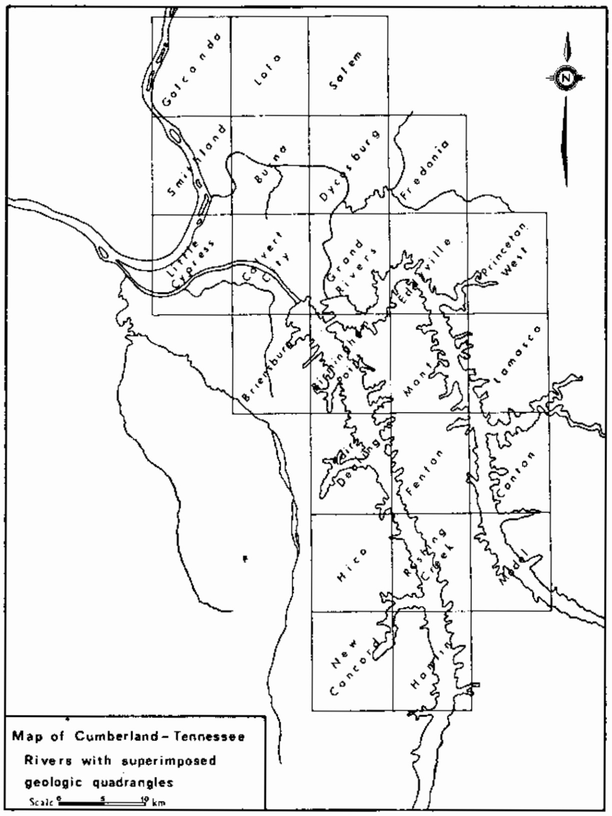

Figure 6. Geologic quadrangles surveyed for chert outcrops.

Table 3. Outcropping chert-bearing units in the lower Tennessee-Cumberland region.

GEOLOGIC QUADRANGLES GOWER FACTOR 1
PRINCIPAL COORDINATES ANALYSIS WITH JACCARD'S COEFFICIENT
* = PRESENCE OF OUTCROP

Geologic Unit: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Geologic Quadrangle
				*	*		*										*	GOLCONDA
*					*			*		*		*						LOLA
	*			*	*			*			*				*		*	LITTLE CYPRESS
						*		*		*		*						SALEM
				*			*	*		*		*	*					FREDONIA
	*	*		*	*		*	*				*			*			SMITHLAND
			*						*	*		*					*	PRINCETON WEST
*	*	*	*		*	*	*	*		*		*	*	*	*		*	BURNA
	*	*													*			NEW CONCORD
	*													*	*			HICO
*	*	*							*	*		*	*	*				DYCUSBURG
*	*	*	*							*		*	*	*	*			CALVERT CITY
	*		*									*	*	*	*	*		BIRMINGHAM POINT
		*	*							*		*	*	*	*			MODEL
		*	*									*	*	*				LAMASCO
		*	*									*	*	*				MONT
			*									*	*	*	*			CANTON
			*									*	*	*	*			GRAND RIVERS
			*									*	*	*	*			FENTON
	*	*	*									*	*	*	*			HAMLIN
	*	*	*									*	*	*	*			FAIRDEALING
	*	*	*									*	*	*	*			RUSHING CREEK
	*	*	*									*	*	*	*			BRIENSBURG
		*	*									*	*	*	*			EDDYVILLE

survey two definite quarries were located in Crittenden County. Considerable amounts of debris and artifacts were collected from these sites. In addition, large amounts of material were collected from stream beds. Although chert occurrence in stream beds is probably of wide incidence, in the immediate study area usable chert appears to be restricted to streams south of the Tennessee Valley Divide.

Gatus (1978) has generally characterized the material collected in the systematic survey. In addition, at SFU we are currently engaged in macro-examination of specimens from these samples, those collected from stream beds and quarries as well as the sample collected from the Dover quarry in Tennessee. Together these samples constitute several hundred specimens. Ultimately we plan extensive thin-sectioning in addition to macro-characterization.

Trace Element Studies

Apparently, the most reliable and accurate means of characterizing lithic sources is some form of analysis for trace element composition. Although trace element analysis of cherts has its complications (Luedtke 1978a, 1978b) recent studies suggest that success in characterizing cherts by neutron-activation analysis is a realizable possibility (Sievking, *et al.* 1972; Ives 1978; Luedtke 1976, 1978a, 1978b). In particular, because of the heterogeneity inherent in chert deposits it may be necessary to utilize larger samples than has commonly been the case (Luedtke 1978a) and statistical techniques such as discriminant functions (Davis 1973) which lend themselves to the objective of defining sets of variables which efficiently discriminate between sources. We hope to be able to use the results of such technical analyses in identification of chert sources in west Kentucky.

One of the most widely utilized prehistoric sources of chert in the mid-south is the Dover quarry in Stewart County, Tennessee. Trace element characterization of this quarry could prove enlightening. For example, when artifacts made of stone visually resembling this distinctive material are observed in artifact assemblage over a wide area of the Southeast, identifications are routinely made as "Dover chert". Such visual identifications are likely to be in error (Ives 1978, 1975; Luedtke 1978a). For emphasis, it may be noted that during our 1978 field work we located chert at three localities in Livingston County, Kentucky (Ft. Payne chert; Amos and Finch 1968) and one locality in Stewart County other than Dover, which is highly similar to material we collected from the Dover quarry. Without doubt other similar sources could be located. Clearly such situations require sophisticated and objective means of source identification.

To this end a visit was made to the Dover quarry to amass a sample of material which we could submit to neutron-activation analysis. Our objective was to sample the quarry in such a way that we could be reasonably confident that the total range of variation in the source would be represented in the sample. By systematic collection along 6 transects 50 samples were obtained from the Dover quarry. These samples are currently undergoing trace element analysis at the University of Toronto.

Sampling the quarry demonstrated unequivocally that a certain amount of visual variability is inherent in material from this site. In particular we observed samples ranging from the banded material most characteristic of this source, to dark visually homogeneous chunks not exhibiting the "typical" banding and color characteristics of Dover chert. To be accurate, it should be pointed out that the typical variant constitutes the overwhelming proportion of the sample.

Pollen Sampling

Archaeological interpretation must always be undertaken with knowledge of paleoenvironmental/climatic factors associated with the prehistoric culture being studied. Although archaeological studies to date suggest that climatic variation in the mid section of the U.S. may have been minimal for the last 4-5,000 years (Watson and Yarnell 1966; Asch and Asch 1972; Zwacki and Hausfater 1969; Chomko and Crawford 1978; Watson 1974; Yarnell 1964; Bryson and Wendland 1967; Parmalee 1969; Mocas 1977, among others), there is a paucity of paleoenvironmental data for the study area. In an effort to remedy this situation we have undertaken the search for materials which may yield useful paleoenvironmental data for the study area.

In 1978 we began the search for pollen-bearing sediments which might yield cores sufficient to aid in reconstruction of a pollen sequence for the last few millenia. Because pollen is not normally well-preserved in archaeological sites in this region, our activity was restricted to water-logged, non-cultural deposits, namely sink holes in the karst of the plateau and small lakes and sloughs along the Ohio River. Samples were collected at 50 cm depth intervals using a Hiller sampler from a small aluminum boat. Along the river only lakes distant from the active channel (that is, near the floodplain/uplands interface) were sampled in an attempt to avoid those subject to periodic or annual flooding. Sediments ranged from 1.5 to more than 4.5 m in depth. In some cases, due to sediment compaction and limitations of the coring device, the bottom of the sediments was not reached. Twenty-one samples have been processed and cursorily examined.

No attempt will be made to extensively describe the samples because the slides have not been examined in detail. In general, however, the samples yielded moderate concentrations of pollen which appears well preserved and therefore not very old. Several samples, in fact, contain introduced species and species which indicate disturbance of the original vegetation. No C-14 analyses on organic matter contained in the cores have been performed to date.

However several of the samples appear to represent undisturbed conditions, mainly because of an absence of *Ambrosinae*. This does suggest that reconstruction and examination of pre-agricultural vegetation might be aided by the use of pollen cores of limited age. This could prove to be a valuable source of information.

Continuation of the search for usable pollen sequence information should perhaps involve large sloughs and possibly caves, although the latter tend to yield small amounts of pollen (Watson 1974). Because long pollen cores may be difficult to obtain it is certain that flotation of archaeological deposits will be critical to acquisition of data which may be useful in suggesting paleoenvironmental conditions. During this year's field work we located a deep mid-Archaic deposit on the Tennesee River which no doubt contains much carbonized material in the very large fire hearths which were observed. Future plans call for work at this site.

Future Research Plans

Limited analyses of data collected in 1978 have provided baseline information for future research and suggest several avenues for further investigation. In an attempt to facilitate construction of an Archaic chronology, survey must be continued and our excavation program must be expanded. I am also currently attempting to secure funds to undertake examination of the extensive materials collected during the Kentucky Dam survey. These collections apparently contain substantial amounts of Archaic material and a respectable beginning at building a cultural chronology can probably be made through analysis of these remains.

We will also continue informal survey. We now have leads on several sites, widely distributed over Jackson's Purchase (obtained from local collectors), which promise to yield exceptional information. We will certainly expand our interests and activities beyond the lower Cumberland area.

Our regional sampling program will be continued in tributary valleys of the Cumberland in addition to Hickory Creek. Both those draining the Mississippian Plateau and the area between the Cumberland and Tennessee Rivers will be examined in a continued effort to gain information about the relative intensity of usage of various zones within the study area. These data will be critical to the design of future investigations and will contribute to a more precise understanding of biasing factors in archaeological survey in the region.

Similarly, the search for chert quarries and technical analyses of chert samples will continue as will exploration for waterlogged and other deposits which may yield older pollen cores. Excavation and flotation of archaeological deposits discovered in 1978 will be undertaken. Carbonized vegetal remains recovered from flotation samples will aid in assessing past paleoenvironmental conditions.

New areas of research should include geomorphological and sedimentological studies of floodplain areas. Such studies will provide information on the history of river channels and yield insight into the possible effects of channel migration on the prehistoric record. They could also shed light on the past potential of the rivers to support populations of various species of shellfish in an era predating modern modification of stream flows. Similar information may be gained by analyses of shellfish remains contained in later (Mississippian) sites in the region. Other important lines of investigation will no doubt suggest themselves as more detailed examination of data collected to date proceeds.

Acknowledgements

I gratefully acknowledge the generosity of the Canada Council in their support of the Lower Cumberland Project. Also a grant from the Canada Council Small Grants Committee at Simon Fraser University permitted a pre-field season visit to the study area in December 1977. Most of all our gratitude is due a very long list of people who reside in west Kentucky and Tennessee without whose cooperation our work would be impossible. They cannot all be listed here but Mr. and Mrs. C. L. Dunning and Eddy Dunning deserve our sincerest thanks. They made the summer of 1978 more pleasurable than we could have asked. Mr. W. T. Steegal and the staff of the A.S.C.S. office in Smithland, Kentucky were of inestimable aid. Postmaster David Vick of Smithland spent many hours with us and provided invaluable assistance. Tim Thomason permitted us to excavate on land which he had under cultivation and helped backfill our excavation units. Also our thanks go to all the people of Livingston County who took a genuine interest in our work and allowed us access to their land. Without their cooperation our project would fail.

The staff at Land Between the Lakes (TVA) provided aid in the form of continuing interest in our work and loan of various pieces of field equipment. George Holley (Southern Illinois University) was helpful in providing chert specimens from southern Illinois.

Finally, I acknowledge the able assistance of those people who were instrumental in insuring that our field objectives were met, especially Bruce Ball. Gerald Oetelaar and Tom Gatus were diligent in their efforts. My thanks to the Kentucky Heritage Commission for releasing Gatus from his usual duties to participate in our research. Kim and Stephen McBride, Joy Santa Barbara, Greg Richards, Cathy Carlson, David Kennedy, Lynn McKitka and Steve Mocas spent long, hot days in the field. Marian Mixon kept everyone pleased with her culinary talents. Also John Hunter of Murray State University worked with us for a short time and Peter Whalley of the same institution was of aid in geological matters. Lynn Hill typed the manuscript for this paper and Gerald Oetelaar executed the illustrations.

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Kent A. Schneider

A CLUTTERED NATIONAL REGISTER: USE, ABUSE, AND LOOPHOLES IN THE LAWS

Introduction

I do not think that the title of my present paper justly reflects what I wish to share with you this morning. When I submitted my abstract to Jeff Chapman a few months ago, I was nearing completion of a fairly comprehensive study of the kinds (and numbers) of archeological sites accumulating in the National Register like kudzu grows in Georgia. I had left a nearby state two or so years earlier where nearly anything 50 years old had an excellent chance of ending up on the Register. There, I watched wrecked, sunken ships wholly out of archeological "reach" due to depths and currents get "nominated"; from the shadows I watched front linesmen eagerly nominate—in their own minds if not in practice—a single-point site and a ring of fertilizer from New Jersey to the National Register of Historic Places. There was no need for me to assume that Georgia would offer any relief. I was shocked to find that some 8000 acres of National Forest land had been incorporated in a 40,000 acre National Register District, and horrified when I discovered why the Forest Service had never been notified about it. I was dismayed when I visited some of the archeological sites printed in the National Register as "eligible for inclusion in" and which now are roadbeds. I felt profound aversion when I found absolutely *nothing* in 5 archeological sites recommended for $15,000 worth of mitigation by a major archeological contractor (my finds were corroborated by 3 uninformed consultants). It was while reading the latest edition of Advisory Council amendments to existing regulations (part 800)—I had obtained a working copy, legitimately—that my reactions to certain trends in today's professionalism began to gel. In its content, the National Register mirrors what we are.

The Reactant and the Catalyst

In an era pushing cultural resource management, how can the above occur, how widespread is it, and what can be the outcome? In light of all the cultural resource regulations effected state and federal wide, we are tempted to believe that archeology has finally "arrived". We have our guidelines, we endeavor to spread the word, we have our own professional society (SOPA). If you read our professional journals, you can be convinced that there is a growing contingent of archeologists which is "*managers managing* cultural resources". While we do have our researchers, the dichotomy between pure and applied is widening, perforce by spin-off funds from construction. Funds for taking archeological sites apart piece-by-piece are drying up; the more visible projects receive attention and get the money. Our degree programs are expanding to accommodate more archeologists who will become "managers managing cultural resources" (there are more student archeologists today then there were professional archeologists a decade ago). Our journals and "best seller" papers remind us of our professional policy:

Eschew Salvage, Bank for the Future

while keeping in mind, of course, the benefits to society in the long run.

Even more supportive of our newly achieved "managers managing" status is the National Register, our site bank. From its inception, National Register site additions have increased in a geometric progression. There are thousands of sites ranging throughout "humantime" and there is (nor should there be) no numeric limit to future additions. While we recognize the problems inherent in qualifying a site for Register status, we do not question the listings but in fact refer to these often as absolutes.

Finally, the role of cultural resource management in gaining archeological ground in the public eye can be seen in the rise of archeological contracting firms which interface directly with industry. These firms thrive on mitigation projects and, generally, have conducted needed salvage or mitigation work with a faster turn-around than universities. These firms are on the "leading edge", so to speak, in that the laws require the destructive agents to stop and account for cultural resources and it is the people in these firms that sell our wares.

If all the above is true, what then is going on? Are we producing slip-shod work? Are we taking clients "to the cleaners"? What values are we managing and for whom? I believe we have some real problems with *values* within our own profession and that we should strive to understand and correct these before we become the reactant rather than the catalyst. Permit me first to define two terms and then address some problems.

Reactant: substance which enters into a reaction and is used up.
Catalyst: substance which speeds up or retards a reaction but is not, itself, consumed.

1. The Big Stick. There are those amongst us (in fact, in every *business*) who, for their own idiosyncracies, have to "hit 'em on the head" to get their point across. Regretably, current cultural resource regulations permit such shenanigans and provide no negative sanctions. Big Stick tactics occur at all levels of the archeology status hierarchy. If a graduate student has a personal dislike of the government, he can cause the 106 consultation process to be invoked and close a project capriciously. There are cases wherein that graduate student subsequently got the survey job. If a private agency using federal funds for a construction project prepares its archeological report in a professionally sound format but one not meeting the dictates of an SHPO (who may not be an archeologist), the project may be held up. Many archeologists are prone to use such phrases as "they'll learn to knuckle under" or, more directly, "you will do the survey and you will pay for it or I will stop your project". I submit that tactics such as these—and these are widespread—encourage the fish-darter image of archeology. We need sanctions against the Big Stick approach.

2. Intangible Data/Intangible Tools. We talk of cultural resource "values", of preserving all potential "values", and of assessing significance qualitatively and quantitatively. How do we get the message across to the public when we can not decide what these are, ourselves? The "law" requires surveys and mitigation where necessary. What kinds of tools can be brought to bear upon "values"? Are these values for archeologists, only? The bottom line is archeological data, but of what order or magnitude? We can not predict the moment of an archeological site as physics does the L subshell, yet we allow 5% samples of 89-mile roads, and 3% samples of 10,000 acres of land. We conduct "100% surveys" of one hundred acre tracts, call these "pedestrian" and are satisfied. We cover ourselves with little clauses, such as "if anything else is found after the survey but during construction, 'stop' ". This phrase should continue to read ". . . stop, and we'll bring in our eyeballs again". I submit that our lack of precision instruments to locate the targets of our field investigations (ceramics, lithics, metallic materials principally) is indefensible and can not pass even the weakest bloc of social criticism. The lack of these tools breeds bad work (intangible results).

3. Loopholes in the Laws. I was disappointed when reading the latest amendments to the Advisory Council regulations. Once again, our profession is "bullish" on itself; this needs to be changed. The National Register is not a place for "garbage" sites, yet with the provision for "eligible" sites it will continue to become one. There are major (multimillion dollar) projects in states in the southeast which have been temporarily suspended due to the presence of "eligible" sites or "eligible" National Register Districts. These sites are printed in the Register for purely *political* reasons; they are not there because they are significant. If there are checks and balances on the calibre of sites included in the National Register, these are ineffective and the result is costly in every respect. These *political* sites are the result of Big Stick tactics. What we need is an inspection of the kind of work accomplished—the benefits of the work to archeology and to the public needs accounting. I submit that we closely review the ground we have taken in archeology, that we begin by asking: *why* a National Register District does *not* require an EIS; why "eligible" sites receive the same protection under 36 CFR 800 as "nominated" sites when virtually nothing needs to be known; why there are no provisions to insure that a client *paying* for the high costs of an archeological survey about which he knows nothing can not be assured a fair and just return.

4. The Archeologist. Just what is the person who manages, researches, conserves, salvages, mitigates and surveys cultural resources? We have, first of all, too many unmanaging managers. These persons are unmanaging because they know *nothing* about management. "Cultural Resource Management" is akin to a call-to-arms . . . but, just how many trained troops could be mustered and what position in the hierarchy do they occupy? What kinds of decisions do they render or affect and what are the results for archeology and the paying public. It is indeed sad that we continue to resist scientific tools and resort, instead, to innate senses for survey and research technique. Rather than maximize data recovery, we continually examine the surface of the same ball with an instinctive fear of exploring the innards. The rest—conservation, salvage, mitigation, survey—fall into place by extention. I submit that the fault is ours, *not* the system. We need to take basic and advanced management courses; to work closely with scientists whose techniques quite obviously have something to offer. Without these requisites, we will continue in directionless confusion. With no buyer, we will be consumed with our product.

Summary

My vantage point is one shared by many of you and is often viewed but talked of quietly. The quality of archeological reports written varies entirely too grossly, our public conduct is "pushy" for such a soft discipline, our tools for search indefensibly antiquated. In our rush for "recognition", our archeological tradition is being shucked and we are exposing our flank to a suspecting public. We can not continue justifying good reports when they are no good; falsifying sites for the National Register; stumbling over one another for contracts to make money or make up what was lost. We can not continue to encourage the ridiculous, such as inventorying all federal land by 1990, or conducting statistical surveys thereof with our feet and eyes. We have a product to sell to the public and Congress. Colleagues, on our present course, we are selling the Brooklyn Bridge. If we don't heave to and introspect, we are going to get the rubber buck.

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Stephen L. Fosberg

THE NATIONAL RESERVOIR INUNDATION STUDY

Introduction

Federally sponsored archeological work at dam projects throughout the nation has attempted to mitigate the impacts of dam construction and reservoir filling on cultural resources. However, contract archeology continues to be carried out largely in the absence of any definitive information as to what exactly will happen to those resources once they become submerged. Federal agencies award contracts to organizations without being able to evaluate the extent to which their research designs assure adequate analyses of those materials and sites most likely to suffer from inundation.

During the May 1975 conference of the Society for American Archaeology, personnel from the Bureau of Reclamation, U.S. Army Corps of Engineers, Tennessee Valley Authority, and National Park Service met and discussed their concern over this failure to protect and conserve cultural resources. These federal agencies then tentatively agreed to pool their financial resources to fund the National Reservoir Inundation Study research program. It was designed to obtain a systematic body of data which could be used to make decisions concerning the mitigation of resources which would be primarily impacted by freshwater inundation.

Rather than each Federal agency produce its own study group, these representatives agreed that one agency should serve as a coordinating body for the project. The National Park Service was chosen to fulfill this function since its duties within the Department of the Interior included providing aid and assistance to other Federal agencies in the field of archeology. Because the National Park Service's Southwest Regional Office already maintained an underwater archeological diving team and was attempting to address similar research problems, it was decided that the National Park Service's Southwest Regional Office should become the headquarters for this study (Lenihan *et al.* 1977). The Corps of Engineers, Bureau of Reclamation, National Park Service, and Soil Conservation Service have contributed funds to this project since its inception in 1975.

Thus, although centered in Santa Fe, New Mexico, the National Reservoir Inundation Study is a research project whose scope is nationwide. Reservoirs throughout the continental United States are being investigated whenever they contain information applicable to the general problem of the impacts of freshwater inundation on archeological remains.

Reservoir Impacts on Archeological Sites

Just what kinds of impacts will affect archeological sites in a reservoir basin? These include at least three types. The three categories are not mutually exclusive. Nevertheless, the divisions do aid in visualizing the interacting variables that determine the extent to which reservoir projects will affect cultural resources. First, mechanical impacts physically alter the contextual and spatial interrelationships of the archeological materials and in their most severe form can completely destroy a site. Several types of mechanical impacts can be briefly described. Waves disturb the physical integrity of sites, whether they are generated by boats or wind. Sites have been documented from Glen Canyon, Utah, where 7 ft high walls were reduced to 1 ft in seven years due to the pounding of waves (Rayl *et al.* 1978). In the context of denuded beach zones caused by wave action, high winds can blow away a site's top stratigraphic layers. The undercutting of banks along the margins of reservoirs threatens sites located above normal pool levels that might otherwise remain unaffected by the waters below.

The most dramatic mechanical impacts, however, are often associated with drawdowns. Drawdowns take place when reservoir water levels are periodically lowered during periods of peak hydroelectric demand. When a drawdown takes place, sites become exposed on denuded slopes. Sheet erosion can quickly cut into archeological deposits. Erosion may be so severe that meters of a site's top stratigraphic layers can be removed. As reservoir waters advance or recede during drawdowns, they often stabilize for short periods of time at different levels. Sediments erode out of their original contexts and become deposited in a series of terraces. Any archeological materials located within this drawdown zone then would be subjected to considerable secondary deposition.

Of course, reservoir mechanical impacts are not limited to erosional phenomena. Deposition occurs as well. In some cases, sedimentation may be so pronounced that entire sites become deeply buried. While this phenomenon does protect the resources from further mechanical impacts, it also poses a problem of re-locating buried sites in the event that additional archeological fieldwork is desired.

The second major category of reservoir impacts on cultural resources is that of chemical effects. In the case just mentioned, where sites have been completely buried under a mantle of foreign sediments, the soil chemistry of the archeological deposits may be altered as leaching of minerals takes place through sediments foreign to the site proper. Soil chemistry of sites can also be altered when pioneer species invade the bare sediments exposed during periods of drawdown. In the Western United States for example, tamarisk plants fix salts in the soils beneath them and thus alter the subsoil chemistry. Most chemical impacts, however, involve the dissolving of materials in contact with unsaturated reservoir water. In Lake Powell, Utah, the iron cements in inundated sandstones have been completely reduced out of the rock after seven years under water (Rayl *et al.* 1978). Inundated structures and artifacts made of this material are physically weakened, since the interlocking quartz grains form the only means of internal cohesion in the absence of any binding cement. In other cases, granite boulders on archeological sites have completely dissolved after reservoir waters attacked their chemically-active feldspar content. Thus, one sees abundant evidence that even so-called "non-perishable" items, such as lithics, are indeed susceptible to chemical breakdown. Chemical impacts on perishable archeological materials have been even more severe.

A third broad class of reservoir effects is biological impacts. It appears likely that microbiological activity within inundated sites may be one of the most important factors contributing to the breakdown of cultural materials. Bone, vegetal matter, wood, and leather deteriorate rapidly in most aqueous environments. Within a few months, these categories may be completely destroyed by aerobic and anaerobic microbes.

Macroinvertebrate fauna also affect cultural remains. Freshwater clams, attracted by the texture of cultural sediments in house floors or middens, will often seek out these features to bury in. Such activity can severely distort the stratigraphic position of materials located within those cultural features. Further destruction to the integrity of these features can occur during drawdowns when rodents dig for clams buried in the middens or house floors.

Of course, the single greatest danger to archeological sites from biological agents comes from man himself. When reservoirs are filled, sites that previously were accessible to all but the most devoted archeologist or pot hunter become approachable by anyone having access to a boat. Picnickers may camp out directly on top of archeological sites. Sites have also been turned into picnic areas, parking lots, or boatramps and their wall alignments have been converted into hearths. In other cases, historic sites have been completely demolished by campers or picnickers seeking to reutilize structural building materials. It is important to reiterate that none of these impacts would have resulted had not previously inaccessible areas been opened up to the recreational boater or camper.

The Preliminary Report

From this discussion, one can begin to appreciate the range and severity of impacts that reservoir construction can have on cultural materials. The National Reservoir Inundation Study's mandate, however, includes more than merely documenting the possible range of effects impacting archeological sites as a result of dam building. There remains an obligation to attempt to predict what the mechanical, chemical, or biological impacts of flooding might be, given the physiographic, geological, and chemical setting of a site, the material it contains, and the river being impounded.

To fulfill this obligation, the Inundation Study published its *Preliminary Report* (Lenihan *et al.*) in 1977. This book presents the formal research design under which the team operates. Some 201 hypotheses are stated in the report which predict the effects that immersion will have on cultural materials, analytical techniques, and dating methods.

Data Collection

The confirmation or rejection of these many hypotheses will be based on information gathered either from library research, field work, or experiments. Library research on these predictions is actively being carried out at the University of New Mexico and Bureau of Reclamation's Engineering and Research Center in Denver, Colorado. Wherever possible, attempts are being made to avoid duplication in research by utilizing data obtained from other disciplines on material types often found in archeological sites. For example, reservoir engineers have conducted numerous tests on the abilities of wood, rock, glass, and metal to stand up under varying conditions of inundation.

However, due to the unique nature of the project, very little previous research has actually proven relevant to the research design. Therefore, field data collection at reservoirs around the country over the last two years has produced most of the information. Such field operations generally encompass underwater photography, underwater mapping using plane tables and alidades, data collection, and sampling both before and after sites go under. The primary criteria for justifying a field session is the existence of good pre-inundation controls. Thorough surveys or excavations must have documented what the condition of a particular site was prior to immersion. Sufficient samples of archeological materials must have been collected so that analytical tests on comparable materials retrieved after the site has been flooded can be run to determine what physical or chemical changes have occurred.

Over the next year and a half, an increasing proportion of data will be obtained through laboratory and field experiments. Physical models are now being designed at the Bureau of Reclamation's Engineering and Research Center that will determine the mechanical impact to sites under various geologic and reservoir conditions. By constructing scale models of sites within sediments being tested by reservoir engineers, it is hoped that hypotheses can be generated and tested which will predict the mechanical impact that periodic drawdowns, freeze-thaws, or wave action might have on particular materials in a site, given its soil type and consistency. Clearly, one must be able to anticipate the physical disturbance to a site that immersion will cause, since complete erosion may render all other questions academic.

Another major experiment already underway is a project designed to assess the impact of water chemistry on the preservation of common archeological materials. This laboratory experiment is taking place at the University of New Mexico. There, thirty containers have been filled with chemical solutions. Based on USGS data, fifteen buckets will hold median concentrations of the major chemical constituents in reservoir waters, while fifteen other buckets will hold solutions approximately twenty times more powerful. The chemical variables being employed in this study are calcium, magnesium, potassium, sodium, iron, sulfate, chloride, carbonate, and bicarbonate. The artifacts being tested include various types of ceramics, lithics, bone, wood, seeds and nuts, pollen, and shell. These artifacts will be immersed in the buckets for one year. It will be argued that the more concentrated solutions represent up to twenty years of inundation. At four month intervals, artifacts will be removed and measurements taken of their rates of decay. They will all be photographed or weighed on sophisticated analytical balances. Their physical deterioration will be measured on durameter machines and chemical changes ascertained by atomic absorption analysis or X-ray diffraction. By taking these periodic analyses, either linear or exponential rates of deterioration can be established for particular types of artifacts in specific water chemical environments.

A third experiment is designed to distinguish the particular impacts to cultural materials caused by microorganisms and macro-invertebrates. USGS data on surface water chemistry across the country indicates that Brady Reservoir in Brady, Texas, matches the median chemical concentrations created in the laboratory. These chemical conditions were matched to those in the laboratory so that they could be factored out to ascertain what other chemical and/or biological variables determine the preservation of submerged cultural resources.

Limnologists from Virginia Polytechnic and State University are working with the Inundation Study on the project. Archeologists will place three containers of identical artifacts to those used in the laboratory experiment at each sampling location in the reservoir. One container will be covered by the finest grade asbestos sheeting. This filtering material is fine enough to prevent even microorganisms from penetrating it while still permitting water molecules to pass through. A second bucket will be protected by a coarser grade of Nitex sheeting. It will be open enough to allow for the passage of microorganisms through it but it will block out macro-invertebrates. The third bucket would be uncovered. By comparing the preservation of the archaeological materials in these buckets, we can check the predictions of artifactual deterioration based solely upon chemical impacts that were generated in the laboratory. Importantly, the different grades of Nitex screening will allow us to identify the specific impacts caused by microorganisms and macro-invertebrates.

From this program of laboratory and field testing, the interaction of mechanical, chemical, and biological variables can begin to be understood. It is hoped that the results will allow for the prediction of what physiochemical changes will occur to the cultural materials in a site, once the geologic setting, geographic location, and local water chemistry conditions are known.

The Final Report

Data from library research, field operations, and experimental designs are being collected to assess the hypotheses proposed in the *Preliminary Report.* Some predictions will be tentatively confirmed, others rejected, and for many, there may not yet exist enough relevant information to evaluate them. These conclusions will be published in a final report to be issued in 1980.

Given the myriad of hypotheses in the *Preliminary Report,* the limited amount of time available for data collection, and the pioneering nature of this research, it should come as no surprise that the *Final Report* will not be definitive. In many instances, a lack of an adequate statistical sample will force us merely to point out trends in the data.

Nevertheless, the impact of the *Final Report* will be significant. For the first time, reservoir managers, Federal officials, and private archeologists will have at their disposal specific information that can help them make decisions concerning the conservation of cultural resources to be impacted by reservoir construction. Offices of contract archeology can utilize the tentative conclusions to insure that their research designs adequately sample those sites and/or classes of archeological data most likely to suffer from inundation. At the same time, Federal officials awarding contracts will have a basis for evaluating the extent to which the competing contracting firms wisely planned to utilize these limited resources. For example, in certain reservoirs, given a particular range of water chemistry conditions and biological activity, bone materials might deteriorate beyond recognition in five years. Given such a prediction in the Inundation Study's *Final Report,* a research design that ignores this class of data, because of a researcher's bias towards ceramic assemblages, is clearly defective.

Thus, the impact of the *Final Report* will be twofold. On the one hand, it will enable researchers and cultural resource managers to more intelligently exploit cultural resources. On the other hand, this work will hopefully stimulate follow-up research which can refine the techniques and methodologies devised by our team. The laboratory water chemistry experiment, the physical modelling of reservoir mechanical impacts on sites, and the sampling of reservoir biological activity are all crude, pioneering efforts, which should be followed by years of additional testing. Several excellent dissertations are currently being written which are based on these areas of study. Such research will be both original and influential. This additional research combined with our *Final Report* will allow reservoir managers to anticipate and effectively mitigate the effects of inundation when archeological resources are being flooded in any section of the country.

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Michael Trinkley

SURVEY METHODOLOGY: A PERSPECTIVE FROM THE CAROLINA PIEDMONT

It is perhaps simplistic to state that archaeology has always been concerned with locating and recording sites. Yet this is sometimes forgotten in the enthusiasm of today's "environmental impact" archaeology, which makes it seem almost as though archaeology did not have any sites to investigate prior to the early 1960s. Or at least if there were sites to study, they were few in number and so elaborate and/or unusual that only a blind man could miss them. I suppose that at least portions of this characterization are true. Archaeologists are now looking harder for sites, usually because of a true scientific spirit.

It is curious that no less an archaeologist than Lewis Binford would sneak peeks at James Griffin's site files, or that for the past three years there has been a clamour for Joffre Coe to open his files to every occasional researcher in the state. Thus, while recent investigators seem to scorn the methods by which Griffin and Coe went about collecting site information, these same researchers seem to go to great lengths to gain access to this "biased data." Perhaps deep down in us all there is the realization that while the site with 1 arrowhead and 4 flakes can answer questions, perhaps even important questions, it is the larger site than can answer the greater variety of complex questions.

I had considered briefly reviewing the evolution of site survey methodologies in the United States, mentioning such notables as Binford, Mueller, House, Schiffer, King, etc. But, not only would I be sure of losing half my readers, but I am tired of never looking beyond the obvious virtues of improved survey techniques. I suppose I am also aware of catching myself at times citing an almost endless stream of "experts" in the hope of baffling the reader into submission. I have also noticed that the bulk of frequently quoted experts on survey techniques have performed their scientific magic not on a pine forest in the southeast, but on a soil-less plain in the southwest.

To examine the success of Piedmont Carolina survey methodology I chose a survey conducted by the Institute of Archaeology and Anthropology, at the University of South Carolina, for my agency, the South Carolina Department of Highways (Cable, Cantley, and Sexton 1978). This survey, on a new location right-of-way 19 miles long from Union to Pacolet, was conducted primarily during February and March of this year, at a cost of over $19,000. The topography of the survey corridor is typical of the Carolina Piedmont and is dominated by well defined drainages and associated upland ridges. I believe everyone is familiar with the terrain of the Piedmont, and its associated problems of ground cover and severe erosion. Coe (1964:14-21) gives a vivid description of the North Carolina Piedmont, and just about every Piedmont survey report will use similar wording. Of the proposed corridor, 38% of the ground is in open land—either under cultivation or in pasture. The remaining 62% of the corridor is in forest. As a result of this survey 85% of the corridor was systematically examined and 21 sites were located. Therefore, I believe we must say this was a commendable survey effort—a great deal of ground was covered, under very trying conditions. Of the sites actually within the proposed corridor, 3—38Un27, 28 and 54—were felt by the field investigators to be important.

The Union to Pacolet project began with a 15 man-day reconnaissance of the corridor, during which 9 sites were found. The only areas of investigation were road cuts, plowed fields, powerline transects and erosional spots, as well as high probability areas such as knolls and stream crossings. Of the nine sites found, 7 were located in agricultural fields and 2 were found in pastures. Obviously, going out and looking for areas where the ground is visible or where one expects sites to occur is a very low order investigative technique.

If I were to summarize the results of this survey thus far, I could say: As a result of a preliminary traditional reconnaissance 43% of all sites eventually to be found were located, 66% of the "important" sites to be found in the corridor were recorded, and all sites located during this portion of the survey were found in cleared areas. If I may offer purely an opinion, I believe the strategy of the survey thus far has been good. We have succeeded in finding almost half the sites, and the majority of the "important" sites—simply by looking in cleared areas.

Yet you may be saying right now one of two things, either, "Yes, but look at everything you have missed, apparently by not checking the areas your intuition said were inhospitable to aboriginal occupation" or you may be saying, "So what." Perhaps I can answer both questions if you will bear with me a bit longer.

The second phase of the Union to Pacolet survey was a 33 man-day investigation systematically surveying the entire corridor. This ideal was not achieved because of time limitations and poor weather. However, as I have mentioned, the investigators estimate that 85% of the corridor was surveyed, and suggest that the 15% not surveyed falls primarily into the category of dissected drainages, accounting for 46% of the total corridor. In other words, large portions of every environmental and terrain type were surveyed. Although a 100% survey was not achieved, the researchers (Cable, Cantley and Sexton 1978:9) state, "we feel that a representative sample of sites was located."

What exactly was found as a result of this intensive field survey? Twelve additional sites were recorded, and one site—38Un54—seems to the field investigators to be "important." But of the 12 sites—3 (25%) were found in plowed fields, 4 (34%) were found in dirt road cuts, 3 (25%) were found in pastures, 1 was found in a fallow field (8%), and 1 (8%) was found in a wooded area. In all, 11 sites, 92% of the intensive survey sites, were found in cleared areas—areas which should be visible during a reconnaissance survey.

During this survey, 20 of the 21 sites, or 95%, could have been found by examining only open ground areas. All of the "important" sites within the proposed corridor could have been located in this manner. The examination of the wooded uplands and dissected drainages, ranking very high in terms of intensity of time and labor investment, located 1 site, having on it 1 quartz chunk and 2 flakes.

From the perspective of an archaeologist I feel we should be striving for increasing knowledge, but as a representative of a state agency utilizing federal funds I feel that we should be cognizant of the cost of our activities. Obviously the thoroughness of the Union to Pacolet intensive survey was expensive—over $1000 per mile—but only 1 relatively insignificant site was recorded for all of this activity. Consequently, I am not impressed with the effectiveness of the techniques, or rather, I wonder, from a management standpoint, if a reconnaissance survey that examined *all* the open ground in the project corridor would not have been more practical.

Nor is this questioning the sole result of hindsight, although hindsight certainly supports my intuitive knowledge of Piedmont Carolina archaeology. Should we force ourselves to learn the same lessons over and over again? If we say that yes, we must not assume that sites won't occur in a particular terrain or environment, then we turn our backs on generalizations, common sense, and the fundamental cornerstone of archaeological theory—patterning of culture.

Let us turn our attention away from South Carolina and onto her northern neighbor. Recently the North Carolina Archaeological Council instituted a series of publications, several of which have dealt with contract work (North Carolina Archaeological Council 1977). One of the major publishers of small, contract surveys has been the Wake Forest Museum of Man, and their survey techniques are carefully detailed.

Generally the various authors do what many southeastern archaeologists do when faced with extensive ground cover and second growth vegetation: they survey clear areas and then rely on a discovery technique where the ground surface is not exposed. The technique requires that the archaeologists walk in straight lines—a formidable task in underbrush—20 to 25 m apart, while digging 50 cm square holes about 10 to 30 cm deep every 20 to 25 m. Once a site is identified on the basis of finding cultural material in the probe hole, additional test probes are dug at 5 m intervals along the four cardinal directions until 2 consecutive pits fail to produce artifacts.

This is certainly an explicit method of site location, but is it successful in maximizing the discovery of site locations? This question can be answered either by examining the number of sites reportedly found utilizing this methodology or by applying it to a series of hypothetical situations. We must opt for the latter approach as sufficient information is not provided by the investigators to enable a determination of the technique's "applied" effectiveness. It is possible to construct a situation whereby we may judge the method's hypothetical usefulness. I have taken one of the investigators' sites of presumed average size (15 x 48 m or 720 m^2) and artifact density (a total of 29 artifacts were found) as my example. The site was found in a cleared area and the investigators made a thorough collection of the surface. But what if this site was covered by leaves and underbrush? Would we be likely to find it? Using 20 m separation of our transects the site might be missed, hit once, or hit a maximum of three times. Yet it would be necessary to dig almost a hundred half-meter square holes before a single artifact was encountered. Even if this small site has 100 artifacts hidden in the humus, it would still take 28 holes to locate a single specimen, and we would dig *at most* 3 holes. In other words, the odds are small that this technique will locate small or medium size sites, while the large sites might probably be observable without the necessity of such a discovery scheme. It would seem that this particular technique, undoubtedly expensive, is unsuited for the purpose of site discovery, or perhaps even site delineation.

The authors of the Union to Pacolet survey in South Carolina used a similar subsurface examination technique wherein 30 cm holes were dug across known sites to determine the size of the site. It is noted that "although this procedure proved invaluable in investigating local soil conditions, and depth of deposits, it was much less useful in determining site size in low visability areas" (Cable, Cantley and Sexton 1978:8). Leland Ferguson (1976:13) utilized posthole diggers to obtain subsurface information in another survey conducted by the Institute of Archaeology and Anthropology. Of the 103 holes dug, material was recovered from only 34, or 33% of the total. While 17 of the 23 sites recorded were found from surface indications, 6 sites were located using only subsurface testing. However, 2 of these 6 sites were found in predicted site locations, leaving only 4 of the 23 sites (17%) located solely by subsurface testing. This demonstrates the distinction between using various forms of "shovel tests" as a rote site discovery technique and using them as a test of the archaeologist's predictions of site locations.

I am suggesting that, as archaeologists, we need to re-evaluate our methods of locating sites. Although we generally use a great deal of fanfare in describing our methodology in the final report, we do not spend as much time as perhaps we should judging its effectiveness. All that looks and smells of science may not be as productive as it should be—in terms of either our time or of our client's money. As archaeologists in the contract and environmental impact "business" we should not oversell ourselves to the point where the public can no longer afford our services. To do so would be to kill the "spirit of the past" we long to protect.

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Thomas W. Gatus

A REVIEW AND COMMENT ON SURFACE AND SUBSURFACE SURVEY METHODOLOGIES OPERATIONALIZED IN KENTUCKY

The purpose of this paper is: (1) to group various survey methodologies into general investigatory categories and evaluate them in terms of resultant site identification and data recovery; and (2) to discuss the status of investigation on small, open sites. While the two purposes do not melt into a cohesive topic for discussion, it is the first that directly influences the type and amount of data retrieved from small, open sites; the type most commonly encountered on survey.

A review of the survey methodologies of almost all survey reports completed to date in Kentucky and filed at the University of Kentucky Museum of Anthropology or the Office of State Archaeology reveals that operationalized surface and subsurface survey strategies which are more sophisticated than the "Grab and Bag" technique can be readily grouped into seven categories which will be referred to as: (1) Random Shovel Testing; (2) Systematic Shovel Testing; (3) Random Backhoe Trenching; (4) Systematic Backhoe Trenching; (5) Transect Interval Sampling; (6) Flag and Bag; and, (7) Flag and Map. For the purposes of this paper, raking, augering and troweling are considered variations of the shovel test technique when implemented for site identification purposes.

Random Shovel Testing

A total of 41 reports indicating the operationalization of a random shovel testing data recovery strategy were reviewed. These reports include Allen (1975); Allen and Cowan (1976); Allen and Griffin (1978a); Allen and Pollack (1978); Autry (1977); Barber (1977a, 1977b, 1977c, 1978); Collins, Glover and Glover (1977); Collins and Griffin (1977, 1978); Conn (1978); Fitting *et al.* (1976); Flanagan (1970); Glover and Glover (1977); Glover, Glover and Funk (1977); Granger (1976); Hopgood (1977); Lafferty (1976); McGraw (1977); Pollack, Griffin and Collins (1978); Robinson, Smith and Collins (1978); Rucker and Parrish (1977); Schock (1976, 1977a, 1977b, 1977c); Schock and Foster (1975); Turnbow and Allen (1977a, 1977b, 1977c, 1977d); Turnbow, Allen and Mayfield (1977); Turnbow, De Lorenze and Allen (1977); Turnbow and Driskell (1978); Weis and Schock (1977a, 1977b, 1977c, 1978a, 1978b).

This approach is probably the most common subsurface survey strategy. Although it is inexpensive and does not require a great expenditure of additional time, it does not produce many sites either. Of the 41 reports reviewed only 6 indicated that sites were found using this technique.

Random shovel testing is commonly employed in heavily vegetated areas. As practiced presently, this technique only yields positive or negative results about the presence or absence of sites. Little, if any, qualitative information can be garnered by operationalizing this strategy alone.

Systematic Shovel Testing

Studies grouped under this rubric include nine examples, Allen and Griffin (1978b), Berwick (1978), Boisvert (1978); Collins, Driskell and Luckenback (1976); Granger and Di Blasi (1975, 1977); Maynard and Gatus (1978); Robinson, Turnbow and Allen (1977); and Schock and Foster (1976). The last example is considered a variation on this technique for the purpose of organizing this paper. In this report three "plow tests" consisting of 55 ft long strips of land 100 ft apart were plowed and checked for artifacts.

Systematic shovel testing appears to take two general forms, one following a grid system, the other being a linear transect interval. Among the reports listed above four utilized a grid system. Another three operationalized the linear transect interval method. One initiated both methods and another tested three lines forming an equilateral triangle.

According to the authors three of these investigations produced artifacts, obviously a better percentage than the random shovel test technique but ultimately more time consuming. Both variations of the method are best operationalized in pasture rather than wooded areas where large trees and roots can throw off the grid or interval, or interfere with actual shoveling.

Random Backhoe Trenching

Four examples of this technique were found in the literature: Collins, Allen and McComas (1976); Janzen (1976); McHugh (1975, 1976). In one instance the backhoe front-end loader (Collins, Allen and McComas 1976) was used mainly to expose the topsoil and define the limits of a known site. The other three reports indicate that a total of forty-one backhoe trenches produced a total of one site.

The infrequency of reported examples of this technique makes its utility difficult to assess. It does have, however, some obvious advantages in heavily vegetated areas and in subsurface reconnaissance compared to other methods. But on some projects its utility may be offset by the cost.

Systematic Backhoe Trenching

A single example of this subsurface survey technique was reviewed. Dragoo and Dobbs (1976) initiated this procedure on the floodplain of the Ohio River southwest of Louisville both as a testing and survey technique. One hundred and eleven test trenches were excavated on 22 archaeological sites and according to Dragoo and Dobbs, they were layed out on straight lines roughly parallel to the river. To maintain horizontal control, a grid system was superimposed over the area being tested centered on one base point, and trench lines were established in reference to this grid (1976:37). Due to the occassional problem of heavy woods or standing structures within the grid, however, not all of the proposed trenches could be excavated.

As a survey technique there are at least two major shortcomings in systematic backhoe trenching. First there is the problem of not identifying small sites if the grid is very large. Second, a site may be identified using this technique but no accurate assessment of its horizontal distribution can be made, especially with a grid of the dimensions described by Dragoo and Dobbs.

Transect Interval Sampling

To date, one report (Leedecker 1978) reports the operationalization of this data collecting strategy in Kentucky. Transects measuring 100 m x 1 m were non-systematically superimposed over areas of high probability for site locations and high priority for adverse effect on the proposed Taylorsville Lake. These transects were regularly spaced in the survey areas but not, however, with great precision. In areas where ground visibility was poor, raking and shovel testing were initiated to reveal artifacts.

Artifacts were collected in approximately 12% of the 7221 transects initiated and approximately 80 sites were identified by this data collection technique. Unfortunately this report did not provide settlement pattern data nor did it evaluate the utility of transect interval sampling. Had the transects been laid out systematically the data recovered would have a much higher interpretative power.

Apparently transect interval sampling coupled with shovel testing and raking is a fairly productive investigatory technique.

Flag and Bag

In a recent survey by Granger and Di Blasi (1977) artifacts and concentrations of artifacts were identified with flagging pins prior to plotting site locations. Maynard and Gatus (1978) employed a similar method. In this instance all artifacts were flagged prior to recovery and any observable discrete or semi-discrete artifactual concentrations were collected and bagged separately. This technique allowed the surveyors to define the limits of a site more precisely by controlling an area with a relatively objective visual mechanism. It also provided a way to identify smaller concentrations within a larger site.

Chomko (1974) used this technique in Missouri where the strategy was taken one step further by utilizing flags of various colors to identify tools associated with specific activities. In the report by Maynard and Gatus (1978) flags were used in one instance to identify the distribution of ceramic sherds alone and as a result, they were able to identify five ceramic concentrations which were probably related to a series of subsurface house floors or other features.

This technique is operable in fresh till and in areas where crops are young or low to the ground. By keeping track of the time necessary to complete specific tasks Maynard and Gatus were able to estimate that the results of one hours flagging, when walking fields in swaths of 2 to 4 m apart, could be retrieved in about 15 minutes if no concentrations were encountered.

Flag and Map

This method was employed by Maynard and Gatus (1978). As in the Flag and Bag method, all artifacts were flagged prior to recovery. In this case, however, artifact clusters approximately 70 m or less were mapped. The decision to map sites of this size was based on the need to investigate small sites in more detail, the need for expediency and the size of the measuring tapes.

The method of mapping consisted of establishing a datum point in or near the site. A 1.3 m iron reinforcing rod was set in the ground over the datum with a 30 m tape attached to it by means of a short nylon cord. A tripod was erected over the datum and a Brunton Pocket Transit was attached. With the aid of the transit, the degree of deviation from north was noted for each flag. The tape was used to measure the distance between the flag and the datum. As one person measured the degrees and plotted the artifacts on a prepared form, the other surveyor measured the distance of the artifacts and noted the tool type, (i.e. projectile point, waste flake, modified flake, chunk, biface fragments etc.). This method was followed until a 360 degree circle was achieved, or until all artifacts were mapped (Fig. 1). Very shortly it was realized that field maps would be difficult to copy and use for illustrative purposes in the text and that it was just as efficient to record the necessary data (angle, distance and tool type) in columnar form on a piece of lined paper to be transferred later to a final map.

This technique was designed and implemented for the purpose of studying possible artifact clusters on small sites. While slight variations in distance, less than 25 cm, could not be accurately mapped due to the scale of the plotting instrument, this is not considered significant in terms of the type of data the survey sought to recover. When concentrations were found an estimated three hours were spent mapping one *flagging hour.* Although the complete utility of this technique is not well known it is probable that activity specific areas will be identified if they exist on these small sites.

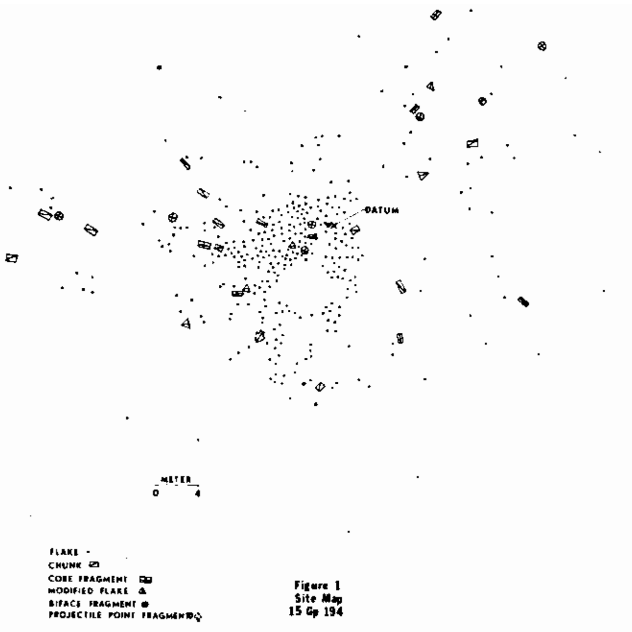

Figure 1. Site map, 15Gp194.

Implementation of the Flag and Map technique is best initiated in freshly tilled or disked fields with no crops planted.

I would like to take this opportunity to suggest the implementation of one more data collection strategy which may be referred to as the One Row-One Bag technique. In essence it is suggested that a collection bag be labeled and dropped after each sweep through a field. By controlling the data along well defined rows (in some instances linear transects) it is to be expected that activity loci may be identified horizontally.

This technique would require a greater expenditure of bags and additional time to gather the bags after the last row is collected but it is felt that the technique may hold some hope for improving horizontal control of data in large fields and fields with high standing crops.

While many survey reports have been cited so far, it should be noted that most sites are not systematically investigated and that of all the sites that are not so investigated, the small, open site is the most commonly overlooked potential source of data. Small sites are considered here to include those that are generally one acre or less in size.

Data collection in Kentucky on the survey level can be typified historically as the "one bag-one site" technique, i.e. a site is walked over and all the collected materials whether representing artifact assemblages, activity areas, etc. or not, are placed in one or two bags with total disregard for horizontal control, making it almost impossible to determine the significance of such sites. This practice is self defeating in that it limits our interpretations of the data to rough estimates of site type and relative chronology. Also, since no intense or continuous investigation of small sites has taken place in Kentucky, it can not be determined *a priori* that they are not significant in some way. Yet they are being written off daily as part of the mitigation process in cultural resources management.

This writer suggests that we pay more attention to small, open sites as a data collection problem and increase our efforts at innovative methodologies that will allow for the extraction of more data from such sites.

Finally, the distribution of bifaces and lack of flakes in the central portion of Figure 1 may represent one or more plowing phenomena. On the other hand, these artifacts may represent a pattern of human behavior yet undiscerned and are therefore worth the time needed to investigate and understand them.

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David S. Brose

HOW CAPT. RIGGS HUNTS FOR MOUND BUILDERS' RELICS: AN HISTORICAL INVESTIGATION OF SOME INFLUENCES ON C. B. MOORE

In the spring of 1976 a brief note was published which described one aspect of curatorial serendipity in archaeological investigations (Brose and Ford 1976). In that report I described how in the initial systematic reorganization of the early twentieth century archaeological collections of the Cleveland Museum of Natural History I came upon a box containing two Mississippian plain vessels of the Mound Field and Old Town Red varieties: Vessels which contained two butternut shells, one pawpaw seed, three common bean cotyledons, and three cob and kernel fragments of probable 8-10 row Eastern Complex maize. These ethnobotanical remains were associated with wood fragments dated to A. D. 1050±65 (CWRU-172) and with a note which implied that these Mississippian vessels and their contents had been given to the Museum by a Mr. Shaw who reported that they had been collected by a Mr. Jones in either 1897, or 1907, from the Rose Mound, Cross County, Arkansas in levels overlying a Baytown-like component.

Investigation suggested that the mound potted by this Mr. Jones had already been visited by Clarence Bloomfield Moore, a figure of some significance in Southeastern archaeology (Willey and Sabloff 1974: 60). As Stoltman has remarked

> Perhaps the most interesting figure in the history of Southeastern archaeology was Clarence Bloomfield Moore (1852-1936). A wealthy Philadelphia socialite, after a life of worldwide travel and no little adventure . . . he turned to archaeology. Among his earliest and best works were his excavations in the shell middens of the St. John's between 1892 and 1894. Traveling by river and with the aid of a crew of up to eight men, Moore was able to revisit all of Wyman's sites, to record forty-three additional sites, and to excavate on a larger scale than anyone before him. His work was surprisingly meticulous ('. . . not one spadeful of debris has been thrown out except in his presence . . . dimensions are derived from measurements, and not from estimate') (Moore 1892:917), and he proved to be a careful observer. He amassed further irrefutable evidence in support of Wyman's view that the middens were of human origin while, with stratigraphic evidence, he demonstrated that

Wyman's opinion about the relative ages of the shell middens was indeed true (1892:916) (Stoltman 1973:128-129).

While Moore's inspiration has always remained somewhat of an enigma, his methods have usually been clear, and his zeal unparalleled.

At the turn of the century and for the next two decades C. B. Moore was the most active figure in Southeastern archaeology. Moore was the most prolific excavator and publisher to have ever worked in the Southeast. Each summer an advance party would survey a segment of one of the major Southeastern streams, seeking excavatable sites and obtaining permission to dig. Beginning typically in November, Moore embarked in his hundred-foot-long, low-draught, stern-wheel steamer, the Gopher, accompanied by a personal friend, five to ten excavators, the steamer captain, a local pilot, and a crew of three. Excavations were conducted usually until April. Upon completion of the field season, a survey party prepared for the next year while Moore studied the artifacts and prepared his reports. To be only slightly facetious, after 1894, Moore's work can be characterized as that of a sophisticated gravedigger. He focused nearly all his attentions upon mounds and flat cemeteries where burials accompanied by rich mortuary offerings were most likely to be found (Stoltman 1973:130-31).

While to a large extent, considerable information can still be extracted from Moore's published reports and his unpublished maps and fieldnotes (e. g. Willey 1949; Peebles 1971; Brose 1979) it is often difficult to reassemble the actual provenience lots of recovered material with which the notes were associated. Moore was overly generous in distributing his collections, some of which (from Tampa Bay) were even given to that same Mr. Shaw whose heirs later donated them to the Cleveland Museum of Natural History. Mr. Shaw, it will appear, was quite interested in prehistoric Southeastern ceramics. So was Mr. Moore, and it is regrettable indeed that after 1896 his work demonstrates that he had strayed from the path upon which he had first embarked, the path which had been so carefully marked by Thomas, Putnam, Wyman, Nelson, and other pioneers of Southeastern archaeology. As in Newtonian physics, we may suspect that some external force was present to alter Moore's initial trajectory toward its final notorious direction. We may even be able to identify it.

Back in Ohio, in late 1977 the last of the uncatalogued Cleveland Museum of Natural History anthropological accessions from the 1930s were being unpacked and entered into the systematic collections. Amidst limestone fragments of Egyptian Hieroglyphic inscription and cartons of Ohio Flint Ridge chalcedony I came upon a taped cardboard box identical to that in which the Rose Mound Mississippian vessels were found in 1974. With considerable anticipation, I opened the box to discover, in wadded newspaper packing, four shell-tempered Mississippian vessels within one of which (Figure 2) were two fragile folded letters. The flat-bottomed jar with loop-handles (Figure 4) had no catalogue number or accession number on it. The other three (Figures 1, 2, and 3) all had the Cleveland Museum accession number 9678 written upon them. They also had the crossed out number 2625 written in white ink upon them. Again, reference to the Museum accession catalogue for Acc #9678 indicated that all four of these vessels had been donated to the Cleveland Museum of Natural History by a H. P. Shaw between 1927 and 1932. The folded letters inside the effigy loop-handled pot (Figure 5, 6) were far more informative.

The first letter dated January 1894 clearly indicated that an A. B. Shaw of Olmsted Falls, Ohio had purchased at least the three vessels marked 2625 from a C. W. Riggs who had exhibited them at the 1893 Columbian Exposition in Chicago. Riggs had excavated them from a grave in a mound located near the bank of the St. Francis River on the southeast 1/4 of Section 3 T8N, R5E in Cross County, Arkansas. Riggs stated that his field records were preserved in a fireproof building. A directory check of the address listed in Chicago revealed that a Captain C. Riggs of Philadelphia and Washington had been occupying an office at 8147 Edwards Avenue from 1893 to 1894 and had then moved to New York. No book dealers in the New York, Chicago, or Philadelphia area have thus far been able to obtain for me a copy of Riggs publication *"How We Find Relics"* which, for 50¢ illustrated frontier life while collecting, gave value of specimens, and also listed old coins, rare stamps, and prices paid therefor. The second letter was a true copy of a letter to Riggs dated September 1893. It was from W. H. Holmes of the Smithsonian Institution authenticating the Riggs collection of Arkansas ceramics. Oddly enough, the subsequent ceramic reports by Holmes (1903) made no mention of Riggs. Nor was there any mention of Riggs in *The Official History of the 1892-1893 World's Columbian Exposition in Chicago* (Truman *et al.* 1893) although the Ethnology section of that report did state that the extensive collections of Mound builder relics from Marietta, Ohio which were on display, had been purchased by Wards Scientific Institution of Rochester, New York or would become the property of the University of Chicago. Riggs' trail in history appeared to have grown cold.

However, the wadded newspapers in which the Cleveland Museum's ceramics from Mr. Shaw had been packed were interesting in their own right. They were from the October 10th, 1891 edition of the *Illustrated Buffalo Express* and while in a poor state of preservation, it was possible to distinguish in the lower left corner of one page, an illustration of a compound globular stirrup-spout jar. With the assistance of Ms. Mary Baum, Librarian of the Cleveland Museum of Natural History I obtained from the *Buffalo Express* morgue, a copy of the October 10th, 1891 issue of the *Illustrated Buffalo Express.* On the first four columns of page 51 the following story was printed:

A COLLECTOR OF CLAY
HOW CAPT. RIGGS HUNTS FOR
MOUND-BUILDERS' RELICS

The Most Valuable Collection Known now in Buffalo
Shall the Society of Natural Sciences Buy it?

> Ancient pottery seems to interest pretty nearly everyone. The deep-learned scientiest studies it to discover what manner of people they were who made it and thereafter draws deductions which, howsoever much they differ from the deductions of everybody else, he is willing to de-

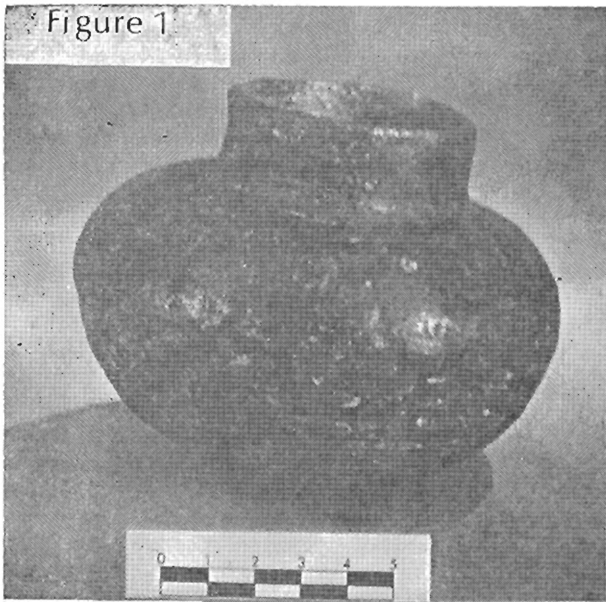


Figure 1

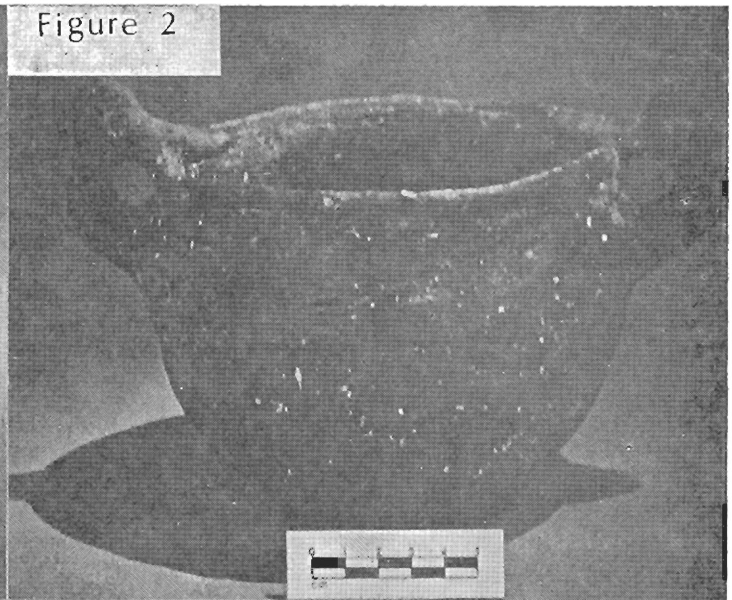


Figure 2

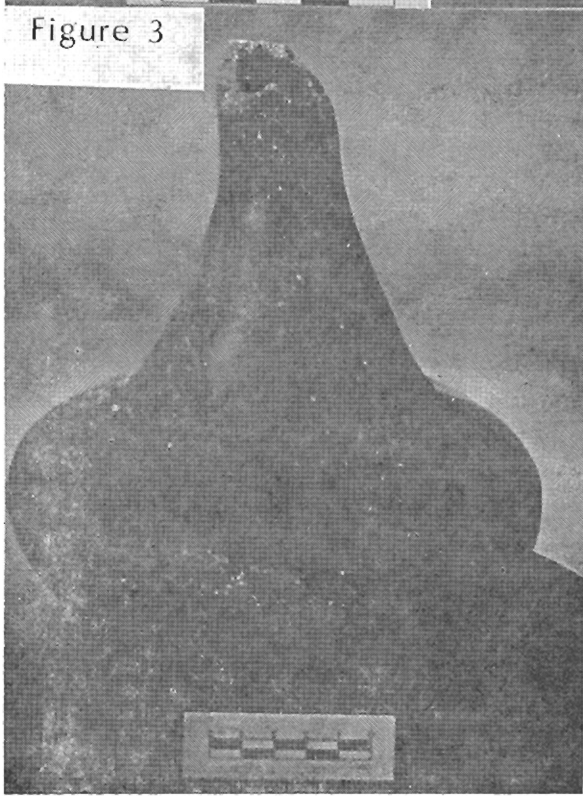


Figure 3

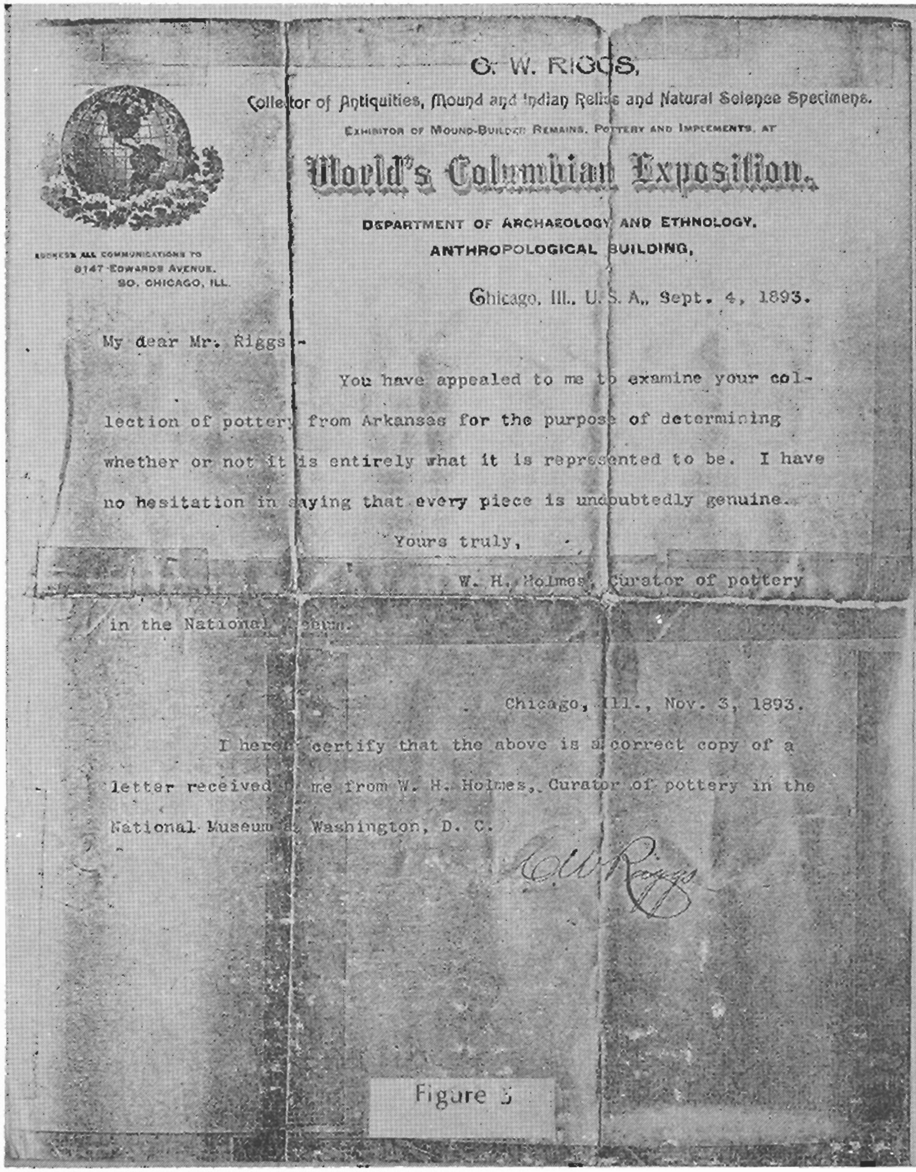
Figure 4

fend with his life. The simple housewife, unsophisticated and illogical as she may be, sees in the pottery graceful designs and can with profit compare the curious, rude utensils that it is to be supposed the ancient housewives used with the modern things of tin and steel that do everything from peeling potatoes to putting the baby to sleep. She is the happier for the comparison, so too is the professor, and the only logical deduction from the two extreme cases is that Buffalo, collectively and individually, would be not only the happier but the wiser and richer were her citizens to come forward with enough money to buy the Riggs collection of pottery now on exhibition at the rooms of the Society of Natural Sciences.

Lieutenant Frank Cushing, the Indian archaeologist, calls it the best collection of mound-builders' pottery in existence–better even than that of the Smithsonian Institute or of the Peabody Museum. Can it be wondered at that the Society of Natural Sciences, as a body, covets this collection for its own? Like most subastral matters, the possession of this collection has resolved itself into a matter of money, and if Buffalo's men and women are liberal enough the collection is ours.

The 3,000 odd specimens of pottery that go to make up the collection represent a 14-years' hunt. A pretty long hunt you will say. Yes, but it was not uninterrupted, and when it is considered that one man did all the hunting and supported a family besides one's astonishment is increased rather than allayed.

Mr. C. W. Riggs is at once the collector and possessor of the pottery. His enthusiasm has carried him thousands of miles and through many hard-ships. It is as essentially a part of him as his skin. The story of his wanderings in search of the precious pottery is nigh as interesting as is Jason's voyage in search of the golden fleece.



G. W. RIGGS,

Collector of Antiquities, Mound and Indian Relics and Natural Science Specimens.

EXHIBITOR OF MOUND-BUILDER REMAINS, POTTERY AND IMPLEMENTS, AT

World's Columbian Exposition,

DEPARTMENT OF ARCHAEOLOGY AND ETHNOLOGY,

ANTHROPOLOGICAL BUILDING,

ADDRESS ALL COMMUNICATIONS TO 6147 EDWARDS AVENUE, SO. CHICAGO, ILL.

Chicago, Ill., U. S. A., Sept. 4, 1893.

My dear Mr. Riggs:-

You have appealed to me to examine your collection of pottery from Arkansas for the purpose of determining whether or not it is entirely what it is represented to be. I have no hesitation in saying that every piece is undoubtedly genuine.

Yours truly,

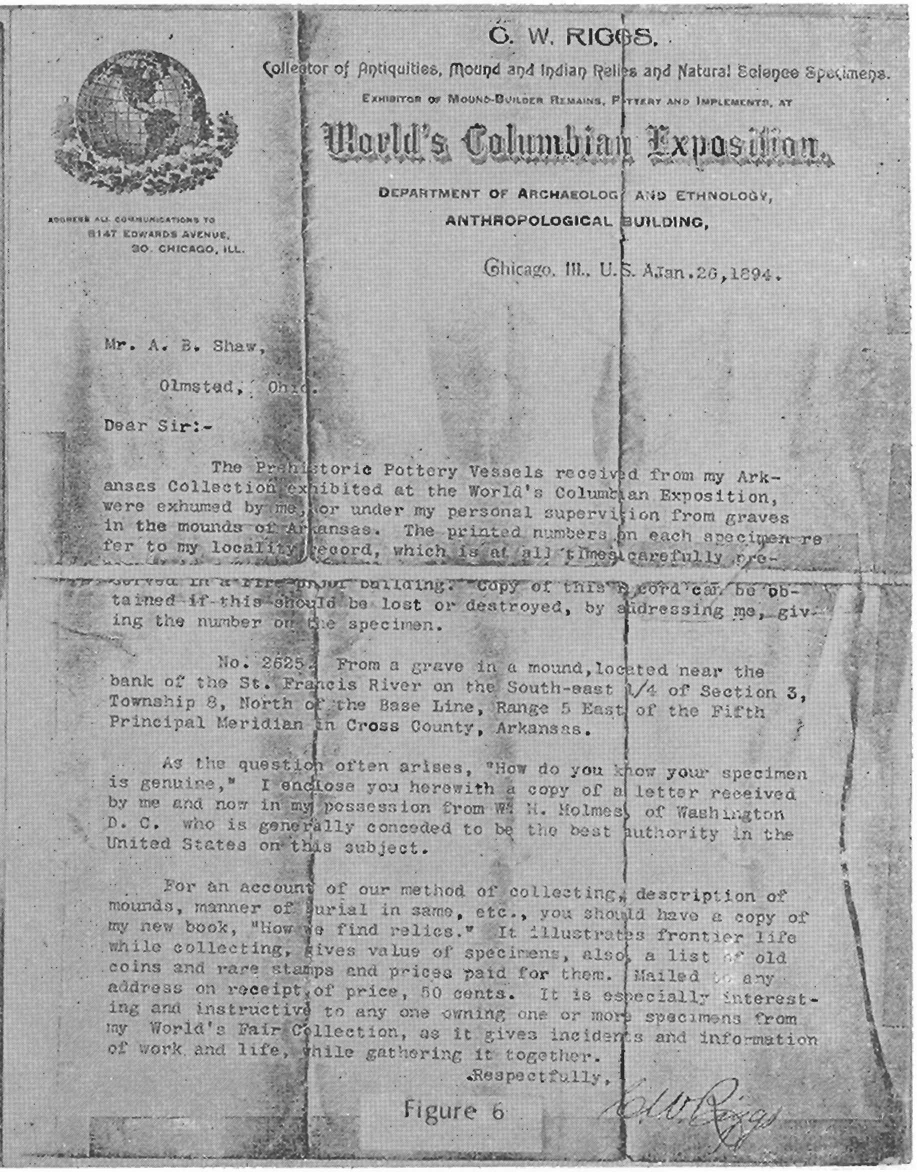
W. H. Holmes, Curator of pottery in the National Museum.

Chicago, Ill., Nov. 3, 1893.

I hereby certify that the above is a correct copy of a letter received by me from W. H. Holmes, Curator of pottery in the National Museum at Washington, D. C.

G. W. Riggs

Figure 5



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DEPARTMENT OF ARCHAEOLOGY AND ETHNOLOGY,

ANTHROPOLOGICAL BUILDING,

ADDRESS ALL COMMUNICATIONS TO 6147 EDWARDS AVENUE, SO. CHICAGO, ILL.

Chicago, Ill., U. S. A. Jan. 26, 1894.

Mr. A. B. Shaw,

Olmsted, Ohio.

Dear Sir:-

The Prehistoric Pottery Vessels received from my Arkansas Collection exhibited at the World's Columbian Exposition, were exhumed by me, or under my personal supervision from graves in the mounds of Arkansas. The printed numbers on each specimen refer to my locality record, which is at all times carefully preserved in a fire-proof building. Copy of this record can be obtained if this should be lost or destroyed, by addressing me, giving the number on the specimen.

No. 2625. From a grave in a mound, located near the bank of the St. Francis River on the South-east 1/4 of Section 3, Township 8, North of the Base Line, Range 5 East of the Fifth Principal Meridian in Cross County, Arkansas.

As the question often arises, "How do you know your specimen is genuine," I enclose you herewith a copy of a letter received by me and now in my possession from W. H. Holmes, of Washington D. C. who is generally conceded to be the best authority in the United States on this subject.

For an account of our method of collecting, description of mounds, manner of burial in same, etc., you should have a copy of my new book, "How we find relics." It illustrates frontier life while collecting, gives value of specimens, also a list of old coins and rare stamps and prices paid for them. Mailed to any address on receipt of price, 50 cents. It is especially interesting and instructive to any one owning one or more specimens from my World's Fair Collection, as it gives incidents and information of work and life, while gathering it together.

Respectfully,

G. W. Riggs

Figure 6

Moreover, there is just one point wherein these two voyageurs resemble each other—they both went in a boat. Only the more recent Argo is a houseboat, and not at all war-like in appearance, as may be judged from one of the pictures on our page.

Mr. Riggs looks to be the sort of man not inclined towards the conventional—and his looks do not belie him, as an Express representative discovered after talking with him for a couple of hours. "Yes," he began. "I have been a wanderer on the face of the earth ever since I was seven years old. I was born in Michigan 34 years ago and when I was 10 I took to trapping and hunting. From that I drifted into my present mode of existence—living in a houseboat most of the time and searching for mound-builders' pottery. To be sure (and he nodded smilingly), I could make more money if I settled down in a city, but I can't give it up—this wandering life." . . . "I bought our houseboat several years ago at Cincinnati, and it's as nice a one as ever I saw. You must know that along the Ohio and Mississippi rivers you see a good many of these 'shanty boats,' as they are sometimes called. They are usually run by a lazy, good-for-nothing lot who don't earn a living, but depend on the fish and game they get, supplemented now and then, I guess, by what they steal to keep themselves alive. Occasionally you run across some very respectable people, however, who float down the river as a novelty or as one way of spending a vacation. Now and then you run across a bridal couple to whom this leisurely, romantic life appeals as a unique way of spending their honeymoon—and it is. But there has not been a year since '76 when I have not lived on a houseboat, so you see it's an old story with me.

"We start out sometimes in the winter, sometimes in the summer. When the birds start south in the fall, you will find us about ready to follow, and in springtime, when the brant fly so high you have to look twice to see them, and all headed north, it is the first reminder that we have not long to stay. Then, after the wild turkeys have about quit gobbling, we are going, and with the season of dewberries we are gone. "We have sailed the Mississippi, the Missouri, the Ohio, and the St. Francis rivers in our houseboat, and as I have just reckoned it, we have traveled nearly 4,000 miles in her. Some few miles aren't they, and we wouldn't have covered so many miles, I guess, if we hadn't been pretty comfortable. Our boat is 66 feet long, 14 feet wide and has a 50-foot cabin. You see, that gives us pretty nearly as much room as some of your Delaware avenue houses, even. . . .

"Over this corner running from the door to the side of the cabin are two shelves. On the top one rests our library, which consists of a Bible, some books on the mound-builders, Chase's receipt book, some Century magazines of 1884, some old newspapers—very old—and my diary. The balance of the shelf is occupied by a big pot, the largest I have ever taken out whole. The bottom shelf holds some pyrostock solution, developing pans, plate holder, and the hundred other things necessary for developing photographs."

The method "Capt." Riggs (as he is usually called) follows in hunting pottery is to explore the land adjacent to the river banks where much the greater portion of the mounds are found, and when he discovers what he believes to be well-stored mounds, delves with spads and what might be called a "feeling rod"—a long iron bar about the thickness of a lead pencil. The pottery is very soft when in the ground, and is easily demolished, so that to guard against accidents, he always carefully "feels" his way. Mr. Riggs has dug for pottery so continuously that he is now able to select the mounds most liable to contain what to him is as "good as gold". Mounds of sepulture are most prolific in pottery, for it seemed to be the custom of the aborigines to bury with him who was to take the journey that ends we know not where, a cup to cheer, a cowl, a breast plate and a few other things that we of the last 1,000 years or so deem necessary only in the mundane sphere and not in the astral hereafter. With the children's skeletons are generally found little bowls which doubtless were placed, there by hands as loving and tender as those that now cover certain tiny graves at Forest Lawn with flowers. Necklaces form a considerable part of Mr. Riggs's collection and these often were found round the neck of a skeleton—presumably the skeleton of some fair young maid—or for that matter it might be the skeleton of an elderly matron. The Siamese-twin water vessel which appears around our illustrations today is made of clay and powdered shell, as are nearly all the pieces in the collection, and it was found in Cross County, Arkansas. As it is fair to presume that there were no Siamese twins in the year 1,100 B. C. or about that period, the name is anachronistic, in a way. It has been suggested that the bottle was made to represent a woman's breasts, but Frank Cushing doesn't accept this view. Of the two bowls with it, the one to the right can scarcely represent a swan and the single alternative is to call it a goose with a much abbreviated tail and a good deal of body. The bowl to the left is an ordinary water jar.

The other picture, showing half a dozen specimens, illustrates what is perhaps the chief value of the collection, i. e., the development of pottery decoration among the mound-builders. The first pottery was without ornament, the walls of clay being rudely shaped by the hands. To protect it, and to assist in carrying, the clay vessel was encased in a plaited straw or grass or wicker case—cheap wine flasks are in Italy today. The plastic clay received the imprint of the encasing straw; and where the strands were twisted in a cord at the top, or gathered into fascicles which should form the handle, the design was recorded by pressure on the soft clay vessel. The hardened vessel, outliving its straw case, was found to be stamped with a pattern. Then vessels were made and marked in imitation. Such primitive decorative designs are seen in the bowl and pot at the left of the two-row picture. From so crude and natural an origin the evolution of the higher decorative forms, and finally the prevailing color patterns, may be traced.

"I never found anything in books to help me in my digging," said Capt. Riggs. "And I have read about everything written on the subject of pottery. You see, most of these scientific fellows start out with a lot of paper and ink wherewith to record their observations, and they return—well, sometimes with a little pottery. I reverse the order. All I know about pottery-digging I have learned through hard knocks and practical experience. It's a good deal like hunting for gold. I have generally found that when I least expect a "find," I run across something particularly good—like that painted bowl up there, for instance. Then again I've dug three weeks without running across even so much as a mound-builder's tooth."

Mr. Riggs's meandering temperament has led him out in the canons of Colorado, where he collected much ancient cliff-dwellers' pottery. It was something over a year ago that he took his family thither, and the picture of the woman on horseback represents Mrs. Riggs as she traveled over the continental divide on a broncho. Pottery-collecting in the West was attended by many disheartening difficulties, for oftimes it had to be carried in the hand over 15 or 20 miles of roads leading between abysms leading down to "eternity," as Mr. Riggs expressed it, on one side, and bowlders loosened by blasting on the other. Whether the pottery was in a dozen fragments or in a single large piece, this equestrian circus task was unenviable. Pointing to a fine "olla"—a water vessel shaped something like an inverted pear—Mr. Riggs testified to the "eternal cussedness" of certain types of mankind—particularly cowpunchers. For an unkown number of years—perhaps centuries—this magnificent specimen of the cliff-dwells' art had stood on a shelf of rock in front of a perfectly inaccessible cliff-house about 200 feet from the level ground below. The pot was in plain view, but the overhanging rock had for years defied the best efforts of collectors. After obtaining one good view of the specimen, Mr. Riggs resolved to secure it at all hazards, and rode 25 miles to the nearest blacksmith who made, at the collector's order, a set of chisels with which to cut steps in the rock. Meanwhile a party of cowpunchers heard of the collector's purpose and going to the spot with their Winchester rifles, deliberately shot the pot to pieces. The fragments that fell to the base of the cliff were gathered up by the collector and put together by Mrs. Riggs. The missing pieces are still on the rock shelf.

After adding many valuable specimens to his earthenware treasury, Mr. Riggs bought a "prairie schooner" and set out for the East with his family. Travel was slow in this nomad ship, but the life suited the gipsy-like family, and they crossed Colorado and 120 miles of Kansas before they took to a railroad.

THE ILLUSTRATED BUFFALO EXPRESS
October 10, 1891
Page 51, Column 1-4
Buffalo, New York

It is apparent from this extensive report that Riggs, who was indeed unconventional in looks had begun collecting aboriginal ceramics in 1876 at the age of 20 years. By 1891 he had attempted (without success) to sell his ceramic collection to the Buffalo Society of Natural Sciences. While Riggs' ideas of ceramic chronology are of some historical interest themselves his major influence in Southeastern archaeology appears to have been along somewhat less theoretical lines.

Between 1891 and 1893 Riggs was in the Philadelphia and Washington area where he met with W. H. Holmes. In 1893 and 1894 he was in Chicago where he exhibited his wares and his methods at the Columbian Exposition. Between 1894 and 1896 Riggs returned to the southwest to collect fabrics. By 1895 he had moved back east to set up a "permanent establishment" at 41 and 43 University Place, in New York City. Less of an entrepreneur than he had thought, Riggs did not prosper on his own. During the first week of May in 1897 there was an Exhibition and Sale of the Riggs collection of Navajo Indian Rugs and curios at John Wanamakers Department Store, Broadway and Tenth Streets (Figure 7). After extolling the recently acquired blankets and rugs, which ". . . command the admiration of artists and connoisseurs throughout the civilized world . . ."; and which ". . . have especial decorative elements for dens, growleries, and smoking-rooms, and particularly for country houses and sea-side cot-.

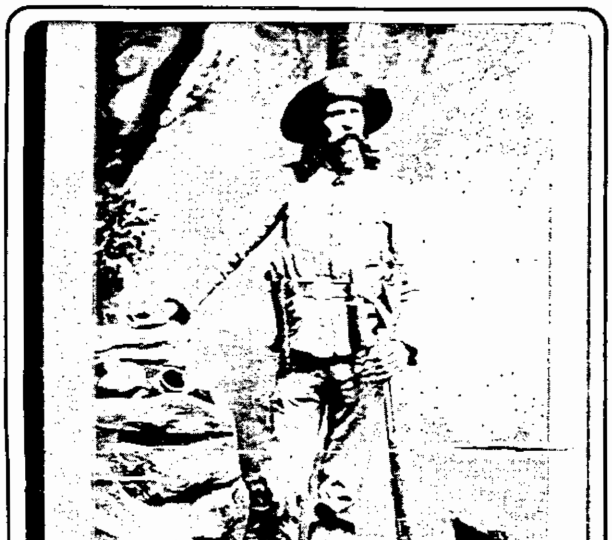

Figure 7

tages.", the Wanamaker sale brochure went on to note that,

> ". . . among the curios are some specimens of prehistoric pottery, also many barbaric ceramics that are of modern production. The collection will remain on show for a short time. When it is gone the opportunity to see and to buy from it will not be repeated. Failure to see and enjoy it will probably cause serious regret."

Apparently most of Riggs' Mississipipan ceramics had been sold off by 1897 and he was dealing primarily in southwestern artifacts. By 1899 he had left his native eastern woodlands for good.

But for those in New York, and Philadelphia, who ". . . to their serious regret . . ." had failed to see and enjoy the results of Captain Riggs' "method" in Southeastern archaeology, there would be Moore.

Appendix:

A Typological Analysis of the Riggs Arkansas Ceramics in the Cleveland Museum of Natural History

The three ceramic vessels now in the Cleveland Museum of Natural History, were collected by Riggs from the Neeley's Ferry Place (personal communication, Phyllis Morse, 1978), a site well described by Moore (1910) and by Phillips, Ford and Griffin (1951). There is no certain provenience known for the fourth vessel which was also part of the Shaw accession. These four vessels represent three distinct technological groups.

The first vessel (Figure 1) a small globular round-bottomed jar with a straight cylindrical neck, has an overall body diameter of 106 mm, a rim diameter of 57 mm, and the short cylindrical neck, represents 18.5 mm of the overall 101 mm height. Vessel capacity is approximately 4.4 l. The average thickness of the rounded lip is 9.5 mm. The inclusive shell tempering fragments are quite thin and rather uniform in size with a mean length of 4.0 mm and a maximum length of 8.2 mm. They lie parallel to the vessel walls within a rather laminar paste and seldom interfere with the rather well-smoothed (but not burnished) exterior surface. This jar of Neeley's Ferry Plain (Phillips, Ford and Griffin 1951:287) is clearly what Phillips (1970:130-135) would classify as *Mississippian Plain*, possibly Mound Field variety although no specific variety can be given on the basis of published sorting criteria.

The second vessel (Figure 2) represents a very thick, rather squat sub-globular small bowl with a slightly flattened round bottom. This bowl has a height of 92 mm, a diameter of 145 mm, and a capacity of 7.3 l. The vessel has two opposed infacing duck effigy riveted loop handles. The 127 mm diameter rims is rather straight to slightly everted with a thickened rounded lip. The vessel wall thickness below the lip is approximately 12.0 mm with the poorly executed thickened rims approaching 17.5 mm in thickness. The paste is coarse and contorted with large amounts of large (mean size is 10 mm) shell fragments, often at irregular angles, occasionally extruding through the poorly smoothed exterior surface. Based upon the paste and vessel thickness alone this bowl would appear to represent *Wickliffe Thick,* plain variety (Williams 1954:214-218) although Phillips (1970:171-172) has restricted Wickliffe thick to the cordmarked funnel vessels. The presence of the duck effigy handles is usually considered to be a Mature Mississippian characteristic (Phillips, Ford and Griffin 1951; Phillips 1970) although it should be remembered that numerous finely executed effigy handles occur in clear pre-Mississippian contexts in the Gulf Coast area (e.g. Brose 1979).

The third vessel (and the last Riggs assigned to the Neeley's Ferry site provenience) is broken but apparently represents a water bottle with traces of fugitive red pigment slip. This vessel (Figure 3) has an overall gourd (or squash) look with a 154 mm wide globular body having a slightly flattened rounded base. At a height of about 62 to 65 mm above the base the 113 mm high neck recurves out of the vessel shoulder. The upper, probably hooded portions of the bottletop are broken. The bottle surface is quite well smoothed, nearly burnished, and where the slip is absent displays some laminar cells from which the finely crushed shell temper has been leached. The vessel at the upper broken hooded top averages 9.5 mm in thickness. This somewhat thick red painted or slipped Mississippian plain water bottle, is clearly an example of what Williams (1954:209) described as *Varney Red Filmed* in the Missouri Lowlands to the north. Exactly how this might differ from Phillips' (1970:145) *Old Town Red var. Old Town* in the Mississippi Bayous an equal distance to the southeast of Neeley's Ferry is uncertain.

The final vessel in the Cleveland Museum Shaw accession (Figure 4) differs from those previously described vessels in several significant aspects. It's provenience, beyond having been donated by Shaw to the Cleveland Museum, is uncertain. It does not carry the 2625 of Riggs' which assigned the other three vessels to the Neeley's Ferry provenience. This fourth vessel, unlike the others, has been broken and restored at some time in the past. Perhaps, it has no relationship with Riggs' early archaeological endeavors at all. It is documented here because everything else which the Shaws donated to the Cleveland Museum (see Brose and Ford 1976) has turned out to have come from northeastern Arkansas and there is certainly nothing known to suggest that the vessel does not. It is finely shell-tempered and very hard and well-fired with a burnished surface and dark core. Vessel walls are 4.5 mm thick just below the flattened lip. The vessel represents a small carinated shoulder (cazuela) jar with a tapering cylindrical neck with a rim diameter of 67 mm. The overall height is 110 mm and the maximum width of 120 mm is at the shoulder about 50 mm above the flat circular base which is about 10 mm high and 43 mm in diameter, and which looks much like a Euro-American standing ring. A single medium wide (1 to 1.3 mm) incised line encircles the vessel 7 mm above the shoulder and represents the only surface decoration. Two opposed luted applique punched-hole vertical lug or strap handles. are present. While in terms of paste it could certainly be included within Williams (1954) or Phillips' (1970:132) *Mississippian Plain var. Coker*, the vessel shape is not reported for that type.

In all the three Riggs' ceramic vessels (and the uncertain fourth flat-based jar) can all be considered representative of the Mississippian ceramic tradition in the northeastern Arkansas area. There is nothing in these vessels to suggest a late or Mature Mississippian (at A.D. 1300) temporal position, which in this part of the Mississippian Valley is often characterized by painted and/or engraved ceramics (Phillips, Ford and Griffin 1951). Mississippian Plain ceramics in several painted and unpainted varieties are reported for this portion of northeast Arkansas by A.D. 1000 (Perino 1967; Brose and Ford 1976; Morse and Morse 1977). The assemblage recovered by Riggs from Neeley's Ferry thus appears consistent with an A.D. 1000-A.D. 1300 temporal position.

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